FIRE AND EXPLOSION INVESTIGATIONS AND FORENSIC ANALYSES:

NEAR- AND LONG-TERM NEEDS ASSESSMENT

FOR STATE AND LOCAL LAW ENFORCEMENT

A REPORT FOR THE NATIONAL INSTITUTE OF JUSTICE (NIJ)

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FOR FIRE AND EXPLOSIONS

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Preface

Among the various types of criminal investigations and the varied specialties for forensic analyses, crimes associated with arson and explosions are sometimes the most difficult to process and analyze. The inherent destructiveness of the events often compromise much of the evidence left behind. Ignitable liquids and many individual chemical compounds are found as contaminants in various matrices from a fire scene. The residues produced from the complete reaction of explosives are often gases. Those, which are not gases, are often so common that their presence is not meaningful.

The International Association of Arson Investigators[1], the **National Fire Protection Association**[2], the **American Society for Testing and Materials**[3], the **International Association of Bomb Technicians and Investigators**[4], and the **Technical/Scientific Working Group for Fire and Explosions**[5], have a high level of interest and desire in improving both the procedures at the scene and the capabilities of the laboratory. Yet, the status of investigations and analyses are not uniform across the nation. Among scene investigators, there is a desire to use more scientific and forensically sound methods. Among laboratory analysts, there is a desire to be able to glean the most that science can reveal about the evidence and to begin to approach the same levels of individualization as has been achieved in DNA analysis.

Recognizing the current state of affairs and wishing to provide guidance, the **National Institute of Justice**[6] commissioned[7] the **National Center for Forensic Science**[8] to prepare this report on the near- and long-term needs in Arson and Explosion analyses and investigations. Through collaboration with numerous representatives of the relevant communities and a survey instrument targeted to those communities this report was prepared.

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[1] IAAI, http://www.firearson.com.

[2] NFPA, http://www.nfpa.org.

[3] ASTM, http://www.astm.org.

[4] IABTI, http://www.iabti.org.

[5] T/SWGFEX, http://www.ncfs.ucf.edu/twgfex/index.html.

[6] NIJ, http://www.ojp.usdoj.gov/nij.

[7] NIJ funded this project (**$100,000**) through **Award No. 2005-MU-MU-K044, Supplement No. 1** (FY-2006, **$1,450,000**), UCF Project No. 24076022. **Mr. John Paul Jones** is the NIJ Program Manager for this award.

[8] NCFS, http://www.ncfs.org.

Acknowledgements

The individuals responsible for preparing this report (and who are listed in Appendix A) would like to thank the Director and Staff of the National Center for Forensic Science, the Chair and Co-Chair of the Technical/Scientific Working Group for Fire and Explosions, the various agencies who allowed their staff members to participate, as well as the national and regional forensic science organizations that assisted with the distribution of the survey instrument, including:

- The American Academy of Forensic Science[9]
- The American Society of Crime Laboratory Directors[10]
- The International Association of Arson Investigators[11]
- The International Association of Bomb Technicians and Investigators[12]
- The Northeastern Association of Forensic Scientists[13]
- The Midwestern Association of Forensic Scientists[14]
- The Mid-Atlantic Association of Forensic Scientists[15]
- The Southern Association of Forensic Scientists[16]
- The Southwestern Association of Forensic Scientists[17]
- Technical/Scientific Working Group for Fire and Explosion[18]

Numerous individuals who sent personal emails and letters to colleagues so that they were aware of the survey are noted, but cannot be listed.

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[9] AAFS, http://www.aafs.org.

[10] ASCLD, http://www.ascld.org.

[11] IAAI, http://www.firearson.com.

[12] IABTI, http://www.iabti.org.

[13] NEAFS, http://www.neafs.org.

[14] MAFS, http://www.mafs.net.

[15] MAAFS, http://www.maafs.org.

[16] SAFS, http://www.southernforensic.org.

[17] SWAFS, http://www.swafs.us.

[18] T/SWGFEX, http://www.ncfs.ucf.edu/twgfex/index.html.

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1. Executive Summary

In March of 2007, the National Center of Forensic Science (NCFS) turned to six (6) members of the Technical/Scientific Working Group in Fire and Explosion (T/SWGFEX) to form a Needs Assessment Planning Panel. This group was charged with preparing a report on the near- and long-term needs to the fire and explosion investigation and forensic analysis communities. The six (6) planning panel members were tasked to chair of one of the following planning sub-committees:

- Near- and long-term needs in Analytical Methods for Fire Debris Analysis
- Near- and long-term needs in Analytical Methods for Explosives Analysis
- Near- and long-term needs in Technology for Fire Debris Analysis and Fire Scene Investigation
- Near- and long-term needs in Technology for Explosives Analysis and Explosive Scene Investigation
- Near- and long-term needs in Training for Fire Debris Analysts and Forensic Fire Scene Investigators
- Near- and long-term needs in Training for Explosives Analysts and Forensic Explosive Scene Investigators

Each Chair selected additional members to fill each of these committees. The group reviewed two (2) surveys originally prepared by the Technical Working Group for Fire and Explosions in 1999 and 2000. These surveys were used by the T/SWGFEX organization to guide it in selecting projects and tasks that would be relevant to the fire and explosion investigative and forensic analysis communities. Using these as a template, one hundred (100) questions were formulated to create a survey instrument for 2007.

The survey was distributed using the assistance of a variety of investigative and analytical organizations. The results were collected in late September of 2007. The Planning Panel and members of the T/SWGFEX Executive Board met in late September of 2007 where they discussed the results of the survey. Using the survey instrument as well as input from their committee members, the group drafted their recommendations for this report. A process of drafts and reviews were used to hone these into a final recommendation divided into five general themes. Some of the themes could only be addressed through examination of multiple issues.

The themes and sub-divisions are:

Within each theme and sub-division, there are recommendations providing specific guidance and comment on:

- Needs and Problems Identified
- Suggested Solutions
- Implementation Strategies

It is hoped that these recommendations will provide direction on methods, technologies, and training identified as being most needed to meet the near and long term needs of those who both investigate fires and bombings as well as the scientists who provide forensic analyses.

2. Background

In 1998, the National Center for Forensic Science[19], a National Institute of Justice[20] program hosted by the University of Central Florida[21], organized a National Needs Assessment[22] meeting for fire and explosion investigators and analysts. Following this meeting, NCFS used NIJ funds to create two (2) Technical Working Groups (TWGs) responsible for writing two (2) guidebooks. NIJ in 2002 published the two (2) documents as research reports: *Fire and Arson Scene Evidence: A Guide for Public Safety Personnel*[23] and *A Guide for Explosion and Bombing Scene Investigation*[24]. A large contingent of the individuals attending this National Needs Assessment and who wrote these reports merged under the guidance of NCFS to form the Technical/Scientific Working Group for Fire and Explosions (T/SWGFEX).

This Working Group is unique among the various Technical and Scientific Working Groups in that it is composed of both laboratory scientists in fire debris and explosives analysis as well as fire and explosives scene investigators. Since then, the mission of T/SWGFEX has been:

> "To establish and maintain nationally accepted programs for the forensic investigation of fire, arson, and explosion scenes and devices. Further, to promote and maintain dialogue among personnel in the public safety and legal communities."

To achieve this mission, its various sub-committees have written and proposed standards for analysis, created modules for training, initiated and maintained a national database and repository for ignitable liquids, and organized symposia. T/SWGFEX chose these projects based on the results from one of its first projects. In 1999 and 2000, T/SWGFEX prepared and issued surveys to both laboratory[25] and

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[19] NCFS, http://www.ncfs.org.

[20] NIJ, http://www.ojp.usdoj.gov/nij.

[21] UCF, http://www.ucf.edu.

[22] August 7-8, 1997 (Orlando, Florida).

[23] http://www.ncjrs.gov/pdffiles1/nij/181584.pdf.

[24] http://www.ncjrs.gov/pdffiles1/nij/181869.pdf.

[25] Survey of Forensic Science Laboratories by the Technical Working Group for Fire and Explosions (TWGFEX)", *Forensic Science Communications*, January 2000 (Volume 2. Number 1), http://www.fbi.gov/hq/lab/fsc/backissu/jan2000/allen.htm.

scene[26] experts in fire and explosion investigations. These surveys provided comprehensive overviews of the state of fire and explosives analyses and investigative issues.

In 2007, NCFS was again charged by NIJ to assess the near- and long-term needs for arson (i.e., fire debris) analysis, explosives analysis, fire scene investigation, and bombing investigations. Its focus was on the analytical methods, technology, and training necessary to improve those fields. To achieve this task, NCFS turned to T/SWGFEX.

The experts from T/SWGFEX, as well as other organizations, were selected to expand the base of expertise within each committee. The panel began by discussing its task and decided that the original T/SWGFEX surveys should be a logical place from where to begin. The panel and their committee members worked to create a comprehensive survey that would assess the needs of the analytical and investigative communities. This survey was posted via Internet to members of relevant associated groups.

The survey was composed of one hundred (100) questions in eleven (11) categories. After the deadline for response to the survey, the results of the survey were analyzed and the various committees made their recommendations, which were coalesced into a comprehensive list of recommendations. This report contains those recommendations as well as additional information on how the recommendations were derived, the survey instrument and its raw results, and interpretation of those results.

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[26] "Results of TWGFEX Scene Survey" (http://www.ncfs.ucf.edu/twgfex/docs/Scene+Survey+Results+Report.pdf).

3. Structure of the Survey Instrument

The survey instrument contained one hundred (100) questions sub-divided into eleven (11) parts:

- Demographics and General Questions
- Professional Development
- Fire Debris Analysis Casework
- Fire Debris Analysis Analytical Methods
- Fire Debris Analysis Data Interpretation
- Explosives Analysis Casework
- Explosives Analytical Methods
- Explosives Data Interpretation
- Fire Scene Investigation
- Explosives Scene Investigation
- Laboratory Research Topics

Most questions related to more than one of the six (6) original planning panel sub-committee topics. Tables showing these relationships are included in the appendix. The survey was formatted by the Vista ™ Survey System to an instrument, which could be posted, completed, and submitted *via* Internet. NCFS representatives and members of the various planning panels made contact with professional organizations who agreed to post a link to the survey on their websites and to alert their members.

The survey was posted for most of the month of August 2007 and the first week of September 2007. At the end of the posting period, the Vista ™ Survey System prepared a report, which a committee of Planning Panel members and T/SWGFEX reviewed. The committee felt that the report by Vista ™ Survey System was helpful, but felt that additional information could be derived through a closer examination of the raw data. Using Statistical Package for the Social Sciences ® (SPSS) software, a member of the Planning Panel was able to re-format many of the results to the survey questions so that committee members could better understand respondents.

For some questions, it was obvious from the number of responses that more than the target community had provided input. Separating responses by the primary job category indicated by a respondent allowed the committee to view responses by specific job category rather than the more general response.

4. Recommendations for the Near- and Long-Term Needs In Fire and Explosion Analysis and Investigations

The 2007 T/SWGFEX Needs Assessment Survey[27] have identified five (5) general areas/themes which address the near- and long-term needs of Fire and Explosion Analysts and Investigators. A careful review reveals that many of the issues are intricately linked; some give greater emphasis to technology and methods while others emphasize education and training. Where a new technology is developed, the issue of training will follow closely behind. The five (5) general themes included (from I through V):

I. Develop Analytical and Investigative Products, Equipment, and Technique

A. Technology Transfer and Development of New Instrumentation for Field and Laboratory Detection and Analysis of Ignitable liquids and Explosives

B. Expansion and Creation of Databases Relevant to Fire Debris and Explosives Analysis

C. Alternatives and Improvements to Fire Debris Extraction Techniques

D. Improvements to Recognition, Sampling, and Preservation of Bombing Evidence

E. Basic Instrumentation Improvement for Under-funded Laboratories

F. Access to Existing Federal Databases and Information on Fire and Explosives Issues and Materials

G. Fire and Explosion Computer Modeling

H. Selected ILRC Reference Materials for Forensic Laboratories

I. Internal Standards Research

J. Development of Gasoline “Taggants”

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[27] NIJ funded the 2007 TWGFEX Needs Assessment *via* its FY-2006 **2005-MU-MU-K044, Supplement No. 1** award to NCFS (UCF Project No. 24076017).

II. Improve Communications, Contacts, and Cooperation

III. Enhance and Standardize Qualifications and Training

IV. Expand Access to Existing Information on Instrumentation and Equipment

V. Promote Consistency in Terminology, Methods, and Techniques

   A. Glossaries for Fire and Explosions

   B. Laboratory Submission Guidelines

   C. Resources and Best Practices in Analysis and Investigations

   D. Canine Use in Post-Blast Environments

Each of these may be further subdivided into sub-topics. All have been proportioned between the three following considerations:

1. Needs and Problems Identified
2. Suggested Solution(s)
3. Implementation Strategies

Participants in the Needs Assessment Planning Panel and T/SWGFEX (see **Appendix A)** were polled during the formulation of these recommendations in order to prioritize their order of presentation within the report. The primary Survey Questions to which each theme derived its response is noted at the beginning of each thematic grouping.

I. Develop Analytical and Investigative Products, Equipment, and Techniques

Survey Questions 12, 15, 18, 19, 20, 21, 22, 26, 27, 29, 30, 31, 54, 55, 60, 62, 66, 73, 74, 75, 76, 88, 89, 90, 91, 92, 93, 94, 94, 96, 97, 98, 99, and 100

A. *Technology Transfer and Development of New Instrumentation for Field and Laboratory Detection and Analysis of Ignitable liquids and Explosives*

1. Needs and Problems Identified

a. Both Fire Debris and Explosives Analysis have benefited from the transfer of technology from other forensic or analytical applications.

b. In some instances, the nuances of separating the analyte from the background interferences have not permitted technology transfer.

c. Advances in analytical chemistry, digital imaging, robotics, and data recording are presenting new tools and technology every day.

d. Forensic Laboratories are confronted with workloads and budgets that do not allow them to explore and validate these new technologies and thus the benefits of technology transfer are often delayed.

e. Competitive grants to research and apply new technology to the analysis of fire debris and explosives and the processing and sampling of fire and post-blast scenes are needed.

f. The specific areas of interest described in the survey instrument and between planning panel members are:

1) Development and validation of instrumentation that will be capable of indicating the probability match of ignitable liquids recovered from a fire scene to ignitable liquids on the person or in the possession of a suspect or victim. In short, the development of “DNA” analysis for fire debris is desired. Examples of instrumentation currently used in other analytical areas that may have an application are: two-dimensional gas chromatography with mass spectral detection (GC x GC/MS); Stable Isotope Ratio Mass Spectroscopy; Gas Chromatography with tandem mass spectral detection (GC/MS^n) or Fourier Transform Ion Cyclotron Resonance Mass Spectroscopy.

2) Development and validation of “expert system” software for GC/MS that can rapidly compare data from case samples with a reference library of ignitable liquid standards to form probability match lists. Examples of data from the reference standards that can be cross-

referenced and compared with unknowns are: target compound retention time, target compound mass spectra, target compound ratios, single ion profiles, and summed ion profiles.

3) An expert system that could be linked between laboratories willing to share their libraries would be an advanced application of this project.

4) Development and validation of additional and new technologies and methods that can identify both inorganic and organic explosives using, but not limited to: Time of Flight (TOF) GC/MS; Raman Spectroscopy; High Performance Liquid Chromatography-Fourier Transform Infrared Spectroscopy (HPLC-FTIR); Capillary Electrophoresis (CE); CE with Mass Spectral Detection (CE/MS); High Performance Liquid Chromatography with Mass Spectral Detection (HPLC/MS); Atmospheric Ionization Mass Spectrometry; or Ion Chromatography-Mass Spectrometry (IC-MS).

5) Development and validation of derivatization procedures and methods for alternative methods of analysis. Not all laboratories possess the same pieces of equipment and technology. Some instruments can confirm the identification of an analyte, so long as it is the type of molecule that the instrument can “see.” This would seek to determine standard methods and techniques for converting certain analytes from one form to another so that alternate instrumentation may be used. For example: conversion of cations to organic salts for analysis by GC/MS or the use of ligands in CE/MS.

6) Continue development of field portable (hand-held) instruments for field analysis of explosives, explosive residues and components, and ignitable liquids. Standardize development of new methods and techniques for field analysis using existing hand-held instrumentation. Candidates in limited use or with significant potential for this type of development include: Raman Spectroscopy; X-Ray Florescence; Micro Cantilever Sensors; Ion Mobility Spectroscopy; Differential Mobility Spectroscopy, Chemiluminescent Detection (EGIS); and GC/MS.

7) Development, testing, and validation of field portable instruments or sensors for explosives, mounted on existing robotic platforms so that they, and not personnel, are sent into “hot” zones to examine and report on the presence of ignitable liquids, or explosives. These field instruments may be capable of either rendering an analysis on site or sending the raw data via wireless communication to a remote laboratory for examination.

8) Develop, test, and validate tools for investigators at a scene such as an affordable hand-held x-ray unit that could allow investigators to “see” the interior of melted and deformed items. Another example is

the development of instruments and tools for scene documentation and laser mapping using GPS markers with the capability of having the data automatically downloaded into computer modeling software (FDS for Fire modeling).

9) Development, testing, and validation of scene "toolboxes" and training kits along the line of the Israeli or Australian models which allow their field agents to process the scene quickly and efficiently.

2. Suggested Solutions

a. NIJ grant solicitations for research into the development of new instrumentation, technology, methods, and sensors for the analysis of fire debris and explosives and the processing and sampling of fire and post-blast scenes as described above.

b. The implementation of technology transfer from techniques and methods not currently used in fire debris or explosion analysis and field investigations would be given preference.

c. The final reports from any funded projects must completely describe how the new technology is applied to fire or explosion analysis or scene investigations and provide comparative data of the new technology's efficiency versus the existing technology as well as the cost effectiveness of the new technology.

3. Implementation Strategy

a. Utilize T/SWGFEX to provide a pool of subject matter experts to review the solicitations and grant application proposals from which they would provide recommendations to NIJ for final consideration.

b. Once projects are selected, funded, and complete, ensure that the results are delivered to the relevant community through publication of the research and/or presentation at professional seminars and symposia.

c. Provide a link to the research results/papers through the T/SWGFEX Website http://ncfs.ucf.edu/twgfex/index.html.

B. *Expansion and Creation of Databases Relevant to Fire Debris and Explosives Analysis*

1. Needs and Problems Identified

a. The existing Ignitable Liquids Reference Collection (ILRC, http://ilrc.ucf.edu/search.php) created by T/SWGFEX contains over 440 ignitable liquids. Each has been analyzed by Gas Chromatography-Mass Spectroscopy and this data as well as manufacturers' and chemical information is available in a publicly accessible Website. Each item is also available as a physical sample that can be sent to a laboratory in order to analyze the ignitable liquid on their instrumentation.

b. More materials such as mixtures of ignitable liquids, various levels of deterioration of ignitable liquids, matrix contributions of ignitable liquids, and pyrolysis products are needed to expand the database.

c. T/SWGFEX is currently engaged in the construction of a similar database for explosives where data from various explosives analyzed by different instruments are also in a searchable format. Due to security issues, the content and method of access to this database requires additional consideration.

d. Additionally, the question of the compositional consistency between pre- and post-blast explosives is not fully known.

2. Suggested Solutions

a. Expand the ILRC by adding more samples of different ignitable liquids, mixtures, and various deterioration curves.

b. Promote and encourage the use of the database by analysts.

c. Continue the T/SWGFEX project to design, create, and post a similar explosives database (without a corresponding reference collection of materials for purchase).

d. Submit an NIJ grant proposal to study the compositional consistency of pre- and post-blast explosives in various environments and add the data to the explosives database.

3. Implementation Strategy

a. Increase funding to the T/SWGFEX **Ignitable Liquids Reference Collection (ILRC)** sub-committee to bring the members of the groups together more frequently to review and categorize data, design database improvements, and plan for further expansion.

b. Increase funding to NCFS to add additional staff for preparing ignitable liquid mixtures, deteriorated levels of ignitable liquids, extraction of matrices, and preparation of pyrolysis products.

c. Increase funding to purchase more ignitable liquids, matrices, instrumentation, and storage materials.

d. Increase the funding to the T/SWGFEX **Explosives Database** sub-committee to bring the members of the group together to complete their review and categorization of the data. Then the group would design the final version of the database for implementation.

e. Increase funding to purchase instrumentation, explosives, range time, personal protective equipment, and storage materials.

f. Increase the funding to the solicitations in order to add additional staff for analysis of explosives and explosives residues and database input and maintenance.

C. *Alternatives and Improvements to Fire Debris Extraction Techniques*

1. Needs and Problems Identified

a. Many of the ASTM methods used to extract fire debris, particularly Passive Headspace Concentration ASTM E1412, require the use of an adsorbent and a solvent. The adsorbent used most often in the United States is activated charcoal/carbon membrane. The solvent most often employed in desorbing the adsorbent is carbon disulfide due to its extreme efficiency in desorbing the trapped ignitable liquids.

b. Activated charcoal/carbon of the correct quality and orientation is only available from a limited number of sources.

c. Carbon disulfide is a dangerous and risky solvent (e.g., flammable, explosive, toxic, carcinogenic, etc.). Less dangerous alternatives such as diethyl ether, pentane, and blends have not proven to be as efficient as carbon disulfide in their desorption ability and may have their own hazards.

d. Active Forensic Laboratories have little time nor resources for conducting experimental casework to find alternatives to the adsorption matrix or the desorption solvent/procedure.

e. Projects to examine, document, and assess alternate adsorption media and desorption solvents and procedures are needed. This would increase the supply and availability of adsorption media and reduce the risk of or eliminate the use of dangerous chemicals in the desorption process.

2. Suggested Solution

a. NIJ grant solicitations for projects to explore alternatives to activated charcoal/carbon membranes as adsorption media focusing on both the efficiency of adsorption and the availability of the alternate media from a variety of resources.

b. NIJ grant solicitations for projects to explore alternatives to the use of chemical solvents currently used in desorbing adsorption media, focusing both on the efficiency of desorption and the reduction of hazards associated with the use of solvents.

c. NIJ grant solicitations for projects to explore alternatives to the use of either adsorption media or desorption solvents such as direct vapor headspace acquisition and injection, thermal desorption media, or cryogenic focusing.

d. The final reports from any funded projects must completely describe the alternative technique and provide comparative data of the following: the new technology's efficiency versus the existing technology; the cost effectiveness of the new technology; and how the new technology will address the need to archive any ignitable liquids extracted from the samples for later analyses. The implementation of technology transfer from techniques and methods not currently used in fire debris analysis would be encouraged.

3. Implementation Strategy

a. Utilize T/SWGFEX to provide a pool of subject matter experts to review the solicitations and grant application proposals from which they would provide recommendations to NIJ for final consideration.

b. Once projects are selected, funded, and complete, ensure that the results are delivered to the relevant community through publication of the research and/or presentation at professional seminars and symposia.

c. Provide a link to the research results and papers through T/SWGFEX http://ncfs.ucf.edu/twgfex/mission.html.

D. *Improvements to Recognition, Sampling, and Preservation of Bombing Evidence*

1. Needs and Problems Identified

a. A bombing scene contains the remains and residues of the explosive device. Unlike most other crime scenes the evidence has been forcefully dispersed over a wide area. Determination of the optimum areas for collection of samples is often difficult.

b. The selection of evidence must also consider the container in which the explosive residues will be preserved until they are to be tested. The various available containers are not the same. Some are porous and will permit the loss of volatile components. Some are so non-porous that volatile components will off-gas and build pressure in the container. Some are caustic and can corrode and breach metal or paper containers. In addition, some residues may dissolve plastic. The decision of which container to use to preserve the evidence is one of the first that can greatly affect the eventual ability of the laboratory to test the evidence and must be made with great care.

c. New explosives present new challenges. Triacetonetriperoxide (TATP) is becoming the explosive of choice with terrorists and anarchists due to the simplicity of preparing it. Its volatility, shock sensitivity, and tendency to succumb to rapid entropy are issues that affect finding and preserving it.

d. Research and training into the optimum areas within a bombing scene for selection of a sample and into the optimum containers for the preservation of various explosives is needed.

e. Research and training into the proper methods for preservation of TATP and other volatile explosives residues is needed.

f. A concise guide for the use and limitations of field instruments and presumptive identification kits would assist investigators in the selection of samples for more intensive laboratory testing.

2. Suggested Solution

a. NIJ grant solicitations for research into probability sampling in a bombing scene seeking to determine the positive hit return rate depending on distance from the crater and the value of various witness surfaces.

b. NIJ grant solicitations into determining the optimum containers for preservation of various explosive residues measuring the retention of the residue within the container without deterioration of the residue or container.

c. NIJ grant solicitations into the hazards and potential for preservation of peroxide based and highly volatile, unstable, or reactive explosives. Can it be done? How? In addition, for how long?

d. Development and distribution of a guide to the proper use and limitations of field instruments and presumptive testing kits.

e. The final reports from any funded projects must completely describe how the new technology is applied to fire or explosion analysis or scene investigations and provide comparative data of: the new technology's efficiency versus the existing technology as well as the cost effectiveness of the new technology.

3. Implementation Strategy

a. Utilize T/SWGFEX to provide a pool of subject matter experts to review the solicitations and grant application proposals from which they would provide recommendations to NIJ for final consideration.

b. Utilize T/SWGFEX to research and create a guide to the proper use and limitations of field instruments and presumptive testing kits. This may require sufficient funds for obtaining the kits (purchase, rental, or lease) as well as travel and lodging for the researchers to meet.

c. Once projects are selected, funded, and complete, ensure that the results are delivered to the relevant community through publication of the research and/or presentation at professional seminars and symposia.

d. Provide a link to the research results/papers through T/SWGFEX at http://ncfs.ucf.edu/twgfex/mission.html.

E. *Basic Instrumentation Improvement for Under-Funded Laboratories*

1. Needs and Problems Identified

a. A few laboratories are using gas chromatography with flame ionization detection (GC/FID) for analysis of fire debris. While this is certainly an adequate technology, it is not the technology of preference as seen in this survey or the results from the various proficiency testing organizations. Currently, fire debris analysis primarily utilizes gas chromatography with mass spectral detectors (GC/MS) in the analysis of extracts from fire debris. The nature of ignitable liquids and the interference chemicals co-extracted from the background matrices can often only be determined by the use of GC/MS.

b. Smaller, under funded laboratories often cannot afford the approximately $100,000 to purchase a GC/MS and train personnel. They must rely on the less expensive technology available with GC/FID. GC/FID, while valid for many samples, cannot provide the level of efficiency and accuracy of analysis as provided by GC/MS on those samples that are "borderline." Additionally, the identification of some ignitable liquid mixtures as well as single components requires mass spectral data.

c. Current Coverdell grants[28] are often targeted to different forensic disciplines or are not sufficient to cover the required costs.

d. In order to provide the highest level of analysis currently available, laboratories performing fire debris analysis should be using GC/MS.

2. Suggested Solutions

a. Establish a funding source whereby a maximum of twenty (20) laboratories per year for three years can receive $85,000 toward the purchase of a GC/MS and $5,000 to cover the training (registration, lodging, and travel) of two personnel with the stipulation that 100% of its fire debris samples must be analyzed on the instrument.

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[28] Coverdell Forensic Science Improvement Grant Program, http://www.ojp.usdoj.gov/nij/topics/forensics/nfsia.

b. Secure an additional $10,000 to be provided to each grantee to purchase extended preventive maintenance and repair service agreements with the instrument manufacturers.

3. Implementation Strategy

a. Utilize T/SWGFEX to assist NIJ with the creation of the grant application and with screening and recommendations of grantees.

b. Utilize the existing GC/MS of Fire Debris as the primary training venue for the grant recipients to send at least two persons from each laboratory for training.

F. *Access to Existing Federal Databases and Information on Fire and Explosives Issues and Materials*

1. Needs and Problems Identified

a. Federal agencies, particularly the Federal Bureau of Investigations (FBI, http://www.fbi.gov), the Bureau of Alcohol, Tobacco, Firearms, and Explosives (BATFE, http://www.atf.treas.gov), and the United States Fire Administration (USFA, http://www.usfa.dhs.gov), have and maintain various databases and reference material collections on fires and explosions.

b. Local and state agencies desire access to these databases in order to be able to cross-reference the items they find in casework with the larger reference collection of the federal agencies. They can take the data they develop on the composition of various materials and compare their results to the federal reference materials. The issue is that more often than not, these databases and materials are not accessible to the local and State agencies. In some instances the databases and materials are available, but not through a single resource.

2. Suggested Solutions

a. Use the resources of NIJ to encourage a meeting between the federal agencies and NCFS with representatives of T/SWGFEX to discuss the mechanism of how certain individuals may be permitted access to the various databases and materials.

b. Use the resources of NIJ to arrange a meeting between the United States Fire Administration and the BATFE to discuss placing links to the National Fire Incident Reporting System's reports on fire in the United States and the Bomb Data Center.

3. Implementation Strategy

a. Convene a meeting between the Director of NCFS, NCFS Technical Managers and staff, Chair of T/SWGFEX, Chairs of appropriate T/SWGFEX sub-committees, and representatives of the FBI, BATFE, and USFA to determine and agree on the databases and materials to be accessed.

b. Determine/define the limitations and modes of access, which would maintain the appropriate levels of security.

G. Fire and Explosion Computer Modeling

1. Needs and Problems Identified

a. Computer fire modeling has improved significantly since its inception. Its key limitation has always been the ability of the program to factor in all the various parameters and the accuracy of the parameters. Many of the references needed (e.g., heat flux, specific gravity, thermal inertia, heat transfer rate, etc.) may exist in various resources. They need to be accumulated into a single source. For many materials, this data does not exist.

b. Obtaining this data is beyond the budget and capabilities of most state or local agencies. Federal agencies such as the BATFE Fire Research Laboratory and the National Institute of Science and Technology (NIST, http://www.nist.gov) may have the equipment and laboratory space, but may need additional personnel and access to the materials themselves. Essentially what is needed is a facility with a cone calorimeter to burn items such as different brands and types of chairs, sofas, clothing, mattresses, tables, furnishings, etc.). Once the data is collected, it would be entered into a searchable database. This would allow investigators performing computer fire modeling to have access to more data to estimate the fuel load and model the fire.

c. Once the data from reference materials are available, the parameters specific to a scene must be input. Scene mapping tools, which could automatically input the data at the scene, may permit on-scene modeling, which would allow investigators to assess the validity of their observations and information from interrogations. If this was possible while on-scene, it would allow the investigator to acquire more precise and accurate information from which a scientifically based conclusion may be drawn.

d. Similar modeling programs and research has not been completed for the dynamics of an explosion. Basic research and modification of some fire modeling software may be possible. If it can be developed this would prove to be an advance for the timeliness and accuracy of post-blast investigations.

2. **Suggested Solutions**

   a. Establish a partnership between NCFS, T/SWGFEX, BATFE, and NIST so determine the feasibility of conducting the necessary testing at the BATFE or NIST facilities and to determine if T/SWGFEX members could be utilized to perform any assistance during the actual testing.

   b. Use the resources of T/SWGFEX to create and input data into a single source database as described.

   c. NIJ grant solicitations for development or adaptation of scene documentation cameras and instruments so that collected data can be directly loaded into computer modeling software.

   d. NIJ grant solicitations for the development or adaptation for fire modeling programs to Explosion Modeling Programs.

3. **Implementation Strategy**

   a. Utilize T/SWGFEX to provide a pool of subject matter experts to review the solicitations and grant application proposals from which they would provide recommendations to NIJ for final consideration.

   b. NIJ would provide funds for the purchase of materials (e.g., furnishings, floor coverings, clothing, other objects, etc.) to be burned in order to collect data. It may also include travel and lodging for the researchers to assist at BATFE Fire Research or NIST.

   c. Utilize T/SWGFEX to research and create the searchable database of fire modeling data. This may require sufficient funds for obtaining reference materials, software, and or hardware, as well as travel and lodging for the researchers to meet.

   d. Once projects are selected, funded, and completed, ensure that the results are delivered to the relevant community through publication of the research and/or presentation at professional seminars and symposia.

   e. Provide a link to the database and research results/papers through the T/SWGFEX Website.

H. *Selected ILRC Reference Materials for Forensic Laboratories*

1. Needs and Problems Identified

a. Laboratories performing fire debris analysis must compare the data generated by submitted evidence to data generated by reference standards analyzed on their own instrumentation in order to follow the guidance of the American Society for Testing and Materials E1618.

b. The survey revealed that some laboratories are not following this basic precept for quality and proper analysis of ignitable liquids.

c. For an individual laboratory to create a collection of ignitable liquids (including all the various classifications and ranges of ASTM E1618 described ignitable liquids) the expense would be significant and storage would become a problem. Not only would storage space be needed, but also it would impose a requirement for additional flammable and combustible storage cabinets to be purchased and installed.

d. This may be an untenable expense for some local and state laboratories.

2. Suggested Solutions

a. The NIJ with the National Forensic Science Technology Center (NFSTC, http://www.nfstc.org) has attempted to address this by sending fire debris validation kits to various laboratories, which included ignitable liquids from a commercial vendor.

b. For laboratories without the basic collection of ignitable liquids, provide a selection of twenty reference standards from the ILRC (which will include one ASTM Test Mix, one Gasoline, and three each [light, medium, and heavy] from the remaining ASTM classes) to be prepared and transferred to a maximum of 200 Forensic Laboratories.

c. Of those 200 laboratories selected, some may have the basic ignitable liquid resources and would prefer to use the twenty new standards to expand their "libraries."

d. T/SWGFEX will prepare an application to be completed by forensic laboratories wishing to receive this collection of reference materials. T/SWGFEX will prepare a select panel of forensic laboratory directors to review the applications and select the laboratories to which the reference collections will be sent.

3. Implementation Strategy

a. Identify appropriate NIJ solicitation to fund the cost of preparing the applications, distributing the applications, reviewing the applications, preparing the reference standards, and shipping the reference materials.

I. *Internal Standards Research*

1. Needs and Problems Identified

a. Some forensic laboratories add a chemical as an internal standard to fire debris samples or the solvent used to extract the fire debris.

b. This ostensibly provides quality assurance information that is useful.

c. Some laboratories do not follow this procedure arguing that adding even an inert material to a sample changes the sample.

d. Objective research needs to be conducted to establish whether this procedure adds or detracts from the value of analyses.

2. Suggested Solutions

a. Solicit applications for grants to study this practice and issue a report.

3. Implementation Strategy

a. Solicit grant proposals *via* the normal NIJ process to specifically, "research and report on the value and role of the use of internal standards in fire debris analysis."

b. Once completed, post the report on the NIJ Website and link to http://ncfs.ucf.edu/twgfex/mission.html, the T/SWGFEX Website.

c. Have the research presented as a paper to the T/SWGFEX symposium, The American Academy of Forensic Sciences (AAFS, http://www.aafs.org) annual meeting, or other relevant scientific meetings[29] and symposia.

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[29] Mid-Atlantic Association of Forensic Scientists (http://www.maafs.org), Midwestern Association of Forensic Scientists (http://www.mafs.net), Northwest Association of Forensic Scientists (http://www.nwafs.org), Southern Association for Forensic Scientists (http://www.southernforensic.org), and the Southwestern Association of Forensic Scientists (http://www.swafs.us).

J. *Development of Gasoline "Taggants"*

1. Needs and Problems Identified

a. The goal of most forensic testing is to associate evidence from a scene with evidence from the possession of a suspect.

b. Ignitable liquids do not lend themselves to this type of comparison as they are usually extracted from debris or matrices after they have been burned and weathered.

c. As a result, the extracted ignitable liquid will have lost many of its components and will have added compounds pulled from the matrix and the burning of the matrix (pyrolysis products).

d. Current instrumentation does not sufficiently characterize the remaining compounds so that probability matches between samples can be made.

2. Suggested Solutions

a. Convene a meeting with NIJ, T/SWGFEX and representatives from academia, the petroleum refiners, and petroleum marketers to discuss the potential of adding combinations of inert and stable chemicals with high boiling points that can be added to gasoline as a marker of its manufacturer or distributor.

b. Obtain agreement from gasoline refiners and marketers on participation in this program as a way of assisting the forensic community and fighting crime.

3. Implementation Strategy

a. If determined to be feasible, use the group to design an implementation strategy by first determining the markers to be used, the amounts to be incorporated, the analytical methodology for "seeing" them (which may be different from the GC/MS of ignitable liquids) and assigning them to refiners and marketers.

b. Encourage and applaud refiners and marketers.

c. Monitor compliance with this voluntary program by having samples submitted to a laboratory specified by S/TWGFEX for analysis.

II. Improve Communications, Contacts, and Cooperation

Survey Questions 10, 12, 15, 16, 24, 68, 69, 84, 85, 86, and 87.

1. Needs and Problems Identified

a. Currently, most professionals in fire and explosion investigations and analyses are segmented into communities within either the investigative or the laboratory subgroup. There is additional segmentation of the sub-groups by specialties and geography. All of these divisions and convoluted pathways give rise to unsatisfactory levels of communication and can cause some practitioners to become isolated.

b. These professionals have identified a need for cross-communication. Among the reasons, is a need to determine the expertise of other members across and within the forensic science and investigative communities. They also need to contact other professionals in the field to promote finding solutions to problems and gathering information. This information exchange enhances the professionalism and competence of the individual. This information may sometimes be sensitive and should not be freely accessible to all members of the public. Direct contact allows for a greater exchange of pertinent information on techniques, methods, and equipment.

c. Some forensic laboratories having a small one-person fire debris or explosives analysis section may not have a second expert on site available to perform peer review of casework, a necessary component of providing quality analyses.

2. Suggested Solutions

a. A centrally available listing of professionals in fire or explosion scene investigation and fire or explosion debris analysis is needed to provide a secure method of contact between the members of the relevant communities. This will enhance communication between the members of the scientific and investigative communities and promote a free exchange of ideas.

b. This listing should include curriculum *vitae* of the individual's areas of expertise as well as contact information in the event that one-to-one contact is desired.

c. The contact list should also indicate if the listed professional would be available to assist other professionals in specific areas such as peer review of casework.

d. An annual meeting/symposium, which would offer training in multiple topics of fire debris and explosives analysis and fire and post-blast investigations.

3. Implementation Strategies

a. Promote and continue to subsidize the Technical Working Group for Fire and Explosives/Scientific Working Group for Fire and Explosions (T/SWGFEX) organization, which has an existing membership of leading experts from forensic analytical laboratories and scene investigations in both fires and explosions.

b. Promote the evolution of T/SWGFEX so that it will move from a subsidized subsistence to one that can support itself.

c. Promote attendance at annual T/SWGFEX symposia and enhance its quality through targeted presentations on topics, resources, and experts defined in other sections of this report.

d. The National Institute of Justice (NIJ) should facilitate T/SWGFEX in creating and posting a comprehensive listing of professionals in the field(s) of fire and explosion analysis and investigation with *curriculum vitae* of expertise and contact information.

e. Poll the professionals listed to determine if they would be willing to provide advice and direction without a financial cost. This could be for scientific peer review of data or for the exchange of experience and/or opinions on the utility of equipment. The core to begin this project should be T/SWGFEX members as they are already part of an organization, which has at its core the desire to merge the two communities.

f. T/SWGFEX would establish a sub-committee to design and build this list and ensure the accuracy of the information concerning the people on it.

g. The T/SWGFEX committee would design the template for listing a participant's professional qualifications.

h. This would effectively create a clearinghouse of analysts willing to perform peer review for those laboratories not currently doing peer review.

i. Once listed, the individual would be given access to the T/SWGFEX list serve. Listing would not automatically place them as members of T/SWGFEX.

j. Other individuals and organizations would be contacted through their publications and meetings to explain the benefits of being listed.

k. This already existing list serve would provide a free Internet link for professionals. This strategy would only require its expansion and publication of its existence once the pertinent protocols are established.

III. Enhance and Standardize Qualifications and Training

Survey Questions 7, 8, 10, 11, 12, 32, 56, 57, 59, 71, 72, 88, and 89.

A. *Near and Long Term Education and Training of Analysts and Investigators*

1. Needs and Problems Identified

a. Formal Education Assistance

1) Investigators and analysts who seek to better themselves and become more adept at their profession are often in a precarious position.

a) Most work full time and are at a point in their lives where they do not have the additional resources to pay for a formal degree even if they can find the time.

b) Some are located in areas where no provider of a relevant degree is available.

c) Some on-line degrees are available, but will not be subsidized by their employers and the individual is back to the problem of resources.

2) Subsidy of individuals seeking formal degrees has been attempted in the past by some governments only to find that some individuals abused the program.

3) Safeguards would be necessary to mitigate this additional consideration.

b. Symposia and Seminars

1) Scene Investigators

a) International Association of Arson Investigators (IAAI, http://www.firearson.com) annual meeting.

b) International Association of Bomb Technicians and Investigators (IABTI, http://www.iabti.org) annual meeting.

2) Analytical Chemists and Forensic Scientists

3) American Academy of Forensic Sciences (AAFS, http://www.aafs.org) annual meeting.

4) Pittsburgh Conference and Exposition on Analytical Chemistry and Applied Spectroscopy (Pittcon, http://www.pittcon.org)

5) Other National/Regional forensic science conferences, meetings, and symposia[30].

6) Investigators/Analysts

7) The only symposia which have deliberately attempted to blend presentations germane to investigators and analysts from both the fire and explosion communities have been the ones produced by T/SWGFEX (http://ncfs.ucf.edu/twgfex/symposium.html). Even those have not appealed to all due to venue, format, and the availability of speakers.

c. Continuing Education

1) There are a variety of commercially available training programs available in a wide variety of topics.

2) Some organizations provide free training classes *via* the Internet.

a) For fire investigators and bomb technicians most of these no-cost on-line seminars are quite good and fulfill many of their needs.

b) For laboratory analysts, very few no-cost symposia are completely relevant to their positions in the forensic laboratory and most are limited to specific instrumental techniques.

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[30] Mid-Atlantic Association of Forensic Scientists (http://www.maafs.org), Midwestern Association of Forensic Scientists (http://www.mafs.net), Northwest Association of Forensic Scientists (http://www.nwafs.org), Southern Association for Forensic Scientists (http://www.southernforensic.org), and the Southwestern Association of Forensic Scientists (http://www.swafs.us). See the **AAFS Website** (http://www.aafs.org) for contract information for other national/regional forensic science-related organizations as well as dates/times for upcoming national/region meetings.

3) Many commercial training programs on DVD, tape, or CD cover subjects so broadly that they only have limited applicability to the needs of the fire and explosion community.

d. Interactive training

1) An essential component to insert into as many of the selected opportunities as possible is to encourage the interaction between analysts and investigators.

2) The more that one can understand about the capabilities and limitations of the other, the better they can interact with each other.

3) Interactive experiments and short cross-training experiences in the basic aspects of each other's work are desired.

4) Accessibility to each other in a broad network across state, local, and federal lines is desired and has the potential to improve the quality of investigations and analyses by simply reducing any perceived or real isolation (by relatively small and remote units).

2. Suggested Solutions

a. Formal Education

1) Contact those schools known for providing quality on-line and non-conventional degree programs to determine if any have a residency requirement (on campus for a set period or number of hours). Ensure that their programs can be completed either entirely on-line or wholly on weekends and evenings. List these programs and contacts and make them the priority programs for the following scholarships.

2) Establish and fund a scholarship program where ten (10) investigators per year are selected for enrollment into a Bachelor or Master's Degree program in Law Enforcement, Criminal Justice, Fire Science, Forensic Science, or a related and germane field. Fund only the tuition costs for a maximum of four years and the minimum number of credit hours required to obtain the degree. All other costs are to be borne by the individual selected.

3) Establish and fund a scholarship program where ten (10) analysts per year are selected for enrollment into a Graduate Certificates and

Degree program in Chemistry, Fire Science, Forensic Science, or a related and germane field. Fund only the tuition costs for a maximum of three years and the minimum number of credit hours required to obtain a Master's or Doctoral degree. All other costs are to be borne by the individual selected.

4) Require that any persons selected for this program reimburse the funding agency for any costs incurred should the individual opt to discontinue the program prior to completion.

5) Require that any person selected for this program remain employed by the same agency through the completion of the program and two years thereafter.

b. Symposia and Seminars

1) Secure solicitations for the registration, travel, and lodging costs for a maximum of ten (10) individuals per year to attend a fire, bombing, analytical, forensic seminar, or symposium where they have been accepted to provide a workshop, paper, or presentation.

2) Promote attendance of the T/SWGFEX symposia by subsidizing the costs for meeting space/venue; speaker honoraria; travel/lodging costs for speakers, hosts, staff, and organizers.

   a) Require that the T/SWGFEX symposium seek an equivalent balance between speakers and presentations germane to investigations and analysis as well as fire and explosions.

   b) Set aside a portion of the symposium where individuals from either the analytical or the investigative communities may present papers regarding original research or unusual cases.

c. Continuing Education

1) Include some of the topics identified in the survey as targeted presentations or workshops to be included in the T/SWGFEX symposium.

2) Create instructional presentations specific to the needs of the fire and explosion communities for no-cost distribution on DVD or download *via* the Internet.

d. Interactive Training

1) Develop solicitations that include the resources to coordinate experimental fires and explosions conducted around the nation so that more than just local or limited agency personnel can participate. This is necessary as it is becoming more difficult to meet all the regulatory and statutory requirements for conducting these “live” experiments. A special effort to determine the capabilities of the BATFE Fire Training Center should be made.

2) Create a protocol for contacting an organizing agency to determine if they would like assistance in the set-up and data gathering and if they will allow observers to attend.

3) Determine a level of assistance that may be made available to the organizing agency: data gathering, recording, consumables, and personnel.

4) Use available resources to identify laboratories willing to host guests to shadow the fire debris or explosives analytical process for a maximum of three days.

3. Implementation Strategies

a. Formal Education

1) Utilize T/SWGFEX to research and create lists and links to the schools that meet the above criteria and post such lists and links on the T/SWGFEX Website.

2) Utilize T/SWGFEX to research and create scholarship application forms that will assess the applicant’s experience, work history, existing education, potential to complete a formal program, financial need, and geographic distribution.

3) Utilize T/SWGFEX to review completed applications and provide a listing of top candidates to NIJ for final selection.

4) Utilize T/SWGFEX to create the attendant promissory forms and to monitor the progress of selected candidates.

b. Symposia and Seminars

1) Utilize T/SWGFEX to research and create symposia and seminar scholarship application forms that will ask which seminar or symposium the applicant wishes to attend. The application form would additionally assess the applicant's experience, work history, existing education, training need, and geographic location.

2) Utilize T/SWGFEX to review completed applications and provide a listing of top candidates to NIJ for final selection.

3) Utilize T/SWGFEX to create the attendant promissory forms and to monitor the progress of selected candidates.

4) Utilize T/SWGFEX to review completed applications and provide a listing of top candidates to NIJ for final selection.

5) Utilize solicitations to distribute funds to pay the selected attendee's travel and registration in advance and to reimburse the attendee for hotel and meals after completion of the seminar or symposium.

6) Support financially efforts to continue to sponsor T/SWGFEX's Symposium.

7) Determine if a change of venue would increase attendance and, if changed, the increased costs of logistics for managing it remote from Orlando, Florida.

8) Topics suggested in the survey, which would be directly applicable to the T/SWGFEX.

9) Speakers should be targeted and solicited who are involved in the development of new technology and instrumentation in the analysis of fire and explosives.

10) Presentations on TATP and other peroxide based and homemade explosives, including manufacture, handling, use, mis-use, and analytical procedures.

11) Scene investigation workshops for both fire and explosives that will promote interaction and idea sharing between investigators and analysts.

12) Develop a session for investigators in explaining the various ASTM classes of ignitable liquids, examples, and why they are used.

13) A session of the use of polarized light microscopy (with an accompanying DVD) and its use in explosives analysis.

c. Continuing Education (CE) – This will require considerable financial support by NIJ in the development of recorded short courses that can be made available by either DVD or on-line.

1) Utilize T/SWGFEX to research and create recorded sessions on the following topics. The initial presentation could be made on-site at NCFS, in a laboratory, at an experimental scene, or an explosives range. This footage would be incorporated into the DVD and online products and may require a legal disclaimer that all methods, parameters, and possibilities may not have been included:

a) Polarized Light Microscopy Of Explosives.

b) Following Fire Debris Evidence Through The Laboratory: Extraction, Analysis, And Interpretation For The Investigator.

c) Following Explosives Evidence Through The Laboratory: Extraction, Analysis, And Interpretation For The Investigator.

d) Understanding ASTM Ignitable Liquid Classifications And Why They Are Used.

e) Organic Chemistry of Fire Debris Analysis: Molecular Composition of Ignitable Liquids and Materials at a Scene; Combustion Reactions and Products; Analytical Procedures for Organic Species.

f) Gas Chromatography/Mass Spectroscopy of Ignitable Liquids and Pyrolysis Products.

g) The Making Of Ignitable Liquids: From Crude Oil Through The Refinery To Commercial Product.

h) Fundamental Fire Scene Investigation According To The NIJ Research Report – *Fire And Arson Scene Evidence: A Guide For Public Safety Personnel* (June 2000).

i) Fundamental Post-Blast Scene Investigation According To The NIJ Research Report – *A Guide For Explosion And Bombing Scene Investigation* (June 2000).

j) Advanced Fire Scene Investigation.

k) Advanced Post-Blast Scene Investigation.

l) Fire Dynamics.

m) How To Be An Effective Expert Witness (One Each For Fire Investigations, Post-Blast Investigations, Fire Debris Analysts, And Explosives Analysts).

n) The Instruments And Methods For Analyzing Explosives.

o) The Collection And Preservation Of Evidence (One Each For Fire Scenes And Post-Blast Scenes).

p) Investigating Potential Electrical Fires.

q) The Training, Use, And Value Of Canines In The Fire (Or Explosion) Scene.

r) Using A Disruption Scenario To Create The "Post-Blast" Scene: Considerations Of Positioning, Comparison Sampling, And Evidence Collection.

s) The When, Where, And How To Of "Render Safe."

t) Interpretation Of Fire Debris Analysis Data.

u) Extraction And Sample Preparation Methods In Explosives Analysis.

v) Report Writing For Accuracy And Validity: Scientific And Legal.

w) How Explosives And Pyrotechnics Are Manufactured.

x) IED's And Homemade Explosives – Recognition And Construction.

d. Interactive Training

1) Use T/SWGFEX to identify ongoing opportunities where experimental fires and explosions are being conducted around the nation. Special effort to coordinate with the BATFE Fire Training Center should be made a priority.

2) Contact the organizing agency to determine if they would like assistance in the set-up and data gathering and if they will allow observers to attend. Assist the organizing agency with the cost of consumable supplies.

3) Maintain a cache of measuring devices and sensors relevant to collecting data on temperature, wind direction, humidity, pressure wave, available oxygen, and heat flux at specified locations. Augment this cache with miniature cameras that can be placed into the experimental environment to collect images during the experimental event.

4) In addition to the cache, T/SWGFEX members must be trained in data recording and camera set-up and so that they can operate the cache of equipment at any experimental scene.

5) Provide funds for travel, lodging, and meals for up to fifteen (15) investigators and analysts to attend these events.

6) Use T/SWGFEX to identify laboratories willing to host guests to shadow the fire debris or explosives analytical process for a maximum of three days.

7) Provide funds for travel, lodging, and meals for up to fifteen (15) investigators or analysts.

B. Fire Dynamics

1. Needs and Problems Identified

a. Much has been done to develop our understanding of the dynamics of a fire scene. A training program has been developed by NCFS and the United States Fire Academy (USFA) offers a two-week class on the subject.

b. While there is some information, research, and references on the dynamics of an explosion or the logistics of a post-blast scene, there is currently no comprehensive program describing the dynamics of an explosion scene.

2. Suggested Solutions

a. Utilize T/SWGFEX to develop a program of training in the dynamics of the explosion scene.

b. Conduct additional research necessary as to fill any gaps in knowledge.

3. Implementation Strategy

a. Issue NIJ grant solicitations for fundamental research as it can be applied to the dynamics and physics of explosions.

b. Utilize T/SWGFEX to provide a pool of subject matter experts to review the solicitations and grant application proposals from which they would provide recommendations to NIJ for final consideration.

c. Utilize T/SWGFEX to write and incorporate existing data and information with developed research into a comprehensive program guide on explosion dynamics.

d. Once created, ensure that the program is delivered to the relevant community through publication of the research and presentation of the program.

e. Provide a link to the portions of the program, which can be made publicly available on T/SWGFEX Website.

IV. Expand Access to Existing Information on Instrumentation and Equipment

Survey Questions 12 and 31.

1. Needs and Problems Identified

a. Forensic laboratories have limited budgets for purchasing instrumentation.

b. There are multiple vendors for each instrument.

c. Each laboratory will have certain specifications for the instrument that are of a higher priority to them than may be held by another laboratory.

d. The task of contacting each manufacturer, reading and sorting the multiple specifications, and comparing the germane specifications to aid in selection of the instrument for purchase is formidable and daunting.

2. Suggested Solution

a. Gather information on instruments, their specifications, literature, and contact information and place it in a single location where it can be accessed by any laboratory.

b. Set up the information on technical specifications in a format that will allow comparison of specifications between instruments.

c. Be certain to design the listing so that the information is taken directly from manufacturer's information and that the listing is entirely objective.

d. Encourage the inclusion of manufacturers in designing the database or spreadsheet and the technical specifications it should contain.

3. Implementation Strategy

a. Survey forensic laboratories on the types and manufacturers of instruments they currently use and would like to obtain.

b. Contact each manufacturer for brochures and technical specifications for their instruments.

c. Have T/SWGFEX (and other relevant experts) review the literature to determine those technical specifications identified as being critical for comparing one instrument with another.

d. Have T/SWGFEX create a database or spreadsheet, listing each instrument by type and the specifications of each so that side-by-side comparisons can be made.

e. Post this spreadsheet on the T/SWGFEX Website for public access to the comparison information.

f. List on a single site, within the T/SWGFEX Website, the web links, addresses, and telephone numbers for instrument manufacturers and their representatives.

g. In a separate T/SWGFEX database or spreadsheet, list observations, cautions, and operational suggestions by instrument manufacturer, instrument type, and application.

V. Promote Consistency in Terminology, Methods, and Techniques

Survey Questions 12, 15, 24, 25, 31, 78, 79, 80, 81, 82, and 83.

A. *Glossaries for Fire and Explosions*

1. Needs and Problems Identified

a. A glossary to promote consistency of terms relevant to fire and explosion investigation and forensic analysis was identified as being desirable.

2. Suggested Solutions

a. Utilize the existing glossaries created by T/SWGFEX and posted on their Website.

3. Implementation Strategies

a. Create a clearly identifiable folder on the T/SWGFEX Website containing a professional version of these Guides. Have a link to this site from the NIJ and NCFS Websites.

b. Send copies of the glossaries to members of the T/SWGFEX list serve with the web link as well.

c. Send electronic copies of the glossaries and the web link to it to other organizations who serve fire and explosion investigation and analysis communities under the imprimatur of NIJ.

d. Print copies of the glossaries under the imprimatur of NIJ for dissemination at professional meetings to investigators and forensic scientists.

B. *Laboratory Submission Guidelines*

1. Needs and Problems Identified

a. Professionals in the fire and explosion scene investigation and laboratory analyses communities want access to evidence submission guidelines used by other agencies.

2. Suggested Solutions

a. Contact members of T/SWGFEX who represent laboratories across the United States, Canada, and Australia for electronic versions of their submission guidelines in PDF format. For those with only hard copies, send them to NCFS to be scanned into digital format.

3. Implementation Strategies

a. Create a folder of evidence submission Guides and Criteria under the T/SWGFEX Website (with links to it in the NIJ and NCFS Websites) where the electronic versions are posted by country>state/province>county/municipality.

b. Have a separate area where private organization criteria can be posted so long as advertisement has been redacted.

C. *Resources and Best Practices in Analysis and Investigations*

1. Needs and Problems Identified

a. Analytical techniques for fire and explosives analyses are available from a variety of resources. For fire debris analysis, the American Society for Testing and Materials (ASTM, http://www.astm.org) has created authoritative resources for both the extraction of ignitable liquids from debris and the identification of those same ignitable liquids by gas chromatography (with either a mass spectral or flame ionization detector). These standards have recently been made available by the National Institute of Justice to all public forensic laboratories.

b. For explosives analysis, the same authoritative references do not exist. Several agencies have protocols, methods, and techniques they are willing to share. T/SWGFEX has posted some guides and references on explosives and others are currently in development. The techniques to be used depend greatly on the instrumentation and resources available within each laboratory. Some laboratories may only have access to wet chemical or polarized light microscopy techniques.

c. The respondents to the survey have identified a need for access to more reference materials, protocols, guides, and macro programs. They desire these to be easily accessible within a single source. They desire similar information for both fire debris and explosives analysis. Survey respondents desire a single source to list the various combinations of instrumental protocols (e.g., columns, flow rates, ion trap temperatures, temperature programs, etc.) for both fire debris and explosives analysis. Essentially they want a listing and links to the "best" methods and techniques. At the same time, they would also like a listing of the techniques and methods, which have documented deficiencies. If possible, the limits of detection, which have been scientifically validated, should be included for the various techniques. Lastly, the guides should be written to address the fact that all laboratories are not similarly equipped and that some laboratories will only have access to basic equipment and resources.

2. Suggested Solutions

a. Use a single Website to create a reference folder with links to commercial sources of guides and standards such as ASTM and NFPA as well as the free guides and standards posted by T/SWGFEX.

b. Poll the membership of T/SWGFEX as well as experts outside the group for the instrumental techniques, protocols, references, instrumental parameters, and guidance they would recommend as well as any cautions they may offer.

c. Review and update existing bibliographies posted on the T/SWGFEX Website in both fire debris and explosives analysis. Add to each reference a list of keywords pertinent to the article.

d. Have the T/SWGFEX organization complete the Fire Debris Report Writing Guide and Post-Blast Materials Identification Protocol.

e. Have the T/SWGFEX organization create new guides:

    1) Standardizing the process of burning comparison and control samples to produce pyrolysis products

    2) Defining the minimum requirements and describing the techniques for polarized light microscopy of explosives

    3) Describing the techniques of wet chemistry and thin layer chromatography in explosives analysis

3. Implementation Strategies

a. Utilize existing and select sub-committee(s) of T/SWGFEX to review the suggestions by its membership and from other experts to create a "best practices" guide for both fire and explosives analyses (taking care not to infringe on the copyright of any other organization). Rely heavily on the T/SWGFEX resources, which are already publicly posted and encourage the completion of those in development.

b. Post this guide along with links to ASTM, NFPA, and others on the T/SWGFEX, NIJ, and NCFS Websites.

c. Print copies of this guide for dissemination at professional meetings attended by both fire debris and explosives analysts.

d. Utilize a separate sub-committee of T/SWGFEX to review and research the bibliographies and update them with newer references. The group will also data mine the keywords from each reference.

e. Post the revised bibliographies in web instrument where the references can be searched by author, title, or keyword.

f. Post links to resources where these reference items may be obtained.

D. *Canine Use in Post-blast Environments*

1. Needs and Problems Identified

a. Canines have been trained to expose the presence of explosives hidden in baggage and packages and to indicate if individuals have explosives residues on their clothing or bodies.

b. Most canines trained in explosive detection are trained to alert to intact non-reacted explosives.

c. Canines, which have been trained to alert to certain ignitable liquid residues, have proven themselves as invaluable tools for determining the areas within a scene, which have the highest probabilities for containing ignitable liquids.

d. Post-blast scenes are not the same as fire scenes in many aspects. One primary aspect, which affects a similar use of canines, is that in fire scenes the ignitable liquids used as accelerants are primarily stationary, remaining in the areas where first deposited. In a post-blast environment, the explosive and its residues may be forcefully dispersed over a large area.

e. Each post-blast investigation is unique. The same sets of circumstances and investigative parameters do not occur in each situation.

f. The increased and improved use of canines to aid in determining the best sampling areas in post-blast scene is desired.

2. Suggested Solutions

a. Development and standardization of protocols for the post-blast usage of canines.

b. Post the developed protocols in a secure environment.

c. Existing and new research into the optimum sampling areas of post-blast sites is needed. Incorporate this research into the training of canines and their handlers.

d. Set up and execute field experiments to gather data which can be applied to the training of these canines.

3. Implementation Strategies

a. Convene a gathering of experts in the handling of canines, explosives canines, analytical chemists, bomb technicians, and bombing scene investigators.

b. Charge the group with gathering and collating all existing protocols on the use of canines in post-blast scenes.

c. Charge the group with developing additional protocols, training guides, and field exercises to promote the improved proficiency of post-blast canines.

d. Support the group by incorporating them into T/SWGFEX so that the benefits of access to related experts is expedited, development of required materials is on-going, and training *via* the T/SWGFEX annual symposium can continue.

e. Have NIJ, or one of its partners, act to create and track canine proficiencies as a national and central clearinghouse. This will improve documentation and records for canine results.

f. This strategy for NIJ to track canine proficiencies as a national and central clearinghouse should additionally be expanded to fire debris canines.

Appendix A.1 Participants, State, and Local

National Needs Assessment Planning Panel

- **James Crippin**
  - Western Forensic Law Enforcement Training Center (Pueblo, Colorado)
- **Dennis Hilliard**
  - Rhode Island State Crime Laboratory (Kingston, Rhode Island)
- **J. Ron McCardle, Major**
  - Florida Division of State Fire Marshal (Tallahassee, Florida)
- **P. Mark L. Sandercock, PhD.**
  - Royal Canadian Mounted Police (Edmonton, Alberta, Canada)
- **Sharee Booke Wells**
  - Alabama Department of Forensic Sciences (Birmingham, Alabama)
- **Lisa Windsor**
  - Tucson Police Department Crime Laboratory (Tucson, Arizona)
- **Carl Chasteen** (Project Manager and Principal Author)
  - Florida Division of State Fire Marshal (Havana, Florida)

Appendix A.2 Participants, State, and Local (*continued*)

National Needs Assessment Sub-Committee Members

- **Judy Hoffman**
  - Montana Forensic Science Division (Missoula, Montana)
- **Kim Freeland**
  - Rhode Island State Crime Laboratory (Kingston, Rhode Island)
- **Mary Williams**
  - The National Center of Forensic Science (Orlando, Florida)
- **Jimmie Oxley**
  - University of Rhode Island (Kingston, Rhode Island)
- **Wendy Norman**
  - Royal Canadian Mounted Police (Ottawa, Ontario)
- **Graham Rankin**
  - Marshall University (Huntington, West Virginia)
- **Mike Sigman**
  - The University of Central Florida (Orlando, Florida)
- **Joe Powell**
  - South Carolina Law Enforcement Division (Columbia, South Carolina)
- **Jim Vose**
  - Vermont Department of Public Safety (Waterbury, Vermont)

- **Vince Desiderio**
  - New Jersey State Police Office of Forensic Sciences (Hamilton, New Jersey)
- **Kristen McDonald**
  - New York City Police Crime Laboratory (New York, New York)
- **Jerry Rudden**
  - Tennessee State Fire Marshal (Nashville, Tennessee)
- **Frank Doyle**
  - Federal Bureau of Investigation (Retired) (San Ramon, California)
- **Dennis Chapman**
  - Iowa State Police Crime Laboratory (Ankenny, Iowa)
- **Jess Dunn**
  - Iowa State Police Crime Laboratory (Ankenny, Iowa)
- **Doug Williams**
  - United States Fire Administration (Emmitsburg, Maryland)
- **Jeffery Jagamin**
  - Washington State Patrol Crime Laboratory (Tacoma, Washington)
- **Tammy White**
  - Florida State Fire Marshal (Fort Myers, Florida)

Appendix A.3 Participants, State, and Local (*continued*)

The T/SWGFEX Executive Committee

- **James Crippin, Chair**
  - Western Forensic Law Enforcement Training Center (Pueblo, Colorado)
- **Clyde Liddick,** Vice Chair
  - Pennsylvania State Police (Harrisburg, Pennsylvania)
- **Dennis Chapman,** Executive Board
  - Iowa State Police Crime Laboratory (Ankenny, Iowa)
- **Dennis Hilliard,** Executive Board
  - Rhode Island State Crime Laboratory (Kingston, Rhode Island)
- **Doug Williams,** Executive Board
  - United States Fire Administration (Emmitsburg, Maryland)
- **Sherrie Thomas,** Executive Board
  - Bureau of Alcohol, Tobacco, Firearms, and Explosives (Atlanta, Georgia)
- **Ingrid Dearmore,** Executive Board
  - Washington State Patrol Crime Laboratory (Marysville, Washington)
- **Tracey Thompson,** Assistant Director
  - Western Forensic Law Enforcement Training Center (Pueblo, Colorado)

Appendix A.4 Participants, State, and Local (*continued*)

The National Center of Forensic Science (NCFS)[31], Orlando, Florida

- Carrie Whitcomb, Director
- Stephen Allen, Technical Manager
- Thomas Minnich, Technical Manager
- John Bardakjy, Coordinator, Research Programs/Services
- Christopher Parker, Computer Systems Analyst
- David Galat, Survey Technical Assistant

[31] NCFS is a **National Institute of Justice** (NIJ) program hosted by the **University of Central Florida** (UCF) in Orlando, Florida.

<u>Appendix B</u>. Synopsis of Survey Results

Discussion of Survey Results

This Appendix will provide a synopsis of the results of the survey. **Questions 1** through **15** are the *demographic, general,* and *professional development* sections. This will allow the reader to understand more about the identity and qualifications of the respondents to the survey. As you will see, the respondents were from a broad spectrum of both public and private agencies. The remaining questions of the survey instrument (**Questions 16** through **100**) contain the full results of the survey. The reader is encouraged to cross-reference both the synopses provided and the full survey with the various recommendations made by the **Needs Assessment Committee.**

Four-hundred and seven (407) responses to the survey were received. Public sector agencies provided 307 respondents (75.43%) and private organizations provided 93 respondents (22.85%). Seven (7) respondents (1.72%) did not indicate if their agency was public or private. A breakdown of all public agency respondents indicates that city employees were the largest group with 170 respondents (41.77%). The remaining public respondents are: county employees – 70 (17.12%); state employees – 52 (12.78%); and federal employees – 15 (3.69%).

An examination of the respondents by discipline found that most individuals work in multiple disciplines. For example, a person may perform fire debris analysis for 50% of their time, explosives analysis for 10%, supervise others 20%, and teach for 20%. Thus, this individual would have entered responses into those questions germane to four of the six disciplines. Other examples of an individual responding to multiple disciplines are possible. This is the reason respondent totals were different from the 407 respondents.

In order to gain a better understanding of each discipline, it was more useful to extract the raw input data and use SPSS software to examine cross-relationships. With this approach the “0 – 10%” grouping for each discipline must be excluded since there is no method to ascertain if the respondent was referring to “0%, “10%”, or any percentage in between. For this section of the report, it will be consistently assumed that most respondents would divide their activities into approximate 10% blocks and would mark 10% or higher when identifying their activities.

One hundred twelve (112) respondents indicated they performed fire debris analysis for more than 10% of their work time. Of these, 59.82% (67) performed fire debris analysis from 10 to 40% of their time. Only 16.97% (19) worked as fire debris analysts from 40 to 70% of the time. Surprisingly, 23.21% (26) indicated they were engaged in fire debris analysis from 70 to 100% of their time. This is seen in **Table 1**. In **Table 2**, another way to examine the 112 fire debris analysis respondents shows that 24.11% (27) work in private organizations and 75.89% (85) work in public agencies. The public agency grouping can be sub-divided into city 30.36% (34), county 16.96% (19), state 24.11% (27), or federal 3.57% (4) as is seen in **Table 3.**

Making the same breakouts as above, but placing the data in tabular form:

Discipline	Total	10 to 40% of time		40 to 70% of time		70 to 100% of time	
		Percent	Number	Percent	Number	Percent	Number
Fire Debris Analysis	112	59.82	67	16.97	19	23.21	26
Explosives Analysis	68	91.18	62	5.98	4	2.94	2
Fire Scene Investigation	292	38.36	112	16.44	48	45.21	132
Bomb Scene Investigation	144	91.67	132	3.47	5	4.86	7
Supervisory	128	56.25	72	11.72	15	32.03	41
Training or Teaching	149	83.89	125	12.08	18	4.03	6

Table 1: Percent Of *Time* A Discipline Is Performed By A Respondent

Discipline	Total	Private		Public	
		Number	Percent	Number	Percent
Fire Debris Analysis	112	27	24.11	85	75.89
Explosives Analysis	68	15	22.06	53	77.94
Fire Scene Investigation	292	80	27.38	212	72.06
Bomb Scene Investigation	144	36	25	108	75
Supervisory	128	26	20.31	128	79.69
Training/Teaching	149	40	26.85	109	73.15

Table 2: Comparison Of The *Number* And *Percent* Of Private *Vs*. Public Respondents By Discipline

Discipline by Public Sector Agencies	Total	City		County		State		Federal	
		No.	Per.	No.	Per.	No.	Per.	No.	Per.
Fire Debris Analysis	85	34	30.36	19	16.96	27	24.11	4	3.57
Explosives Analysis	53	25	36.76	12	17.65	11	16.18	5	7.35
Fire Scene Investigation	212	141	48.29	43	14.73	19	6.51	9	3.08
Bomb Scene Investigation	108	54	37.5	32	22.22	16	11.11	6	4.17
Supervisory	128	47	36.72	29	22.66	20	15.63	6	4.69
Training/Teaching	109	53	35.57	27	18.12	23	15.44	6	4.03

Table 3: *Number* and *Percent* of Respondents Working in Public Sector Agencies *by Discipline*

Question 3 of the survey, "List the number of employees (including you) in your laboratory or unit involved in fire debris or explosives analysis, scene investigation, and/or reporting for each of the following categories," sought to determine the average number of individuals in the various responding agencies. The degree of variation between responding agencies is reflected in the standard deviation noted in **Table 4.**

Position	Average per Respondent	Standard Deviation
Analyst/Scientist	2.00	3.81
Lab Supervisor/Manager	0.80	2.30
Scene Investigator/EOD	6.62	15.04
Scene/EOD Supervisor	2.28	5.27

Table 4: Average Number of Personnel per Agency By Job Type

For **Question 4**, the respondents were requested to indicate the number of employees having specific years of experience from 0 to more than 30. The posting of this survey item failed to include a choice for 15 to 20 years. Even with this anomaly however, charting the responses received shows that the respondent's organizations have individuals with a broad level of experience (See Figure 1). The bell shape of the curve (minus the data for 15 to 20 years) would indicate that 10 to 15 years of experience is typical. A potentially disturbing phenomenon is the rise in the number of respondents who indicate they have a significant number of employees with more than 30 years experience. This could potentially indicate a significant loss of experience as these individuals retire and should increase the emphasis on training and continuing education of those who remain.

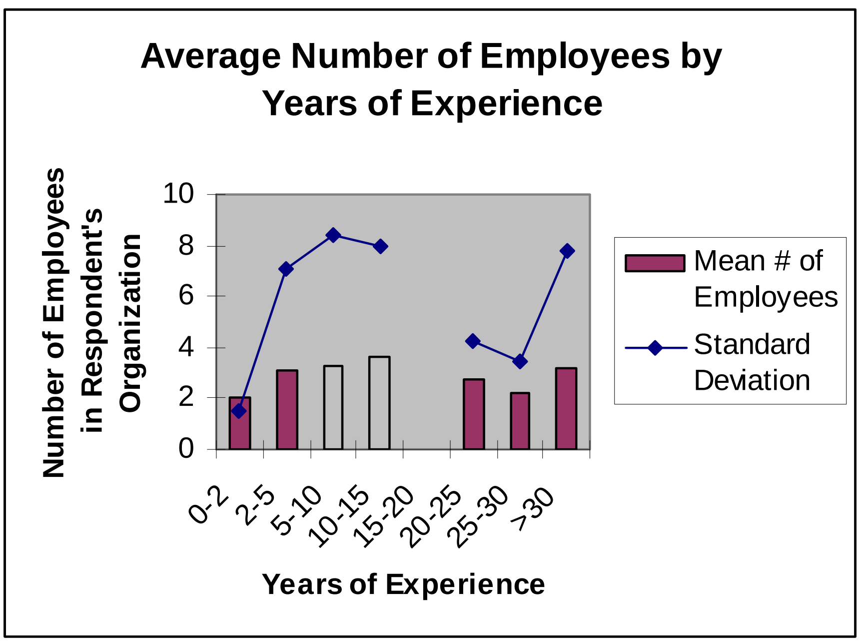


Figure 1: Graph of the Average Number of Employees Per Agency By Years of Experience

Question 5 sought to determine the level of education of employees within the respondent's organizations. The responses would seem to indicate that most respondent's organizations are populated primarily with high school graduates and very few with Bachelor's and advanced degrees. Because this data set did not separate those with a primary duty in investigations from those with a primary duty in forensic analysis, it is likely skewed. Forensic Laboratories typically require a minimum of a Bachelor's degree in a natural science in order to be employed while it is common for investigative agencies to have a high school diploma as the minimum requirement. Regardless of this, however, it should be noted that the numbers having Master's and Doctoral degrees drop significantly. This may be an indication of the need for more formal educational opportunities for both investigators and analysts.

The responses to **Question 6**, "Indicate the number of times you testified in court in 2006" are not surprising. Those who testified only one (1) to five (5) times comprise 80% (256 of the 320 responding to the question). Those indicating six (6) to ten (10) times comprise 10.9% (35 of 320) and those indicating eleven (11) to fifteen (15) comprised 4.1% (15). Thus 95% of the 320 respondents to this question testify fewer than fifteen (15) times in 2006. Compared to other forensic disciplines this is very few. The reasons are anecdotal yet will be reflected in other answers found in this survey. In many areas of the nation, prosecution for fire and or bombings are rare. The main reason is that these cases are largely composed of circumstantial evidence. Even the forensic evidence rarely points to a perpetrator and typically only proves that a crime was committed. Thus, prosecutors identify the amount of work to be done on these cases to be inordinate with their chances for conviction and are thus willing to plea the case before it goes to court or are unwilling to prosecute. The discussion among the planning panel members and T/SWGFEX indicates that in jurisdictions having a dedicated prosecutor, who has received active training from both investigators and forensic laboratory personnel, the rate of cases proceeding to prosecution and eventual conviction is higher.

As we move into **Part B** of the survey, we sought to determine information regarding the professional development of the respondents. **Question 7,** “Which, if any, of the following professional development activities will your laboratory or agency pay (in part or in full) for employees to attend (check all that apply)”, received responses from 390 individuals. The most encouraging response was that only 6.2% (24) respondents indicated that their employer would not pay for any courses, seminars, conferences, or symposia. If a conference, seminar, or symposium were held in the same state or province as the respondent, 86.9% (339) indicated their agency would be willing to assume at least a portion of the costs. Another 80% (312) respondents indicated support from their agency to attend local, state, or regional professional association meetings. The remaining six choices are broken down as:

- Seminars of courses held off site – 70% (273)
- Conference, seminar, or symposium were held outside the same state or province – 62.6% (244)
- Seminar or course held on site – 60% (234)
- Classes held at a local university – 52.1% (203)
- On-line classes from an accredited university – 42.1% (164)
- Conference, seminar, or symposium were held outside of home country – 12.3% (48)

Question 8 attempted to determine the level of funding typically provided by an organization for an employee. 375 of the respondents provided an estimate to this question. A level from $501 to $2000 was indicated by 41.6% of the respondents. The level from $2001 to $5000 per employee was indicated by 24.2%. At the opposite extremes were those agencies that provided either no funding, 8.8% of respondents, or over $5000, 8.3% of respondents. Considering the cost of travel, hotels, and registration fees, the funding levels indicated would tend to limit the training and educational opportunities for the vast majority of respondents. Question 9, in anticipation of this result, asked respondents the likelihood of the individual’s ability to assume the costs of their own training. If an individual were asked to pay for 100% of the costs, 65.4% of respondents said that it would be unlikely to never. At 75% of cost, the number indicating unlikely to never dropped to 61.3%. For 50% of the cost for training, the number of respondents dropped further to 40.8%. In fact at 50% of the costs, the shift indicated that the majority of respondents, 59.2%, would assume part of the training costs. If they were asked to pay for 25% of the training costs, the number indicating a positive response raises to 80.2%. Obviously the percentage of respondents who indicated their level of participation in training as extremely likely to absolutely if they were not asked to pay for any training costs rose to 85.4%.

Continuing Education Course	Primary Rank	Secondary Rank	Tertiary Rank
EOD Range Time (Training with EOD personnel)	7	4	1
Fire Scene Evidence Collection, Preservation, and Packaging	7	4	5
Explosives Scene Collection, Preservation, and Packaging	7	4	NA
Fire Dynamics (including Chemistry and Physics)	7	4	5
Petroleum Refining Processes	1	4	3
Ignitable Liquid Classification System	4	7	NA
Electrical circuitry and fire	7	4	5
Testifying as an Expert Witness	7	5	4
Explosives Manufacturing Processes	7	4	5
IED recognition and construction	7	4	5
Computer Fire Modeling	7	4	5
Gas Chromatography	4	1	2
Mass Spectral Interpretation	1	4	3
Raman Spectroscopy for Explosives	1	4	NA
X-Ray Analysis Techniques (Diffraction, Fluorescence, Energy Dispersive)	7	1	4
Ion Chromatography	1	3	4
Capillary Electrophoresis	1	3	4
Fourier Transform Infrared Spectroscopy	1	4	3
Advanced Organic Chemistry for Fire Debris Analysis	1	4	7
Advanced Topics in the Chemistry of Organic Explosives	1	4	7
Advanced Topics in the Chemistry of Inorganic Explosives	1	4	7
Forensic Fire Scene Examination	7	5	NA
Forensic Explosive Scene Examination	7	5	4
Communication and Cooperation between Investigators and Analysts in Fires	7	4	5
Communication and Cooperation between Investigators and Analysts in Explosions	7	NA	NA

Table 5: Ranking of Continuing Education Courses

Question 10 is logically in the "Professional Development" section and the information it provides is of particular use to the sub-committees charged with investigation of the training needs. An issue, raised when the task group met to discuss survey results, is that the responses of the forensic analysts are not separate from those of the respondents with investigations as their primary focus. Because more investigators responded, these measures are skewed. In order to attempt to glean the best information, the probability density plot of the responses for each "continuing education" topic must be carefully examined. If we ascribe the major peak in each as being weighted primarily by the investigators, then any secondary (and in some instances a tertiary) peak would be indicative of the rankings by the analytical community. The complete question for #10 is, "Rate how interested you would be in taking each of the following types of continuing education courses (1-7 where 1 = Never, 4 = Likely, and 7 = Absolutely). Creation of a tabular display of the responses where the probability is measured at more than 0.15 is seen in **Table 5.**

Those with the primary ranking at 7 with secondary and tertiary rankings of 4 or lower are courses which would be most desired by investigators (marked in tan). Those with a primary ranking of seven with secondary and tertiary rankings above 4 would appeal to both investigators and analysts (marked in pale blue). Those with a primary ranking of 1, but with a secondary and tertiary ranking of 4 or higher would appeal most to analysts (marked in light turquoise). The key anomalies to this ranking begin with the last listing, "Communication and Cooperation between Investigators and Analysts in Explosions." It appears to be ranked as a "7" by all respondents and thus would appeal to everyone. Next the "Ignitable Liquid Classification System" with a primary ranking of 4 but a secondary of 7 with no tertiary ranking would also tend to be a course which would have strong attendance by both investigators and analysts.

Training and continuing education continued under **Question 11** when the respondents were asked to identify "training/classes that you feel would be helpful to you in order to do your job better." A review of the inputs, excluding several that were redundant to courses already listed, and condensing similar items provided the following list of additional topics of interest:

- Vehicle, Heavy Equipment, And Recreational Vehicle Fires
- Death Scenes And Investigations
- Quality Assurance In The Laboratory – Reducing Interferences And Eliminating Contamination
- Digital Photography And Image Management
- Appliance Fire Investigations: Electrical And Gas
- Watercraft And Underwater Investigations
- Data/Document Management And Writing Reports
- Complex Scene Management
- Effect Of Fire Suppression And Overhaul On Fire Scene Evidence
- Interview And Interrogation Techniques Including Kinesics

- Hazardous Materials Recognition And Sampling
- Latent Prints In Fires And Bombings
- Live Experimental Fires And Explosions: Investigation And Evidence Collection
- Laser Documentation And Computer Aided Design For Crime Scene Documentation
- Wildland Fire Investigations
- Objectivity And Avoiding Bias: Using The Scientific Method
- Forensic Accounting And Financial Analysis In Fires With Fraud Implications
- Case Law Studies And Review Pertaining To Fire And Bombings
- Safety At Fire And Bombing Scenes – Awareness Of Acute And Chronic Dangers
- Reading And Comprehending The Technical Report
- Military Ordnance Recognition
- Spontaneous Combustion Fire Investigation
- Surveillance
- Chemical Incendiaries And Hypergolic Mixtures
- Serial Arson Investigations – Recognition And Techniques
- Legal Liability And Spoliation In The Fire Scene

Resource	**Mean Ranking**
Comprehensive Listing Of People Working In The Field (Private And Government)	5.20
Create A Secure Internet Link For E-Mail And Information Exchange Between Professionals	5.70
Establishment Of A Collection Of Sample Laboratory Reports	4.95
Creation Of A Glossary Of Analytical, Explosives, And Fire Debris-Related Technology	5.42
Creation Of Information Templates For Evidence Submission	5.08
Establishment Of A Collection Of Methods And Protocols For Analytical Techniques	5.28
Establishment Of Databases Of Reference Materials For Analytical Techniques	5.27
Creation Of A National Database For Tracking Bombing Matters	5.16
Creation Of A National Database For Tracking Arson Matters	5.73
Establishment Of A National Resource Database (For Lab Equipment, Expertise, Etc.)	4.99
Establishment Of A National Explosives Formulation Database	4.82
Creation Of A Bulletin Board For Communication Between Explosives Analysts	4.78
Creation Of A Bulletin Board For Communication Between Fire Debris	5.26
Creation Of A Library Of Manufacturers' Literature	5.55
Database Of Explosives Analyst Training Manuals And Materials	5.19
Information center for inter-agency training exercises	5.65

Table 6: Ranking of Initiatives for the Fire and Explosion Communities (Investigative & Analytical)

Under **Question 12**, the Needs Assessment Task Groups wanted to determine both whether certain initiatives would be well met by the fire and explosion community and whether the community was aware that some initiatives already existed. It asked the respondents to rank the resource along a scale from 1 - “Not at all” to 7 – “Very Important.” The results are in table 6.

While **Table 6** indicates the average ranking for all these initiatives is above the mid-point of the ranking scale, the top five (5) resources desired are:

- Creation of a national database for tracking arson matters (5.73).
- Create a secure Internet link for E-mail and information exchange between professionals (5.70).
- Information center for inter-agency training exercises (5.65).
- Creation of an library of manufacturers’ literature (5.55).
- Creation of a glossary of analytical, explosives, and fire debris-related technology (5.42).

Questions 13 and **14** sought to determine if agencies provide employees with the opportunity to conduct “research” and if so, the time allowed. Of the 375 respondents who answered this question, 54.1% indicated that they were allowed to conduct research. The averages for the four (4) categories of research are:

- Fire Debris Analysis 57.12 hours
- Explosives Analysis 49.8 hours
- Fire Scenes 146.30 hours
- Explosives Scenes 121.92 hours

Topic	Ranking
Sufficiency of explosives and fire debris publications provided by your laboratory	3.60
Interest in receiving a library of ignitable liquid standards on a regular basis	4.98
Interest in receiving a library of pyrolysis standards on a regular basis	4.75
Importance of national standards for report writing	4.90
Importance of a specific protocol for wording of both positive and negative samples	4.91
Importance of a national database for chromatographic data for ignitable liquids	5.28
Importance of a national source for ignitable liquid standards	5.52
Interest in participating in the fire and explosives debris analysis technical working group	4.90

Table 7: Ranking of “Sufficiency, Importance, or Level of Interest”

The last question in the Demographics and General Section**, Question 15,** asked respondents to rank the sufficiency, importance, or level of interest (from 1 = “Not at all” to 7 = “Very”) on eight (8) topics. The most important to the respondents, as seen in Table 7, is the maintenance of both a national database and source for ignitable liquids. Fortunately these resources are already provided through the NCFS and T/SWGFEX. The explosives and fire debris publications provided by agencies to their employees was ranked the lowest and clearly shows that more references are needed in the field.

The first grouping, **Questions 16** through **32** are primarily for Fire Debris Analysts. Some allow an assessment of the typical workload, some allow assessment of the methods and quality control employed, and others the importance of certain classes essential for the field.

Question 16 divides the work typically done by an agency into fire debris samples versus ignitable liquids. Though the analyst uses the same standards to make a determination, the distinction is in how the samples are submitted and processed.

Agency	1 to 50	51 to 100	101 to 250	251 to 500	501 to 750	751 to 1000	1001 to 2000	> 2000
Private	8	2	2	3	0	0	2	1
City	15	2	0	0	0	0	0	0
County	5	3	5	0	0	3	0	0
State	4	3	5	3	3	0	0	2
Federal	2	0	0	0	1	0	0	0
Total	34	10	12	6	4	3	2	3

Table 8: No. of Respondents Indicating the Number of Debris Samples Worked by their Agency

An examination of **Table 8** indicates thirty-four (34) respondents from all five sectors indicate that their agencies processed fewer than fifty (50) fire debris samples in 2006. In fact, the vast majority of agencies (56) processed fewer than 250 fire debris samples in 2006. Only thirteen (13) agencies indicated that they processed from 251 to 1000 samples. None were City laboratories and the majority were from State laboratories (6). Only three (3) Private and two (2) State respondents indicated their laboratories processed more than 1001 fire debris samples in 2006. Both of the state laboratories indicated they processed more than 2000 samples in 2006.

Agency	1 to 50	51 to 100	101 to 250	251 to 500	501 to 750	751 to 1000	1001 to 2000	> 2000
Private	8	2	2	3	0	0	0	0
City	14	1	0	2	0	0	0	2
County	8	2	2	0	0	0	0	0
State	11	3	3	1	1	0	0	1
Federal	0	0	1	0	1	0	0	1
Total	41	8	8	6	2	0	0	4

Table 9: No. of Respondents Indicating the No. of Ignitable Liquid Samples Worked by their Agency

Table 9 shows forty-one (41) respondents from four of the five sectors indicate that their agencies processed fewer than fifty (50) ignitable liquid samples in 2006. Again, the majority of agencies (57) processed fewer than 250 ignitable liquid samples in 2006. Only 8 agencies indicated that they processed from 251 to 750 samples. None of the agencies indicated processing 751 to 2000 samples. Two City, one State, and one

Federal laboratory indicated they processed more than 2000 ignitable liquid samples in 2006.

Passive headspace sampling using activated charcoal/carbon was indicated as the fire debris extraction technique of choice by 76.2% of respondents. This was distantly followed by dynamic headspace sampling by 20.2% of respondents. **Question 17** also indicated that very few respondents used Tenax ® (3.6%) or solid phase micro extraction (SPME) (1.2%). When asked about other adsorbents the remaining 8.3% provided answers that indicate that they did not comprehend the question with responses ranging from gauze pads and non-bleached flour to clay chips and sterile pads.

The choice of eluting solvent in **Question 18** indicated that 56.7% of respondents use carbon disulfide. This solvent's efficiency at stripping ignitable liquids from adsorbents is considerable, but presents several safety issues. This may be the reason that 16.4% indicate they use thermal desorption or SPME. Another 16.4% of respondents indicate the use of pentane, which has been touted as a safer alternative to carbon disulfide. Surprisingly, 9.0% indicated the use of diethyl ether that has its own significant health hazards. Dichloromethane, which has health hazards as well, was indicated by 7.5%. The only solvent identified by the remaining 6.0% of respondents indicated a 1:1 mixture of carbon disulfide and pentane.

The use of an internal standard either added to the debris during extraction or to the solvent was indicated by only 15.1% and 15.2% of respondents respectively as indicated in **Questions 19** and **20**. For those adding an internal standard to the debris, it appears that the use of 3-phenyltoluene is the most common. There is not a common internal standard indicated for those who add it to their solvent. With the vast majority of respondents not indicating the use of an internal standard, the practice should be in question. While it is common practice in many other fields of analytical chemistry, the question is why fire debris analysts do not use it.

Question 21 assesses the usage of various types of instrumentation employed in fire debris analysis. The scale is 1 = Never and 7 = Exclusive. Clearly at an average rating of 6.08 the most common instrumental method is gas chromatography with mass spectroscopy (GS-MS). This is followed by Gas Chromatography with Flame Ionization Detection (GC-FID) at a rating of 2.29. GC-FID has been shown not to be as effective or efficient in the analysis of fire debris as GC-MS. This may indicate a problem with getting the GC-MS technology to some laboratories.

Split solvent injection mode (69.4%) with analysis on a 100% polydimethylsiloxane column (58.8%) or 5% phenylmethylpolysiloxanne: 95% polydimethylsiloxane were parameters indicated in Questions 22 and 23. These responses were expected and are anecdotally accepted as being the most common in use by the relevant community.

Quality Assurance/Quality Control measures are necessary to provide acceptable levels of dependability when performing chemical analyses. Forensic analysis of fire debris should not be an exception. Question 24 assessed the commonality of certain of these QA/QC procedures where the scale was 1 = Never and 7 = Exclusive:

QA/QC Technique	Ranking
ASTM 1387 test mix or similar mixture	5.09
Internal Standards (e.g., 3-phenyltoluene)	2.90
Solvent Blanks	5.68
Apparatus Blanks (e.g., strips, glassware)	5.16
Recovery Checks (e.g., simulated case extractions)	3.19
Peer Review	5.72
Other: (specify)	5.50
Validation kits (NFSTC)	
Proficiency Tests	
Ignitable Liquid Reference Materials	

Table 10: Ranking of QA/QC Techniques

As seen in Table 10, Peer Review ranked as the most common measure followed closely by the use of solvent blanks. Apparatus blanks and the use of the ASTM E1387 test mix also ranked above 5.

Question 25 sought to determine the level of conformance to the provisions in various ASTM methods. Again the scale is 1 = Never and 7 = Exclusive:

Standard #	General Topic	Rank
ASTM-E 1387-01	Analysis by GC-FID	4.00
ASTM-E 1618-06	Analysis by GC-MS	5.69
ASTM-E 1385-00	Extraction by Steam Distillation	2.03
ASTM-E 1412-00(2005)	Extraction by Passive Headspace	5.00
ASTM-E 1413-06	Extraction by Dynamic Headspace	2.08
ASTM-E 1388-05	Simple Headspace	3.33
ASTM-E 1386-00(2005)	Solvent Extraction	4.12
ASTM-E 1492-05	Receiving and Handling Evidence	5.03
ASTM-E 1459-92(2005)	Evidence Labeling and Documentation	5.00

Table 11: Ranking of Conformance to ASTM Guides

The analytical method of most common use is again confirmed as GC-MS, but GC-FID ranked higher than expected as is seen in Table 11. Of the extraction techniques, the use of Passive Headspace as the most common was also confirmed. The fact that solvent extraction ranked above “4” would indicate that it is also used by many laboratories. It is disturbing to note that simple headspace was ranked as high as it is, considering that the technique should be limited to screening.

When queried as to new equipment and techniques available to fire debris analysts, 85% of the respondents to **Question 26** indicated "no." Those who responded "yes" were asked to describe the equipment and techniques. The following is a synopsis:

- New software for comparison of data.
- Tandem GC-MS (GC-MS-MS).
- Two-dimensional GC with MS (GC X GC-MS).
- Flash Chromatography.
- Pyrolysis product database.
- Fourier Transform Ion Cyclotron Mass Spectroscopy (FT-ICMS).
- Stable Isotope Ratio MS.
- DART sample introduction.
- Alternative Light Sources (scene investigation).
- GC with Infrared and mass detection (GC-IRMS).
- Time-of-flight GC-MS.

Questions 27 and **28** directly asked respondents to assess the needs of fire debris analysts. Question 27 focused on the short-term needs and **Question 28** on the long term needs. In review of the responses it was noted that there were several responses which were listed in both. The following lists of suggestions were prepared by consolidating similar responses.

Short Term Needs in Fire Debris Analysis:

- Improvements to turnaround for processing evidence.
- More personnel.
- Improved software for analysis and comparison of data.
- More information on pyrolysis products and interference compounds inherent to matrices.
- Improved chromatographic resolution.
- Improved and greater access to reference materials and standards.
- An extraction procedure which can replace the use of carbon disulfide without sacrificing efficiency (solvent free and improved desorption).
- More training for personnel.
- Financial assistance to laboratories.
- Development of a field gas-chromatograph with sufficient ease of use and accuracy to allow high quality presumptive analyses on the scene.
- Place a GC-MS in all laboratories.

Long Term Needs in Fire Debris Analysis:

- Enhanced ability to compare ignitable liquids from separate sources at a level where individualization (similar to DNA analysis) can be made.
- Improve the library search function of the Ignitable Liquid Reference Collection database currently posted on the NCFS database.
- Greater access to extraction and analysis standards and procedures.
- Training in advanced organic chemistry for analysts.
- Enhanced sharing of data between laboratories.
- Seek and promote consistency in wording between reports from various laboratories.
- Greater understanding of the effect of ignitable liquids on bodies.
- Increase understanding and adherence to American Society for Testing and Materials guidelines and test methods.
- Cross-training in the "scientific method" for investigators and analysts.
- Lower cost and more affordable instrumentation.

The responses to **Question 29** were disturbing. The question sought to determine if the respondents used an in-house ignitable liquid reference collection in casework. ASTM E1618 and E1387 both require that analysts compare the data of an unknown against the data of reference materials analyzed on the same instrument. With only 25.4% indicating that they do this in every case and 18.4% indicating "often," it appears that the majority of respondents are not in compliance (18.4% reported "sometimes," and 37.7% reported "never").

Question 30 asked if the respondents used the on-line reference collection data available through NCFS and found that 59.5% of the respondents answered "never" while a scant 1.8% answered "every case." Those responding with "sometimes" made up 28.8% and those who indicated "often" only 9.9%. These responses may be interpreted to indicate that NCFS needs to promote this resource more widely.

Previous questions asked about extraction procedures and instrumentation. **Question 31** asked, "How does your laboratory routinely identify an ignitable liquid in fire debris"? The overwhelming response at 73.2% was "pattern recognition by mass chromatography (extracted ion chromatogram or extracted ion profile)". The next highest at 12.7% was "other." The majority of those responses indicated use of multiple combinations of all of the listed choices. These responses appear to be consistent with the majority responses received on extraction and instrumentation.

The last question specific to fire debris analysts (**Question 32**) asked them to rank the importance of various classes to the training of a fire debris analyst (**Table 12**). It was not noticed until after the return of the surveys that the choice of "Advanced Physics" was listed twice. We will use the responses from the first iteration only, thus the percentages reported here were derived from the analysis of the raw data after redacting the secondary response. The choice of "other" only had four responses and will be discussed later. The ranking was from 1 = "Not Important," to 4 = "Moderate," to 7 = "Extremely." Out of a total of 90 responses, the choice of "Instrumental Analysis" was ranked highest at 6.30, and "Organic Chemistry" was ranked second highest at 6.16 Third was "General Chemistry" at 6.02, ranked by 91 respondents. The table below shows all classes, the rankings, and the number of respondents:

Class	Respondents	Mean Rank (1 to 7)
Other:	4	6.33
Instrumental analysis	90	6.30
Organic chemistry	90	6.16
General chemistry	91	6.02
Analytical chemistry	87	5.88
Advanced organic chemistry	90	5.48
Inorganic chemistry	91	4.67
Introductory physics	90	4.67
Physical chemistry	88	4.25
Advanced physics	87	3.70
Advanced mathematics	87	3.57

Table 12: Ranking of Training Classes for Fire Debris Analysts

As stated earlier, the choice of "other" was input by only four respondents and the mean ranking of 6.33, while technically the highest, was not considered valid in relation to the other classes. While the respondents who entered "other" were not many, the suggestions they listed should be considered. They are: spectroscopy with structural elucidation, combustion gas analysis, digital imaging, and logic.

Explosive	% Yes	% indicating 1 to 50 samples
Intact Low Explosives	44.9%	53.2%
Intact High Explosives	26.0%	32.8%
Intact IED's	35.1%	40.0%
Post-Blast Low Explosives	56.6%	55.4%
Post Blast High Explosives	21.3%	26.2%
Post Blast IED's	42.5%	40.6%
Intact Incendiary Device	48.1%	49.2%
Post-Reaction incendiary	47.4%	45.3%

Table 13: Types and Percent of Analyses Performed by Respondents

Question 33 began the sections specific to explosives analysts. From **Questions 33** to **40** (summarized in the “% Yes” column of **Table 13**), the determination was whether or not the respondent performed the analysis in 2006. **Questions 41** to **48** (summarized in the “% Indicating 1 to 50 Samples” column of Table 13) asked–the respondent to indicate the number of samples processed by their laboratory.

In **Question 49**, respondents were asked to indicate their ranking of the frequency which they utilized various forensic techniques with the scale of 1 = “Never” and 7 = “Exclusive.” The following, **Table 14**, is a summary of the responses with the mean from all respondents sorted from highest rank to lowest rank:

Technique	Mean Ranking (1 to 7)
Ignition analysis	3.50
IR	3.20
FTIR	3.17
GC/MS	2.88
SEM-EDX	2.83
Other:	2.70
Microchemical analysis using stereomicroscopy	2.45
Microchemical analysis using PLM	2.42
Spot tests	2.25
IC	2.10
XRF	2.00
Field explosives screening	1.78
TLC	1.76
Raman spectroscopy	1.57
GC/FID	1.46
HPLC	1.46
XRD	1.46
HPLC/MS	1.46
GC/ECD	1.27
CE	1.26
GC/TEA	1.23
ICP	1.21
HPLC/TEA	1.21
IMS	1.21
NMR	1.13
SEM-WDX	1.11

Table 14: Ranking of Explosives Analytical Techniques

The top five (5) responses were Ignition Analysis, Infrared Spectroscopy, Fourier Transform Infrared Spectroscopy, Gas Chromatography with Mass Spectroscopy, Scanning Electron Microscopy with Energy Dispersive X-Ray detection. However, it must be noted that none of the responses ranked above 3.5 and the top three are the only ones above 3.0. The next eight (8) responses in the table are clustered between 2.0 and 2.99. The reason for this is most likely that the sheer variety of explosive compounds and mixtures often require the use of multiple techniques to make a determination.

For **Question 50**, 86% of the respondents indicated that they were not aware of new techniques, instruments, or methods for explosive analysis. In **Questions 51** and **52** respondents were asked to indicate their sense of the short and long term needs for explosives analysis. In review of the responses it was noted that there were several responses which were listed in both. The following lists of suggestions were prepared by consolidating similar responses.

Short Term Needs in Explosives Analysis:

- Education and training in the production of improvised and homemade devices and materials. What is out there?
- Collation and dissemination of comprehensive analytical methods covering multiple analytical techniques. If one is unavailable, what else can be used?
- Basic and Advanced training in the comprehensive analysis of explosives (analytical methods/techniques, compositions, reactions, dynamics).
- Explosive Materials Database and reference collection.
- Financial assistance.
- Digital Imaging Training.
- Improvements to the use of robotics technology.
- Improvements to sample collection.
- Improving field analyses and their value (instruments, presumptive tests, etc.).
- Improvement of communication between analysts and investigators.

Long Term Needs in Explosives Analysis:

- Information and data sharing between agencies with significant resources (federal and some state) and those who are resource challenged.
- Chemical derivatization protocols to allow alternate analytical methods.
- Reduced cost of instrumentation.

Procedure	Mean Ranking (1 to 7)
8095 Calibration Mix A	1.47
8095 Calibration Mix B	1.47
Smokeless Powder (or similar) mixture	3.37
Internal Standard (please indicate):	1.57
Solvent Blank	3.62
Peer Review	3.79
Other:	3.16

Table 15: Ranking of Explosives QA/QC Procedures

Question 53 sought to determine the use of various Quality Assurance and Quality Control procedures and methods in explosives analysis. **Table 15** summarizes the results. The scale ran from 1 = "Never" to 7 = "Exclusive." The only internal standard indicated was 5-nitro-2-fluorotoluene. The primary "other" QA/QC procedures listed were proficiency testing and comparison of unknowns to explosives and chemical standards.

The respondents (82) under **Question 54** indicated that 36.6% "never," and only 37.8% "sometimes" used an internal explosives reference collection in casework. This result was discouraging. The question becomes, how do these analysts assure themselves of an identification without comparative data? **Question 55** regarding the use of an on-line collection of explosives data by the respondents (79) provided more encouraging results. Those who selected "sometimes" (38%) and "often" (34.2%) were the clear majority.

Similar to **Question 32** for Fire Debris Analysts, **Question 56** asked respondents to rank the importance of various courses as part of the education of an explosives analyst. Again the scale ran from 1 = "never" to 7 = "extremely." The results after isolation and examination of the raw data inputs are summarized and sorted from highest to lowest ranking in **Table 16:**

Courses for Explosives Analysts	Mean Ranking (from 1 to 7)
Explosives analysis	6.56
Introduction to explosives	6.40
The chemistry of pyrotechnics	6.33
Chemical analysis of explosives	6.17
Combustion explosions	6.03
Instrumental analysis	6.00
General Chemistry	5.77
Inorganic chemistry	5.60
Analytical chemistry	5.53
Organic chemistry	5.47
Advanced organic chemistry	5.30
Introductory physics	5.07
Physical chemistry	4.77
Advanced physics	4.30
Advanced mathematics	4.17
Other:	6.50

Table 16: Ranking of Importance of Courses of Study for Explosives Analysts

The items indicated under "other" are "blast effect calculations" and "safety"

Question 57 sought to rate additional training and course work in the professional development of an explosives analyst. Again the scale ran from 1 = "never" to 7 = "extremely." The results after isolation and examination of the raw data inputs are summarized and sorted from highest to lowest ranking in **Table B17**:

Training/Continuing Courses	Mean Ranking (1 to 7)
Analytical examination of high and low explosive materials and residues	6.50
Composition of low explosive materials	6.20
Construction of improvised devices	6.13
Recognition of improvised device components	6.11
Manufacturing of explosives	6.00
Construction of military devices (e.g. simulators, rockets, hand grenades)	5.97
Composition of high explosive materials	5.95
Construction of commercial pyrotechnic devices	5.94
Peroxide Based Explosives	5.92
Terminology and vocabulary of explosives	5.85
Range procedures	5.51
History of Explosives	4.88
Other:	5.50

Table 17: ranking of Additional Training for Professional Development of Explosives Analysts

Questions 58 through **69** were designed to assess opinions of those who identified themselves as fire scene investigators.

The first question of this group, **Question 58**, asked them to indicate the number of fire scenes processed in 2006 by all the investigators at their particular location. The largest grouping indicated by the 270 respondents indicated that 48.1% worked from 1 to 50 scenes. Significantly, 15.2% indicated they worked from 51 to 100 scenes, 15.2% indicated they worked from 101 to 250 scenes, and 12.2% indicated they worked 251 to 500 scenes. The number of individuals indicating they worked 501 to > 2000 scenes was only 9.3% of respondents.

The majority of respondents, 94.8%, indicated that they have had formal training in fire scene investigation in **Question 59**. Another majority, 85.1%, indicated that formal training was "very important" in the investigation of fire scenes.

Question 60 asked respondents to identify the types of containers used to secure evidence by percentage of time used. Clean unused paint cans were indicated as being used 78.82% of the time. Glass jars and vials were indicated as being used 21.58% of the time and Nylon bags 16.8% of the time. The items listed in "other" included a number of entries for "Kapak ™" bags and the respondents were unaware that they are included in the "nylon bag" category. There were a significant number of entries stating the use of paper bags. It is hoped that these are used for non-fire debris evidence as they are useless in securing fire debris for ignitable liquid determination.

In **Question 61** respondents were asked to identify the equipment “essential to help you process fire scenes.” In **Question 62**, respondents were asked to identify “equipment desirable to help you process a fire scene.” All entries were free text entry and not from a pre-set list which led to a significant variety in the responses. The lists of entries were examined and significant repetition and overlap was noted. Many of the responses have been combined, with similar entries being consolidated, and summarized in the lists below:

Equipment *Essential* to Processing Fire Scenes:

- Accelerant Detection Canine team.
- Hand tools (e.g., saws, chisels, hammers, screwdrivers, pry bar, etc.).
- Power tools (e.g., saws, drills, etc.).
- Gloves (both disposable and protective).
- Personal protective and safety equipment (e.g., hard hat, coveralls, respirator, etc.).
- Shovels, rakes, and scoops.
- Cameras (both still and video).
- Screens and sieves.
- Knives (various).
- Tape measure, GPS, laser measuring devices.
- Magnets.
- Fingerprint, trace evidence, and impression evidence kits.
- Heavy debris removal equipment (e.g., forklifts, cranes, bulldozers) depending on the scene.
- Directional and evidence flags.
- Vehicle for transport of tools.
- Gas/hydrocarbon “sniffer”/detector.
- Ultraviolet light source.
- Portable lighting for night work.
- NFPA 921 and other authoritative reference books.
- Brooms and brushes.
- Ladders.
- Generator.
- Circuit Tester/Volt/Ohm meter.
- Information recording tools (e.g., pens, paper, voice recorder, etc.).
- Buckets.
- Water and soap for decontamination and cleaning.
- Laptop with software necessary (e.g., word processing, digital photo archiving, CAD software, etc.).

Equipment *Desired* for Processing Fire Scenes:

- Multigas detector/electronic nose.
- Laser scanners and measuring.
- Panoramic cameras.
- Portable X-Ray units.
- Portable/Handheld chemical identification equipment (e.g., GC-MS, FTIR, Raman).
- Mobile Internet access.
- Advanced scene documentation tools (e.g., laser, CAD, etc.).
- Thermal imaging.
- Fire Modeling software.

Question 62 also asked if the respondent or their agency had access to an accelerant detection canine team. Of the 260 respondents, 69.2% indicated they have access to a canine team. Half of the respondents indicated that such a canine team would be used in only 1 to 20% of their cases. For 22.9% of the respondents the canine team would be used in 21 to 40% of their cases. Only 16.7% of the respondents went so far as to state that canines would be used in 41 to 60% of cases. Thus, very few, 10.4%, would use canines in more than 61% of their cases.

As a corollary, 48% of respondents said they had access to an electronic “sniffer” and 46.4% said they did not. Of the respondents, 31.6% indicated that an electronic “sniffer” would be used in 1 to 20% of their cases. For the grouping of 21 to 40% of cases, the number of respondents dropped to 13.2%. For each of the three remaining groupings, 41 to 60%, 61 to 80%, and 81 to 100% of the time, the number of respondents was evenly distributed with 18.4% of the respondents in each group.

Question 63 asked if the respondent’s agency had a specific criteria for activation of a canine unit. The majority, 67.9%, indicated they did not. The follow up question asked the respondent to describe the criteria. The answers were considerably varied and the reader is directed to the Vista ™ survey in the appendix.

Only 33.3% of respondents indicated their agency tracked the usage of the accelerant detection canine in each investigation (**Question 64**). Only 28.1% of respondents indicated that the canine’s positive to negative hit rate was tracked (**Question 65**). Skipping to Question 67, 72.8% of respondents think they would benefit by having access to a national/international database of certified accelerant detection canine teams.

When asked if investigators had access to other forensic laboratory tests in addition to fire debris/ignitable liquid analyses, 57.1% of the respondents answered "no" in **Question 66**. Only a very slight majority of respondents (50.4%) indicated they had access (on-scene, by telephone, or email) to a fire debris analyst/scientist for consultation while working a scene (**Question 68**). In **Question 68a**, 61.5 % of the respondents who indicated that they had access to a scientist indicated that in 2006 they called upon this expertise 1 to 5 times. In **Questions 69** and **69a**, 91.7% of the respondents who answered that they did not have access to a scientist, indicated that this type of access would be desirable. They further ranked the importance of this access using the scale of 1 = "Not at all" to 7 = "Very" with 29% of respondents ranking this service at 7 ("very" desirable). For rankings of 5 or 6, 26.2% and 22.1% respectively indicated a positive level of importance.

Questions 70 through **89** were designed to be specific to Explosion/Bomb scene investigators. Of the 157 respondents to **Question 70**, 87.3% indicated they worked from 1 to 50 cases in 2006. On the issue of having received formal training, 76.8% of the respondents to **Question 71** answered "yes" and in **Question 72**, 83.2% indicated that formal training was "very" important in the investigation of bombing crime scenes.

Question 73 assessed the types of sampling containers used to package debris collected from explosives scenes and found that clean unused paint cans were used by 62.1% of the respondents in 61 to 100% of their cases. For 1 to 20% of their cases, 49.0% of the respondents used glass jars and vials and 47.1% used nylon bags. The remaining types of containers commonly indicated in the "other" selection were various paper evidence bags.

The results for **Question 74** on the equipment "essential to help you process bombing scenes" are the same as for Questions 61 and 62 with the following additions:

- Explosive Ordnance Disposal suits (Bomb Suits).
- X-Ray machine.
- Disruptors.
- Metal detector.
- Explosives swab kits.
- Presumptive explosives identification wet chemical kits.
- Robots for unmanned approach and entry.
- Non-sparking tools.

Question 75, that asked which equipment is "desirable," is also similar to the responses in **Questions 61** and **62** with the following additions:

- Better evidence preservation and sampling technology (includes vapor sampling and preservation).
- Explosives Detection Instruments for field use (e.g., Ion Mobility Spectroscopy, Raman Spectroscopy, FTIR spectroscopy, etc.).
- Portable wet chemical explosives identification kits.
- Mobile Command Center.
- Equipment that can elevate the investigator above the scene.
- Bomb Component Blanket.
- Blast Modeling Software.

Question 76 asked if the respondents used the equipment they listed and 85.2% replied "yes." **Question 77** asked respondents what training was desired. The following are the training/classes listed by respondents (after consolidation and sorting):

- Advanced post-blast training with "hands-on" experience at a "live" experimental scene.
- The chemistry of explosives.
- Bomb scene evidence sampling, collection, and preservation.
- Scene excavation.
- Recognition of the blast effects of high or low order explosives on various scenes (as a method to assess presumptively the type used upon arrival at a scene).
- Using advanced scene documentation equipment.
- WMD scene investigation.
- Anti-terrorism training.
- Partnering with federal agencies for on-scene experience.
- Basic EOD for the fire service.
- Using mapping tools and documentation to prepare a land survey of a scene.

Under **Question 78**, 64.4% of respondents indicated they had access to and used an explosives detection canine. For **Question 79**, 53.7% of the respondents indicated that they used a canine explosives detection team from 1 to 20% of the time. Only 16.3% indicated using such a team for 81 to 100% of the time. The respondents to **Question 80** indicated that 62.8% did not have a specific criteria for calling out the canine team. The follow- up question asked the respondent to describe the criteria. The answers were considerably varied and the reader is directed to the Vista ™ survey in the appendix.

Only 37.1% of respondents indicated their agency tracked the usage of explosives detection canines in each investigation (**Question 81**). Only 30.6% of respondents indicated that the canine's positive to negative hit rate was tracked (**Question 82**). In **Question 83**, 69.3% of respondents think they would benefit by having access to a national/international database of certified explosives detection canine teams.

When asked if investigators had access to forensic laboratory experts for consultation in explosives while investigating a bombing scene, 52.4% of the respondents answered "no" in **Question 84**. In **Question 85**, 76.5 % of the respondents who indicated that they had access to a scientist, indicated that in 2006 they called upon this expertise 1 to 5 times. In **Question 86**, 96.1% of the respondents who answered that they did not have access to a scientist, indicated that this type of access would be desirable. For **Question 87**, they further ranked the importance of this access using the scale of 1 = "Not at all" to 7 = "Very" with 46.4% of respondents ranking this service at 7 ("very desirable). For rankings of 5 or 6, 14.5% and 20.5% respectively indicated a positive level of importance.

Question 88 asked respondents to estimate the number of scenes containing various types of explosives which they worked in 2006. The vast majority either did not work that type of device or the number of incidents was few (between 1 to 20), see **Table 18.**

Scenes Containing:	Percent indicating "0"	Percent indicating "1 to 20"
Intact Explosives	40.00%	50.40%
Intact IED	51.90%	40.50%
Post Blast Explosives	39.30%	56.40%
Post Blast IED	52.30%	43.10%
Intact Incendiary Device	35.00%	60.70%
Post Reaction Incendiary Device	39.40%	53.30%

Table 18: Estimate of the Number of Scenes with Specific Types of Explosives

Question 89 sought to determine the number of times that a respondent was called upon to "render safe" a device and the methods used to accomplish the task. **Table 19** provides a synopsis of the data:

Render Safe Method	"0" occasions	"1 to 20" occasions
Hands on	54.30%	43.20%
Remote Cutter	75.00%	22.20%
Disrupter	28.30%	46.70%
Other	57.80%	33.33%

Table 19: "Render Safe" Method and the Number of Occasions Used

It must be additionally noted that another 13% of respondents used the Disruptor from 21 to 50 times and 8.7% indicated Disruptor use from 51 to 100 times.

Questions 90 through **100** were designed to assess laboratory research needs. Many of the questions asked respondents to write their opinions and comments as free entries instead of simply checking a box. Those with free entries were examined, and insofar as possible, were consolidated by combining similar comments and opinions. Answers which were flippant or not relevant to the laboratory analysis of fire debris or explosives were not considered.

Question 90 was one of these questions. It asked, "What major breakthrough in the area of ignitable liquid or explosives analysis would have the most impact on the area of forensic science (think big the sky is the limit)?" The following is the synopsis of the written responses:

- A simple to use, portable, cost effective, validated instrument that can reliably produce presumptive identifications of ignitable liquids from samples (with minimal sample preparation) while at the scene. Portable GC-MS instruments were suggested.

- A simple to use, portable, cost effective, validated instrument that can reliably produce presumptive identifications of explosives from samples (with minimal sample preparation) while at the scene. Portable GC-MS or IMS instruments were suggested.

- Instrumental software that can reliably match data from unknowns to library reference standards and can provide a realistic probability index of a match against a specific ASTM class of ignitable liquid.

- Research instrumental methods, software, or new instruments that will allow the exclusion of interfering compounds and pyrolysis products so that only ignitable liquid components are seen.

- The introduction of taggants or chemical markers in ignitable liquids that will not be destroyed or altered by fire and will allow identification of the specific ignitable liquid and identify the manufacturer or brand of ignitable liquid.

- Instrumentation and/or software that will allow a probability match of ignitable liquids found at a scene to ignitable liquids in the possession of the suspect or from specific sources. DNA for fire debris analysis.

- Improved and low or no cost access to a database listing relevant scientific research (for fire debris and explosives analysis) which has been peer reviewed and published. The ability to obtain specific articles at low or no cost without the need to subscribe to the publication is also requested.

- Research into the source determination of explosive residue compounds found in a sample versus the same compounds inherent or produced in the scene. For example, could stable isotope ratio MS tell you if the nitrate anion found in a soil sample has the same ratios as the nitrate anion from different sources. These may be the fertilizer previously added to the soil or the black powder in the possession of the suspect. Other instrumentation may work as well and could be used so long as there was a differentiation.

- Federal financial support to provide low or no cost portable instruments for on-scene testing (Ion Mobility Spectroscopy, portable Raman, portable FTIR, etc.).
- Research into alternate extraction technologies which would reduce the presence of background interferences (supercritical fluid extraction for example).
- A single comprehensive analytical technique for identifying any compound (organic or inorganic) extracted from explosive residue (Fourier Transform Ion Cyclotron Mass Spectroscopy was suggested as an existing technique which needs research).
- Research into the persistence of ignitable liquids on footwear or tracked by footwear onto different substrates.
- Research into the deterioration rates of various ignitable liquids based on variables such as time of exposure, temperature, air flow over the ignitable liquid, and the absorptive protection provided by various matrices.
- Video documentation of the investigation or analysis which could be used to show the jury exactly what was done by an investigator or analyst.
- Prepare and distribute testing kits that can be used to assess initially the identity of explosives or ignitable liquids at a scene.
- Determine the likelihood of determining DNA from evidence in a fire or bombing.
- Research into the differentiation of terpenes found inherent to natural wood versus those found in commercial solvent products.
- Research into the use of alternate light sources as tools to aid in determining the areas with ignitable liquids in fire scenes.
- RSP of HME's or PBE's. Not spray misting but actual RSP methods.

Question 91 asked the respondents to rank several research areas in terms of whether the research area would have “a significant impact on ignitable liquid or explosives analysis.” The scale for ranking is 1 = “not likely,” 3 = “is possible,” 5 = “is probable,” and 7 = “extremely likely.” Table 20 lists the research area then indicates the percentage of respondents who selected a ranking of 5, 6, or 7.

Research Area	% Ranking “5”	% Ranking “6”	% Ranking “7”	Total of 5, 6, & 7
New Analytical Methods	28.70%	11.10%	30.60%	70.40%
New and Improved Databases	23.40%	16.20%	40.50%	80.10%
New Data Analysis Methodology	27.80%	7.40%	32.40%	67.60%
New Standards	24.10%	4.60%	24.10%	52.80%
Sample archiving practice/method	19.40%	8.70%	30.10%	58.20%

Table 20: Ranking the potential Impact of Areas of Research in Ignitable Liquid & Explosion Analysis

Once the totals for the rankings of 5, 6, or 7 are viewed, the respondents indicated that “New and Improved Databases” followed by “New Analytical Methods” and “New Data Analysis Methodology” are the areas “probable” to “most likely” to have an impact.

For 93.0% of the 115 respondents to **Question 92**, the need for additional research “in the area of explosives disposal/disruption” is clearly “yes.” In **Question 94**, the ranking of “the importance of an analyst’s knowledge of the fate and transport of explosives in the environment as related to forensic casework” was ranked at “7” or “urgent” by 36.9% of respondents and at “5” or “very important” by 26.2%. When asked about the push to lower detection limits in the analysis of explosives (**Question 95**), 64.5% of the respondents ranked the subject from “is very important” to “urgent.”

In **Question 93**, the respondents were asked to indicate “the most significant improvement on the efficiency of useful sample collection at the fire and explosive scenes.” The response with the highest percentage (36.3%) was “New field instrumentation/sensors to aid in sample selection.” The second highest response (32.7%) indicated the need for “Training of sample collection personnel.”

Question 96 is another free entry question that asked fire and explosives analysts to identify their greatest challenges. The list is below.

- Maintaining a turnaround time (from the submission of the samples to the issuing of a report) that is low enough to allow the report to be useful while the investigation is open, yet long enough to insure proper and adequate analysis and evaluation.

- Obtaining training and education at a professional level that is affordable to an agency with budget considerations and can be scheduled to avoid a hardship on the agency.

- Receiving adequate and appropriate comparison samples from the scene. This promotes being able to determine if the trace ignitable liquid in the sample was inherent to the matrix/scene or foreign to the scene (an accelerant).

- Budget restrictions to negate the ability to purchase equipment or hire more personnel. As a result, many of us are forced to use obsolete equipment.

- Inadequate staffing levels to meet the workload.

- Communication and cooperation between the investigators and analysts and from one agency to another. Roadblocks to sharing information with peers.

- Advising investigators of the best and worst areas for sample collection in the scene with a follow-up on proper and adequate packaging and preservation of the samples collected.

- References and a better understanding of pyrolysis products. A pyrolysis product database.

- Having the research, data, and references to allow a determination of the presence of an explosive though many of the post-blast residues are individually considered inherent to a scene or innocuous.

- Working with prosecutors to train them in our capabilities and more importantly, our limitations. Keeping open dialogue with prosecutors or other attorneys so they fully understand what you can and cannot say when on the stand. Encouraging pleas when appropriate and pursuing prosecutions when justified.

- Having access to ignitable liquid reference standards. Knowing about new petrochemical products that could be used as accelerants. Open communications with the petrochemical industry.

- Not being able to make probability match comparisons between samples from a scene and a suspect with the same level of certainty as DNA analysts.

- Awareness and familiarity with NFPA 921 so that it does not become a tool to attack the work that you did, but rather a source to show that you were objective.

- Inadequate funding for research into fire and explosion dynamics as well as analytical methods and instruments.

- How to assess the reputation and objectivity of experts brought in to conduct an investigation or analysis.

- Proper scene security and preservation until the public investigator can conduct his investigation. Timeliness of transferring the scene from public to private investigation.

- Awareness and training in new legal issues which affect the investigation, analysis, and testimony.

- Availability of forensic engineers to public agencies for investigation of electrical fires.

- Raising the forensic and scientific awareness and training of investigative personnel. Teaching the "scientific method" as applied to investigations.

- Raising the national standards on bomb squads to ensure that only properly trained and adequately equipped squads are working.

- Greater understanding and information on the identification of peroxide based explosives.

- Greater understanding and awareness of trends and procedures in homemade explosives and improvised devices. Staying one step ahead of the bomb makers.

- Understanding and support by those outside of the agency or laboratory that may not be knowledgeable about the particulars of your job. Getting administrators and politicians to not attempt to micro-manage areas outside of their expertise. Getting them to treat and trust the agency/laboratory representative as then subject matter expert and avoid second guessing them.

Question 97, “What area(s) of your investigation analysis is (are) most frequently challenged in court?”, asked respondents to list up to three (3) items. The varied answers required considerable review and consolidation. The following table represents not only the consolidation but also a sorting of the frequency of similar responses as interpreted by the Needs Assessment Committee. The most common responses are listed first:

Expertise/Qualifications - Including accreditation and/or personal Certification(s)

- Origin and Cause (i.e., elimination of all other potential causes).
- Selection, Collection and packaging of the evidence.
- Choice of analytical methodology/Quality of the analysis.
- Identification of a suspect/motive/intent.
- Chain of Custody.
- Significance and relevance of findings or results.
- Interpretation of laboratory data and formulation of results for report (GC-MS or other instrumental data).
- Education and training received (i.e., type, amount, and relevance).
- Documentation of the scene.
- Assessing the potential for contamination of the sample.
- Connecting the suspect and the evidence.
- Where the ignitable liquid originally came from.
- Knowledge of NFPA 921.
- General Expertise in the field.
- Bias for employer/client.
- Consideration of the contribution from pyrolysis/matrices.
- Hesitance of prosecutor to proceed to trial.
- Use and significance of a canine.
- Completeness/quality of written report.
- Spoliation.
- Determining the explosive potential of devices.
- How long the ignitable liquid was there before the fire.
- Ability to compare recovered ignitable liquids.
- Determination of the source of ignition.
- How the type of explosive was determined.
- Possible electrical causes.
- Overall investigative process.
- Quantification of the amount of ignitable liquid found or used.
- Gunshot residue analysis.
- Engineers.
- Initial and over all assessment of scene.

The significance of Daubert/Frye standards when introducing a new analytical method, technique, or instrument into a laboratory was ranked by respondents on a scale of 1 = “not at all,” 3 = “fairly important,” 5 = “very important,” and 7 = “urgent” in **Question 98**. The majority (26.2%) ranked the issue as 5, “very important.” The second highest percentage of respondents (21.5%) ranked this issue at 7, “urgent.” The third highest percentage (15%) ranked the issue at 6 which would be between “very important” and “urgent.” If we total the percentage of responses ranking this issue above 5 or “very important,” the total is 62.7% and the significance is clearly seen.

Question 99 asked respondents if the creation of a “new practices” review panel comprised of academic and practicing forensic scientists would facilitate the implementation of new methods in the view of the courts. The majority of respondents were ambivalent on this issue as 56.3% responded “possibly.” It must be noted however that a full 38.1% of respondents answered a definitive “yes” and only 5.6%a definitive “no.”

The last query, **Question 100**, asked if laboratory analysts are interested in collaborating with university researchers to implement new and/or field methods. Again the majority of respondents (46.6%) answered “possibly. This time however, 23.3% answered “no” and 30.2% answered “yes.”

The above synopses lists and tables were assembled in an attempt to clarify how the Needs Assessment Committee viewed the results. Even among committee members there may be disagreement as to the significance or interpretation of the data. The reader is urged to review the full survey results included in the attached appendix.

Please be aware that additional or differing opinions concerning the results of the survey are possible. The opinions contained herein were developed by consensus by the Needs Assessment Committee members and representatives of T/SWGFEX.

Appendix C. Tables of Survey Questions

Their Relationships to Planning Sub-Committees

Q #	Analytical Methods Fire Debris	Analytical Methods Explosives	Technology Fire Debris	Technology Explosives	Training for Fire Debris	Training for Explosives	General and Demographics
A	Demographics and General Questions						
1							
2							
3							
4							
5							
6							
B	Professional Development						
7							
8							
9							
10							
11							
12							
13							
14							
15							
C	Fire Debris Analysis Casework						
16							
D	Fire Debris Analysis Analytical Methods						
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
E	Fire Debris Analysis Data Interpretation						
29							
30							
31							
32							

Table C1: Questions 1 To 32 And Their Relationship To Planning Sub-Committees

Q #	Analytical Methods Fire Debris	Analytical Methods Explosives	Technology Fire Debris	Technology Explosives	Training for Fire Debris	Training for Explosives	General and Demographics
F	Explosives Analysis Casework						
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							
44							
45							
46							
47							
48							
G	Explosives Analytical Methods						
49							
50							
51							
52							
53							
H	Explosives Data Interpretation						
54							
55							
56							
57							
I	Fire Scene Investigation						
58							
59							
60							
61							
62							
63							
64							
65							
66							
67							
68							
69							

<u>Table C2</u>: Questions 33 To 69 And Their Relationship To Planning Sub-Committees

Q #	Analytical Methods Fire Debris	Analytical Methods Explosives	Technology Fire Debris	Technology Explosives	Training for Fire Debris	Training for Explosives	General and Demographics
J	Explosives Scene Investigation						
70							
71							
72							
73							
74							
75							
76							
77							
78							
79							
80							
81							
82							
83							
84							
85							
86							
87							
88							
89							
K	Laboratory Research Topics						
90							
91							
92							
93							
94							
95							
96							
97							
98							
99							
100							

<u>Table C3</u>: Questions 70 To 100 And Their Relationship To Planning Sub-Committees

Appendix D. Vista ™ Survey Results and Survey (see following pages)

Survey Results
& Analysis

for

Survey of Forensic Laboratories and Scene Investigation

Account: NCFS

Monday, September 17, 2007 10:09:46 AM

Vista™ Survey System

Introduction

This report contains a detailed statistical analysis of the results to your survey named *Survey of Forensic Laboratories and Scene Investigation*. The results analysis includes answers from all respondents who took your survey in the 94 day period from Wednesday, June 13, 2007 to Friday, September 14, 2007 inclusive.

Report Contents

This report is divided into four sections:

1. Introduction
2. Results Analysis
3. Questionnaire
4. Notes

The **Introduction** (this section) contains an overview of the report structure.

The **Results Analysis** section contains a summary and statistical analysis of the results to each question in your survey.

The **Questionnaire** section lists all questions in your survey's questionnaire. This is provided as a reference to help you interpret the Results Analysis.

The **Notes** sections contains definitions of key terms and tips on how to interpret your results.

Confidence Intervals

Wherever possible, results are presented with an indication of the results accuracy. Usually this is presented in the form of a confidence interval. It is important when reviewing survey results to make sure that any action you plan is based only on statistically significant results.

Correlation Analysis

In preparing the results analysis, the report generator has examined all questions in pairs to see if there are any correlations between answers. Whenever a significant correlation is found, it is noted. This information can be valuable in determining what demographic or experience characteristics tend to drive key measures such as overall satisfaction.

Results Analysis

Survey name:	Survey of Forensic Laboratories and Scene Investigation
Start date:	Wednesday, June 13, 2007
End date:	Friday, September 14, 2007
Number of respondents:	407

Filter:
Include all respondent's answers.

i) Because this survey is posted in a variety of locations, we ask that you fill and submit only one version. We also ask that you only complete answers to those questions that pertain to you. If a question does not pertain to the work you performed in 2006, please leave it blank.

1) **Part A. Demographics and General Questions**

Indicate the type of work you do and assign a percentage of time in that activity (if you perform in multiple areas please indicate):

Job Title / Percentage of Time

1a) Fire Debris Analyst

10-20%	(39)	22.0%
20-30%	(22)	12.4%
30-40%	(6)	3.4%
40-50%	(11)	6.2%
50-60%	(6)	3.4%
60-70%	(2)	1.1%
70-80%	(6)	3.4%
80-90%	(8)	4.5%
90-100%	(12)	6.8%
N/A	(65)	36.7%
Total	(177)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 230 of 407 respondents chose not to answer.

1b) Explosive Debris Analyst

10-20%	(51)	34.7%
20-30%	(8)	5.4%
30-40%	(3)	2.0%
40-50%	(4)	2.7%
50-60%	(0)	0.0%
60-70%	(0)	0.0%
70-80%	(0)	0.0%
80-90%	(0)	0.0%
90-100%	(2)	1.4%
N/A	(79)	53.7%
Total	(147)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 260 of 407 respondents chose not to answer.

1c) Fire Scene Investigation

10-20%	(56)	17.3%
20-30%	(37)	11.5%
30-40%	(19)	5.9%
40-50%	(21)	6.5%
50-60%	(13)	4.0%
60-70%	(14)	4.3%
70-80%	(28)	8.7%
80-90%	(35)	10.8%
90-100%	(69)	21.4%
N/A	(31)	9.6%
Total	(323)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 84 of 407 respondents chose not to answer.

1d) Explosives (Post Blast) Investigation

10-20%	(112)	56.0%
20-30%	(13)	6.5%
30-40%	(7)	3.5%
40-50%	(2)	1.0%
50-60%	(2)	1.0%
60-70%	(1)	0.5%
70-80%	(0)	0.0%
80-90%	(0)	0.0%
90-100%	(7)	3.5%
N/A	(56)	28.0%
Total	(200)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 207 of 407 respondents chose not to answer.

1e) Supervisor/Administrator for either Laboratory Analyses or Scene Investigations

10-20%	(40)	20.3%
20-30%	(21)	10.7%
30-40%	(11)	5.6%
40-50%	(6)	3.0%
50-60%	(5)	2.5%
60-70%	(4)	2.0%
70-80%	(8)	4.1%
80-90%	(6)	3.0%
90-100%	(27)	13.7%
N/A	(69)	35.0%
Total	(197)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 210 of 407 respondents chose not to answer.

1f) Academic/Teaching

10-20%	(98)	47.3%
20-30%	(17)	8.2%
30-40%	(10)	4.8%
40-50%	(9)	4.3%
50-60%	(6)	2.9%
60-70%	(3)	1.4%
70-80%	(2)	1.0%
80-90%	(1)	0.5%
90-100%	(3)	1.4%
N/A	(58)	28.0%
Total	(207)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 200 of 407 respondents chose not to answer.

2) Indicate the type of organization for which you work (check one):

Private	(93)	23.2%
City/Municipal	(170)	42.5%
County	(70)	17.5%
State/Provincial	(52)	13.0%
Federal	(15)	3.8%
Total	(400)	0 10 20 30 40 50 60 70 80 90 100%

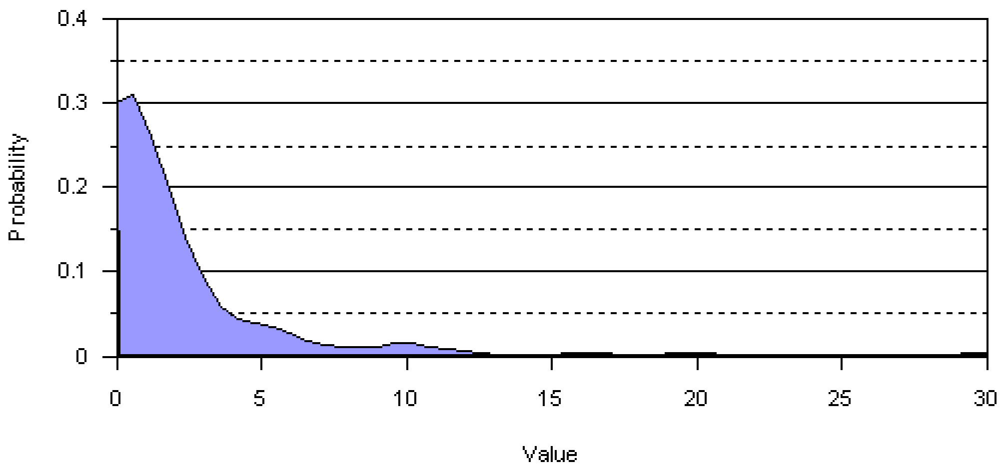
An answer to this question is not required and 7 of 407 respondents chose not to answer.

3) List the number of all employees (including you) in your laboratory or unit involved in fire debris or explosives analysis, scene investigation, and/or reporting for each of the following categories:

Position / Number of Employees

3a) Analyst /Scientist

Probability Density Function



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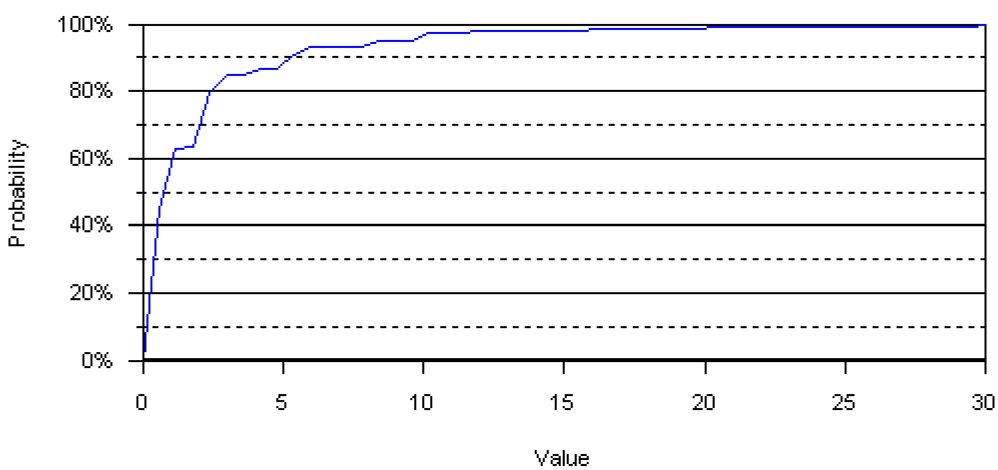
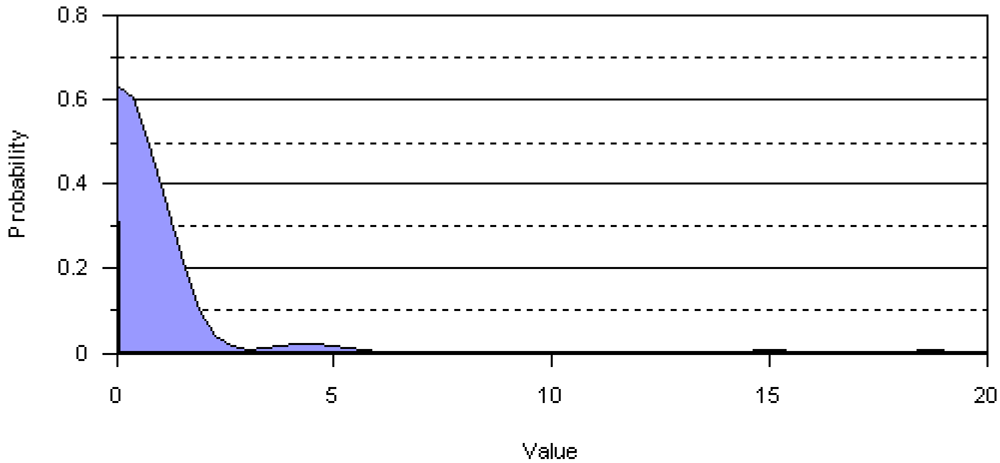


Average:	2.00
Standard Deviation:	3.81
Minimum:	0.00
Maximum:	30.00

An answer to this question is not required and 257 of 407 respondents chose not to answer.

3b) Lab. Supervisor/Manager

Probability Density Function



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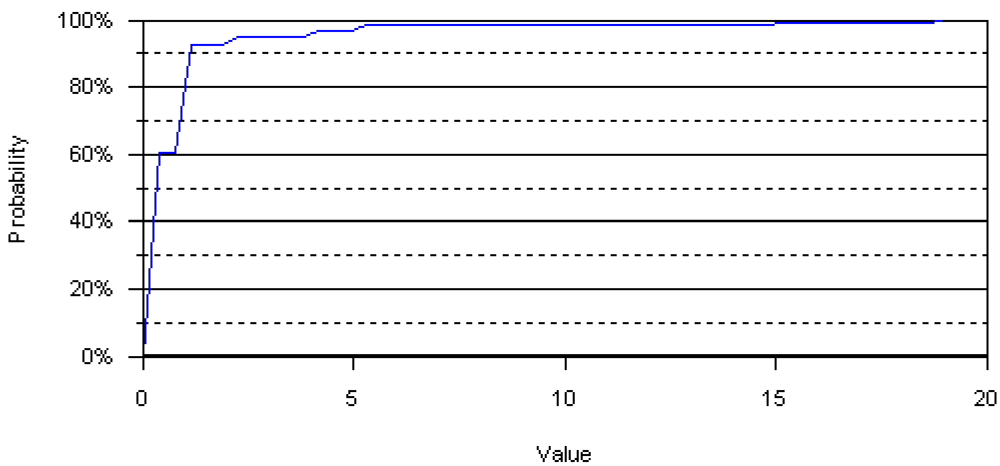
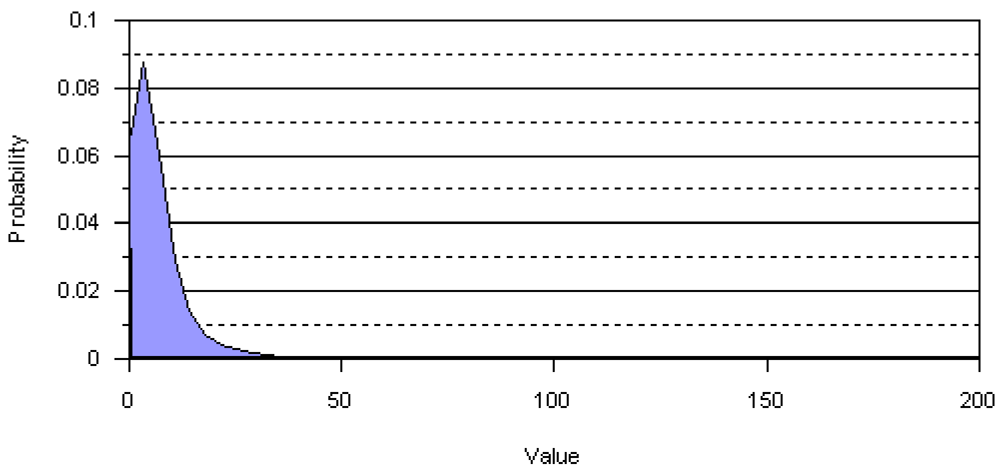


Average:	0.80
Standard Deviation:	2.30
Minimum:	0.00
Maximum:	19.00

An answer to this question is not required and 285 of 407 respondents chose not to answer.

3c) Scene Investigator/EOD

Probability Density Function



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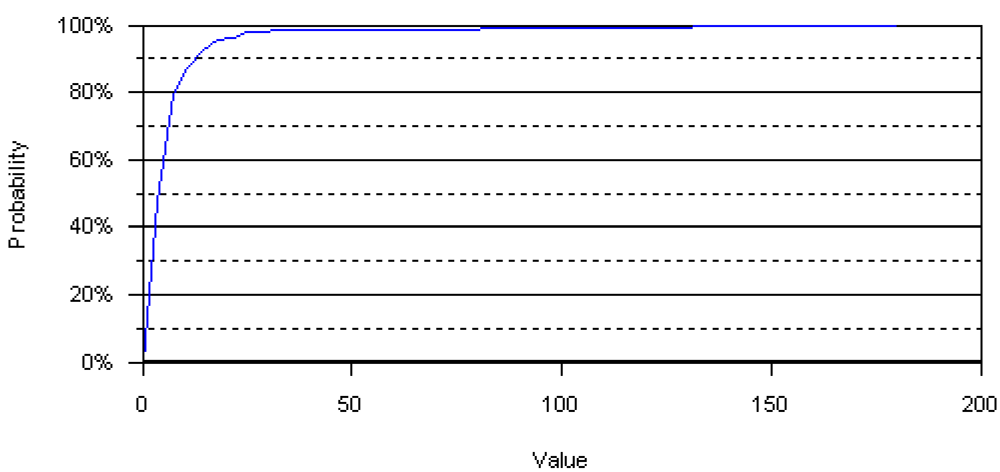
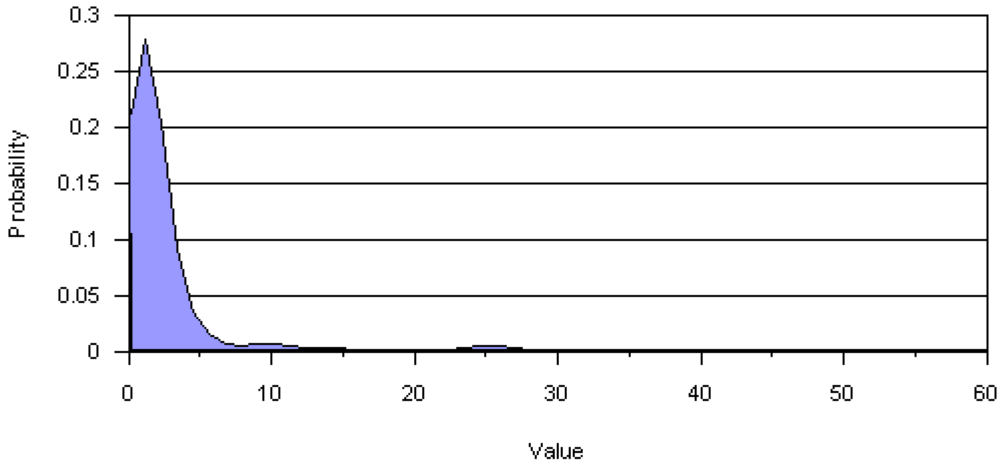


Average:	6.62
Standard Deviation:	15.04
Minimum:	0.00
Maximum:	180.00

An answer to this question is not required and 83 of 407 respondents chose not to answer.

3d) Scene/EOD Supervisor

Probability Density Function



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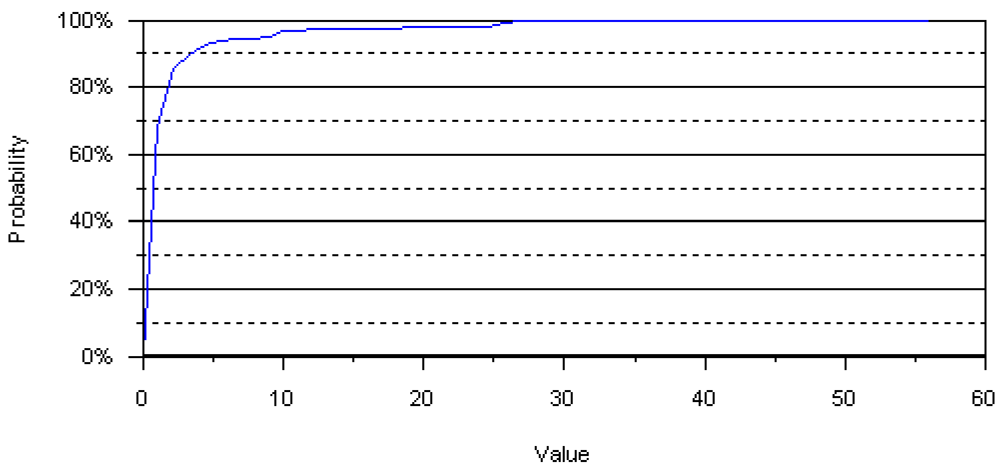


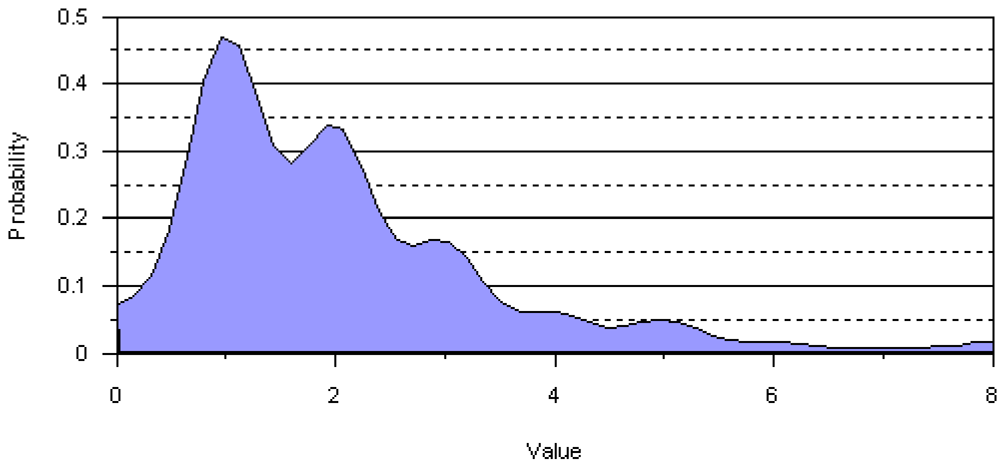
Average:	2.28
Standard Deviation:	5.27
Minimum:	0.00
Maximum:	56.00

An answer to this question is not required and 204 of 407 respondents chose not to answer.

4) Years of Experience in this field / Number of employees

4a) 0-2

Probability Density Function



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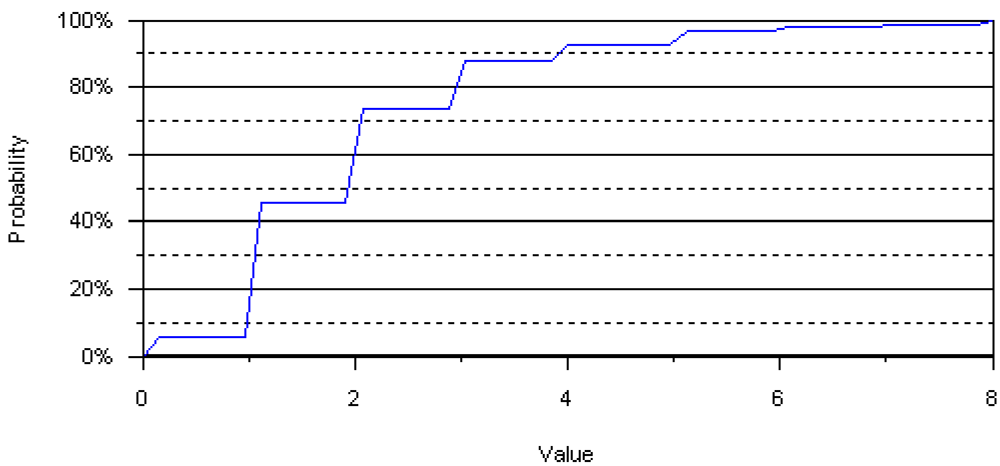
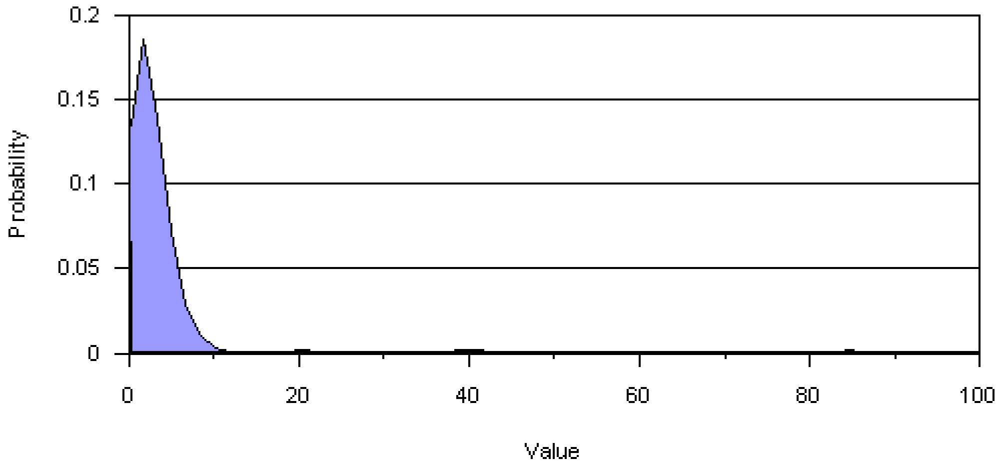


Average:	2.02
Standard Deviation:	1.49
Minimum:	0.00
Maximum:	8.00

An answer to this question is not required and 262 of 407 respondents chose not to answer.

4b) 2-5

Probability Density Function



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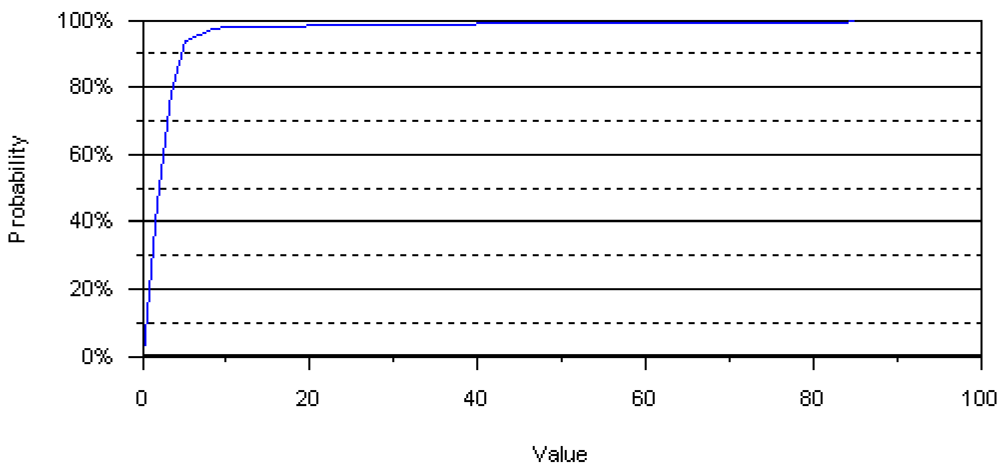
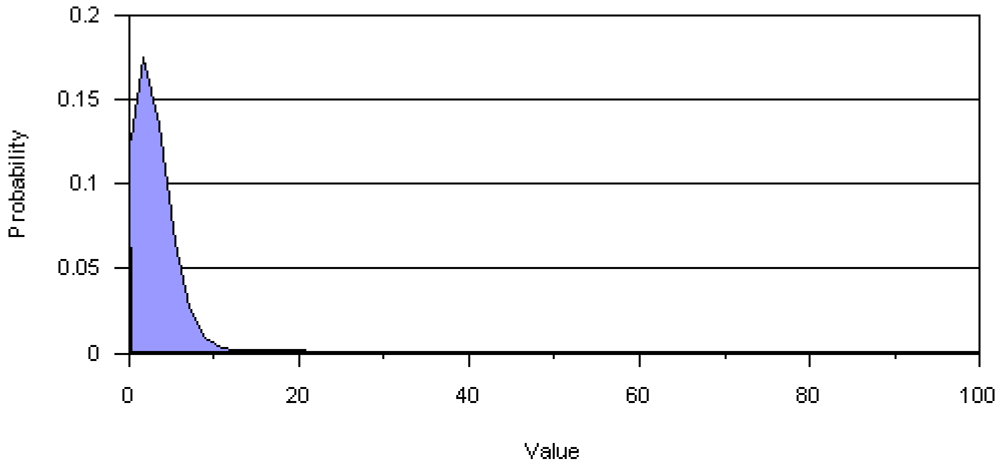


Average:	3.07
Standard Deviation:	7.50
Minimum:	0.00
Maximum:	85.00

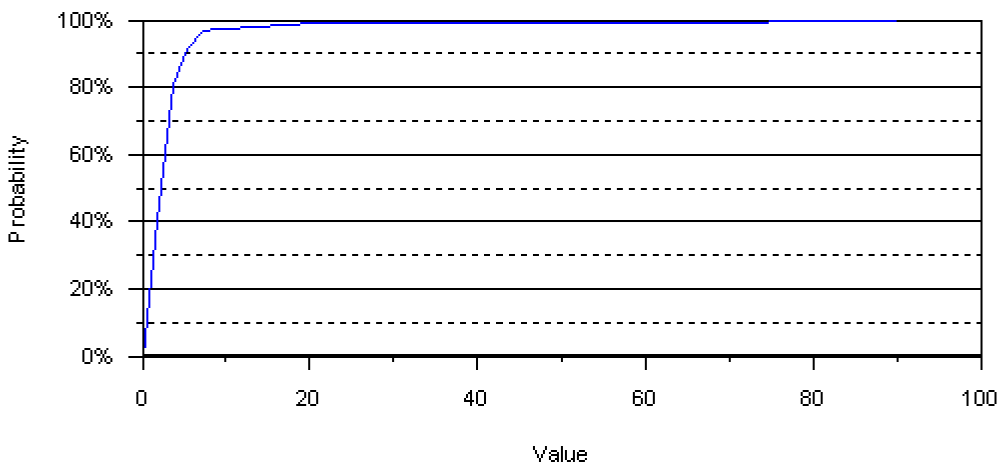
An answer to this question is not required and 247 of 407 respondents chose not to answer.

4c) 5-10

Probability Density Function



Cumulative Distribution

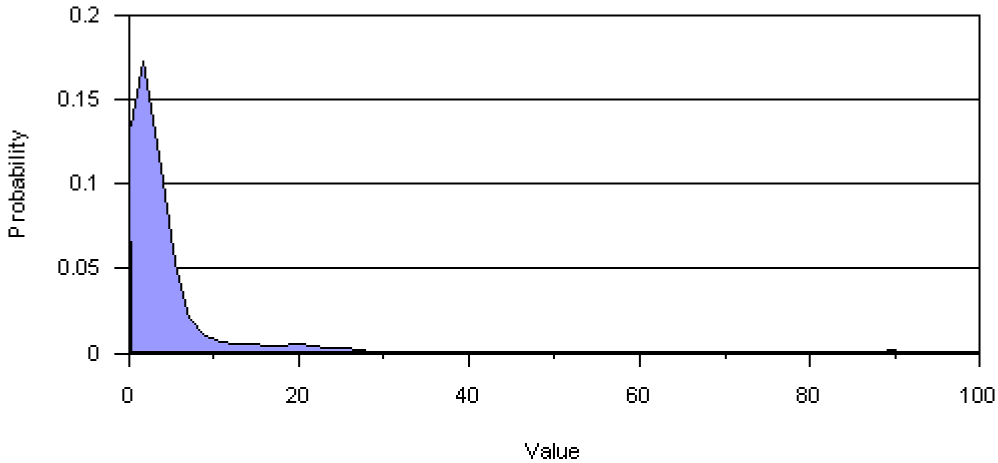


Average:	3.27
Standard Deviation:	8.42
Minimum:	0.00
Maximum:	90.00

An answer to this question is not required and 211 of 407 respondents chose not to answer.

4d) 10-15

Probability Density Function



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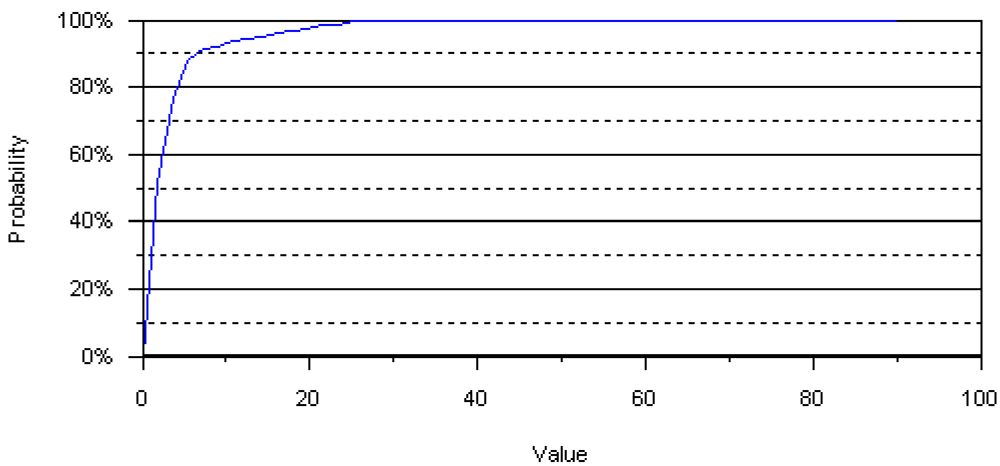
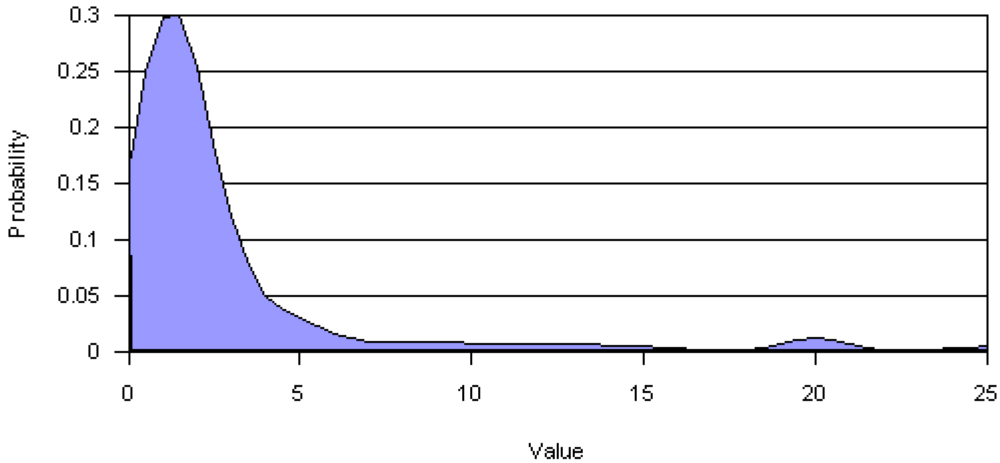


Average:	3.61
Standard Deviation:	7.99
Minimum:	0.00
Maximum:	90.00

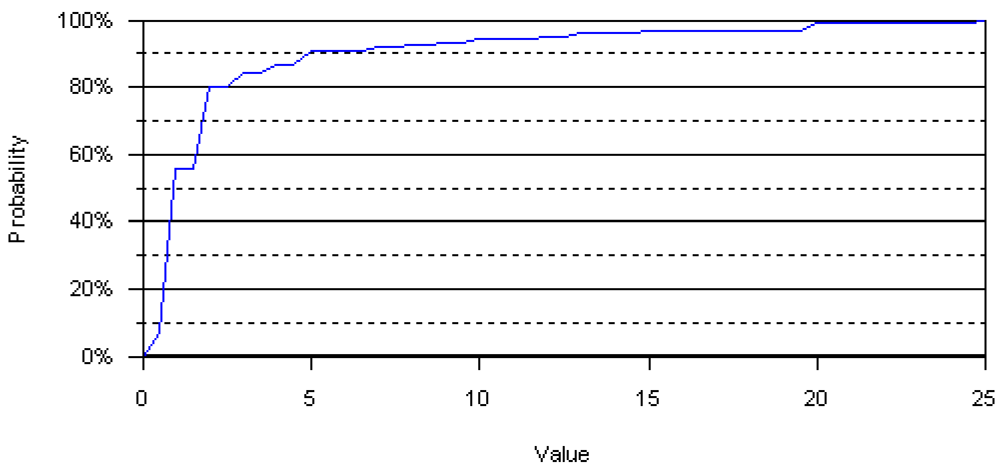
An answer to this question is not required and 238 of 407 respondents chose not to answer.

4e) 20-25

Probability Density Function



Cumulative Distribution

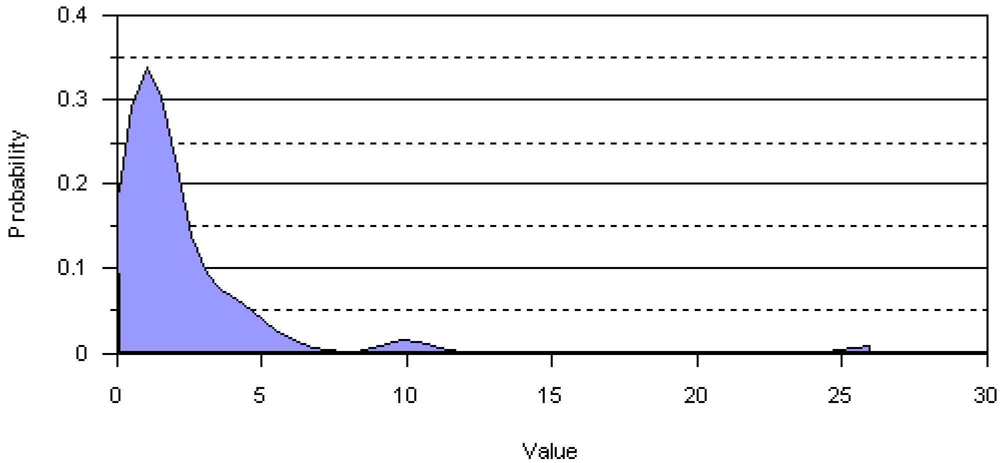


Average:	2.73
Standard Deviation:	4.24
Minimum:	0.00
Maximum:	25.00

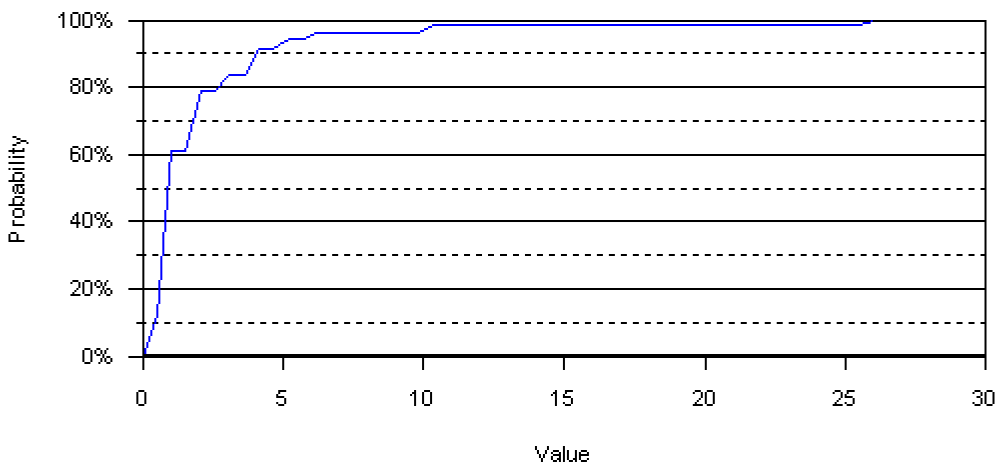
An answer to this question is not required and 286 of 407 respondents chose not to answer.

4f) 25-30

Probability Density Function



Cumulative Distribution

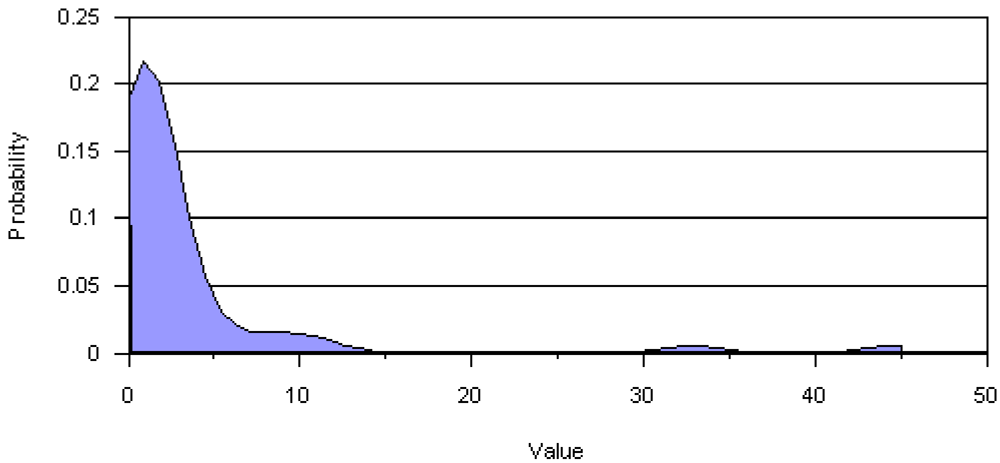


Average:	2.17
Standard Deviation:	3.43
Minimum:	0.00
Maximum:	26.00

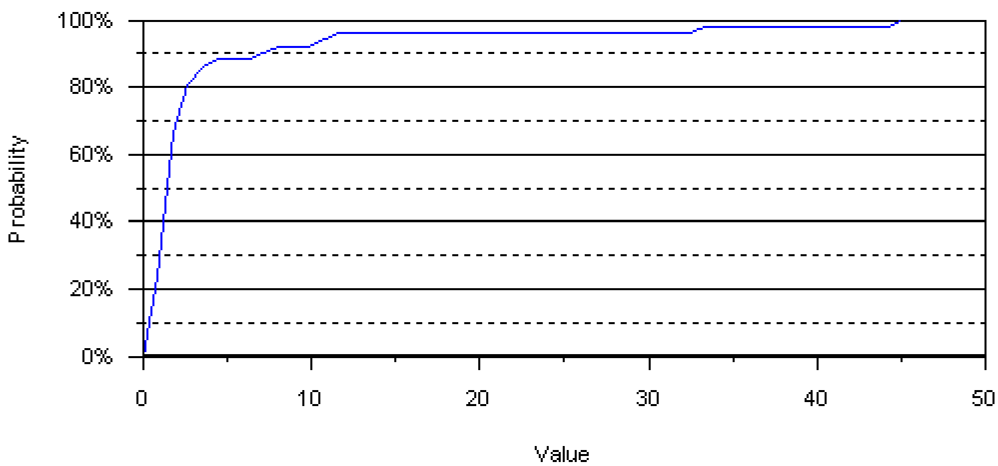
An answer to this question is not required and 335 of 407 respondents chose not to answer.

4g) >30

Probability Density Function



Cumulative Distribution



Average:	3.20
Standard Deviation:	7.77
Minimum:	0.00
Maximum:	45.00

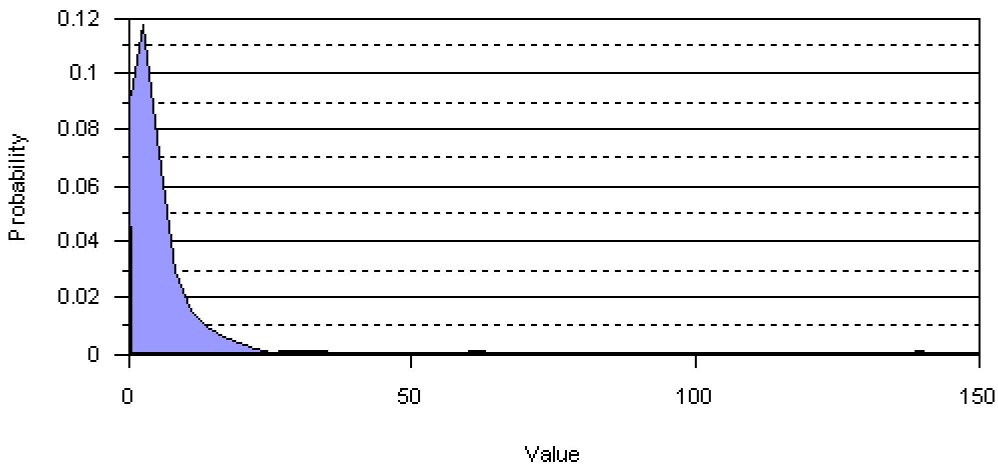
An answer to this question is not required and 356 of 407 respondents chose not to answer.

5) List the number of all employees (including you) in your laboratory or unit involved in fire debris or explosives analysis, scene investigation, and/or reporting for each of the following categories:

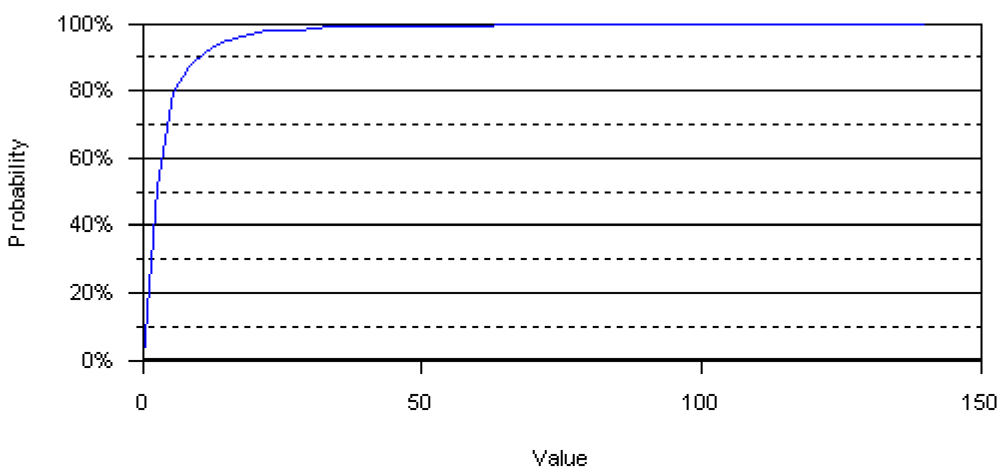
Highest Education attained by each employee / Number of Employees:

5a) High School

Probability Density Function



Cumulative Distribution



Average:	5.01
Standard Deviation:	11.72
Minimum:	0.00
Maximum:	140.00

An answer to this question is not required and 216 of 407 respondents chose not to answer.

5b) 2-3 year degree / diploma

- X
- 1
- 1
- 2
- 10
- 2
- 6
- 1
- 3
- 1
- 2
- 2
- 1
- 3
- 1
- 1
- 1
- 3
- 1
- 10
- 1
- 1
- 2
- 1
- 6
- 2
- 1
- 1
- 5
- 15
- 6
- 1
- 1
- 7
- 1
- 2
- 1
- 2
- 0
- 1
- 1
- 2
- 3
- 2

- 4
- 2
- 5
- 1
- 1
- 7
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- 1
- 1
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- 1
- 1
- 3
- 2
- 2
- 3
- 3
- 3
- 3
- 2
- 5
- 5
- 10
- 1
- 1
- 80
- 1
- 1
- 1
- 3
- 4
- 2
- 2
- 1
- 3
- 1
- 3
- 1
- 5
- 4
- 1
- 4
- 2
- 1/1
- 3

- 1
- 3
- 0
- 4
- 1
- 0
- 2
- 3
- 2
- 1
- 5
- X
- 1
- 3
- 1
- 12
- 2
- 7
- 2
- 2
- 2
- 4
- 1
- 1
- 1
- 1
- 4
- 1
- 1
- 4
- 7
- 2
- 1
- 2
- 3
- 4
- 2
- 1
- 5
- 1
- 2
- 10
- 25
- 6
- 1

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- 4
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- 2
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- 0
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- 2
- 2-2
- 15
- 1
- 3

- 1
- 3
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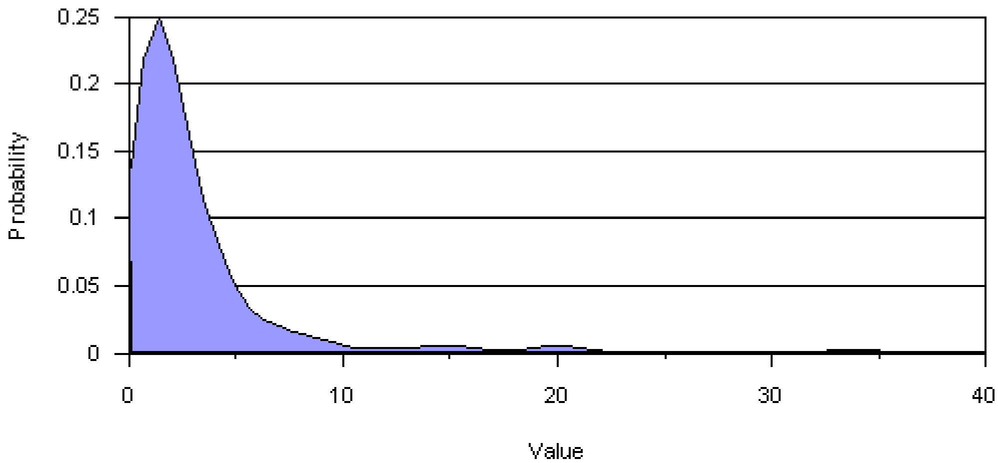
- 5
- 3
- 3
- 1
- 1
- 5
- 3
- 5
- 2
- 1
- 1
- 1
- 1
- 4
- 2
- 4
- 3
- 6
- 3
- 1
- 8
- 0

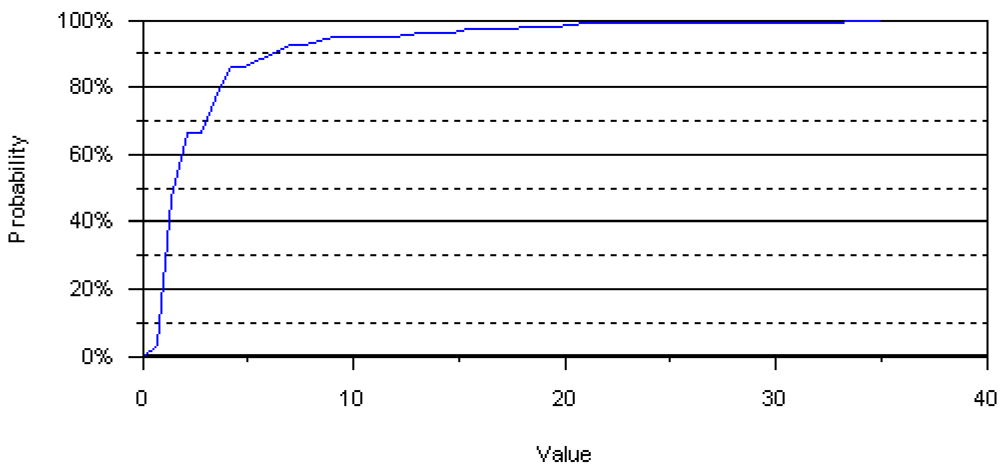
An answer to this question is not required and 199 of 407 respondents chose not to answer.

5c) 4 year BA or BS or BSc

Probability Density Function



Cumulative Distribution

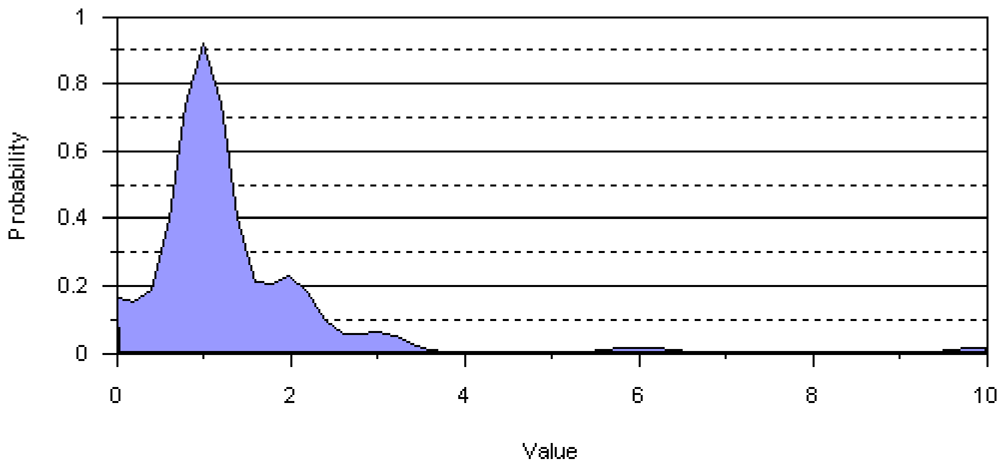


Average:	3.09
Standard Deviation:	4.46
Minimum:	0.00
Maximum:	35.00

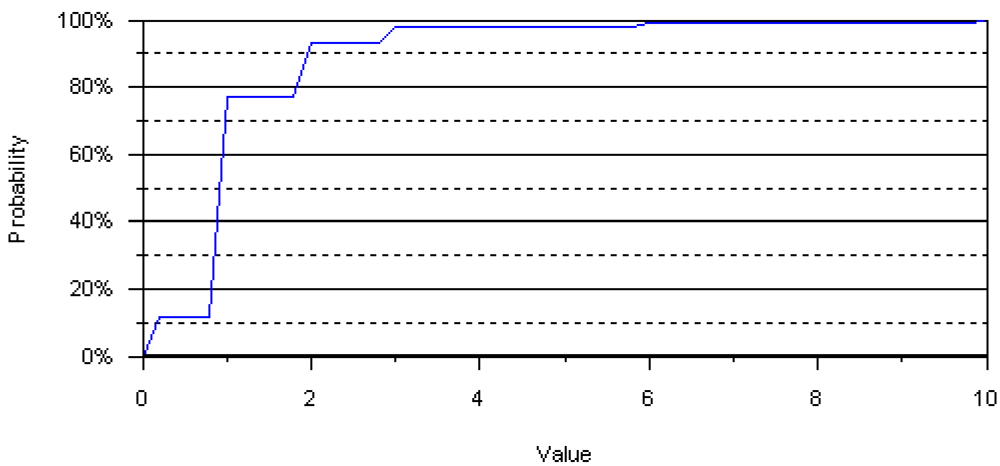
An answer to this question is not required and 179 of 407 respondents chose not to answer.

5d) Master's degree

Probability Density Function



Cumulative Distribution

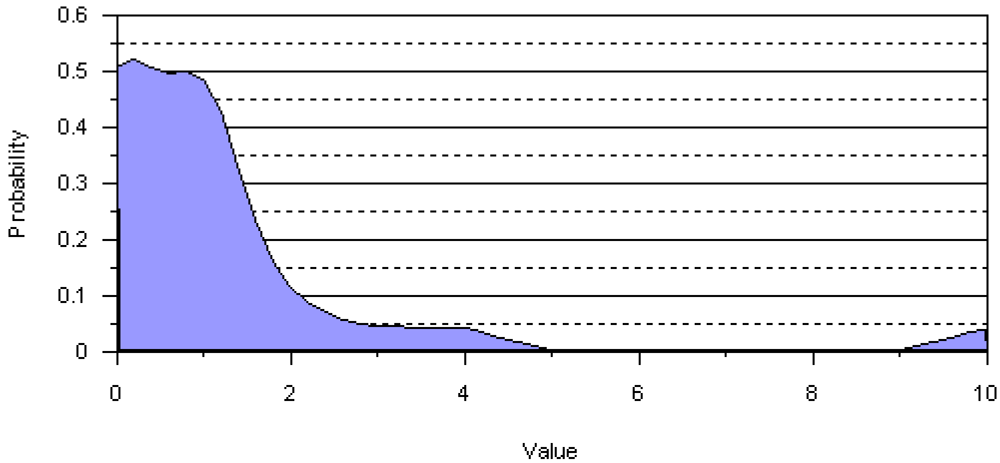


Average:	1.30
Standard Deviation:	1.27
Minimum:	0.00
Maximum:	10.00

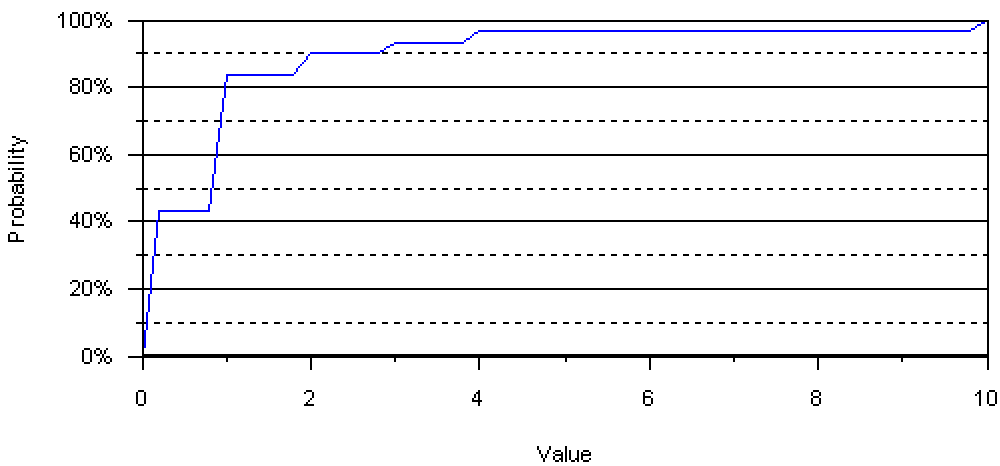
An answer to this question is not required and 320 of 407 respondents chose not to answer.

5e) PhD

Probability Density Function



Cumulative Distribution



Average:	1.10
Standard Deviation:	1.94
Minimum:	0.00
Maximum:	10.00

An answer to this question is not required and 377 of 407 respondents chose not to answer.

6) Indicate the number of times you testified in court in 2006

1-5	(256)	80.0%
6-10	(35)	10.9%
11-15	(13)	4.1%
16-20	(4)	1.2%
21-30	(5)	1.6%

31-40	(3)	0.9%
41-50	(1)	0.3%
>50	(3)	0.9%
Total	(320)	

An answer to this question is not required and 87 of 407 respondents chose not to answer.

ii) **Part B. Professional Development (Check an answer only on those questions which apply to you)**

7) Which, if any, of the following professional development activities will your laboratory or agency pay (in part or in full) for employees to attend (check all that apply):

local/state/regional professional association meeting	(312)	80.0%
conference, seminar, or symposium held within the state/province	(339)	86.9%
conference, seminar, or symposium held outside the state/province	(244)	62.6%
conference, seminar, or symposium held outside home country	(48)	12.3%
seminar or course held off-site	(273)	70.0%
seminar or course held on-site	(234)	60.0%
classes held a local university	(203)	52.1%
on-line classes from an accredited university	(164)	42.1%
employer does not offer to pay for courses, seminars, or for conference/symposium attendance	(24)	6.2%
Total	(390)	

An answer to this question is not required and 17 of 407 respondents chose not to answer.

8) On average, in 2006 what level of funding support did your agency provide for your continuing education/training/professional development? (This includes tuition, registration, travel, lodging, meals, and incidentals.)

No funding provided	(33)	8.8%
$1 to $500	(63)	16.8%
$501 to $1000	(69)	18.4%
$1001 to $1500	(38)	10.1%
$1501 to $2000	(49)	13.1%
$2001 to $2500	(33)	8.8%
$2501 to $3000	(27)	7.2%
$3001 to $4000	(20)	5.3%
$4001 to $5000	(11)	2.9%
>$5000	(32)	8.5%
Total	(375)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 32 of 407 respondents chose not to answer.

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9) Rate your level of interest (along the following scale) in attending college level courses if: (1-7 where: 1 = Never, 4 = Likely, 7 = Absolutely)

9a) You had to pay 100% of the costs

1	(121)	33.5%
2	(76)	21.1%
3	(39)	10.8%
4	(59)	16.3%
5	(23)	6.4%
6	(7)	1.9%
7	(36)	10.0%
Total	(361)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 46 of 407 respondents chose not to answer.

9b) You had to pay 75% of the costs

1	(92)	26.7%
2	(61)	17.7%
3	(58)	16.9%
4	(68)	19.8%
5	(25)	7.3%
6	(15)	4.4%
7	(25)	7.3%
Total	(344)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 63 of 407 respondents chose not to answer.

9c) You had to pay 50% of the costs

1	(68)	19.4%
2	(29)	8.3%
3	(46)	13.1%
4	(96)	27.4%
5	(56)	16.0%
6	(25)	7.1%
7	(31)	8.8%
Total	(351)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 56 of 407 respondents chose not to answer.

9d) You had to pay 25% of the costs

1	(45)	12.9%
2	(11)	3.2%
3	(16)	4.6%
4	(63)	18.1%
5	(63)	18.1%
6	(79)	22.7%
7	(71)	20.4%
Total	(348)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 59 of 407 respondents chose not to answer.

9e) You had to pay 0% of the costs

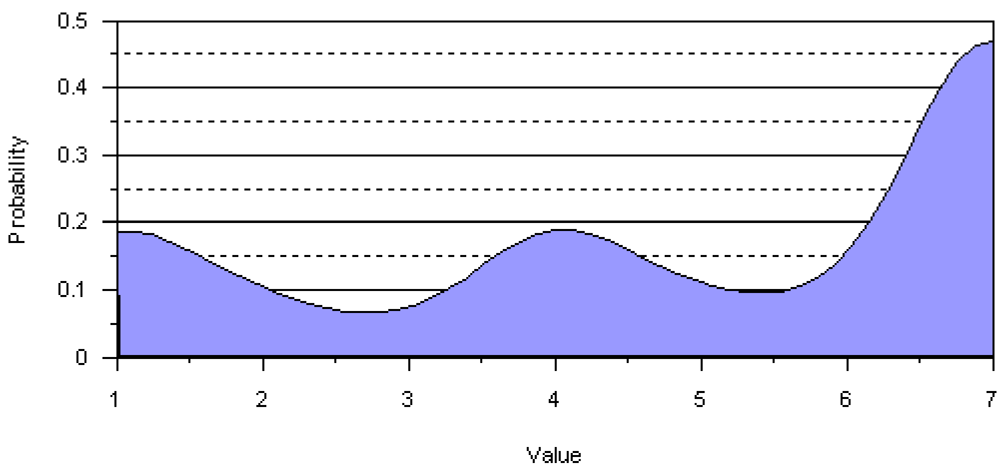
1	(21)	5.9%
2	(1)	0.3%
3	(7)	2.0%
4	(11)	3.1%
5	(12)	3.4%
6	(22)	6.2%
7	(282)	79.2%
Total	(356)	

An answer to this question is not required and 51 of 407 respondents chose not to answer.

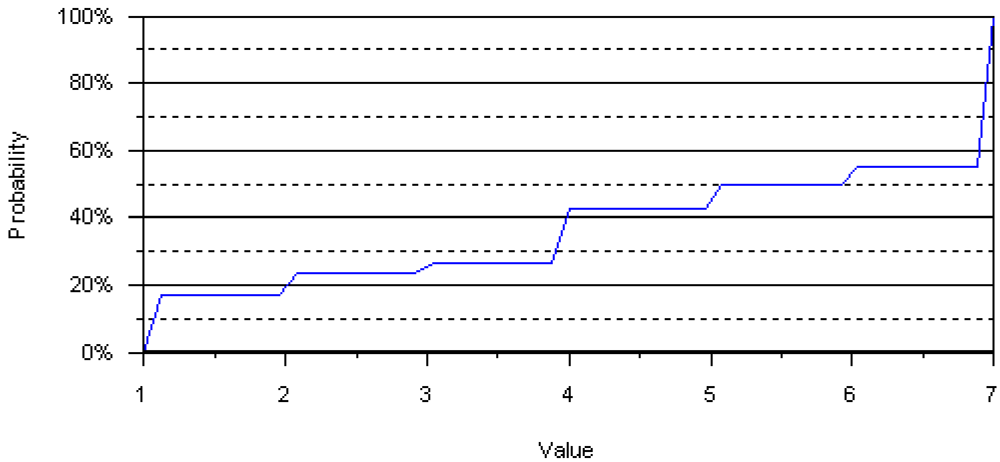
10) Rate how interested you would be in taking each of the following types of continuing education courses: (1-7 where: 1 = Never, 4 = Likely, 7 = Absolutely)

10a) EOD Range Time (Training with EOD personnel)

Probability Density Function



Cumulative Distribution



Average: 4.86

Standard Deviation: 2.33

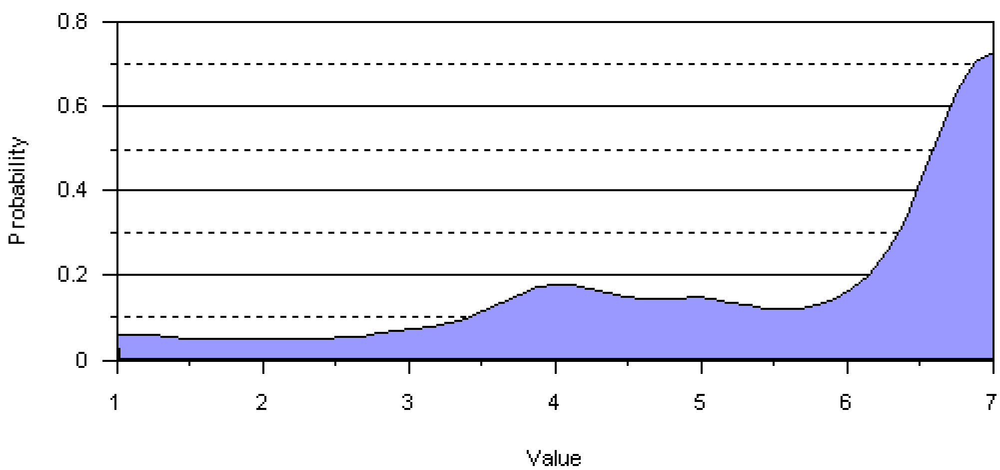
Minimum: 1.00

Maximum: 7.00

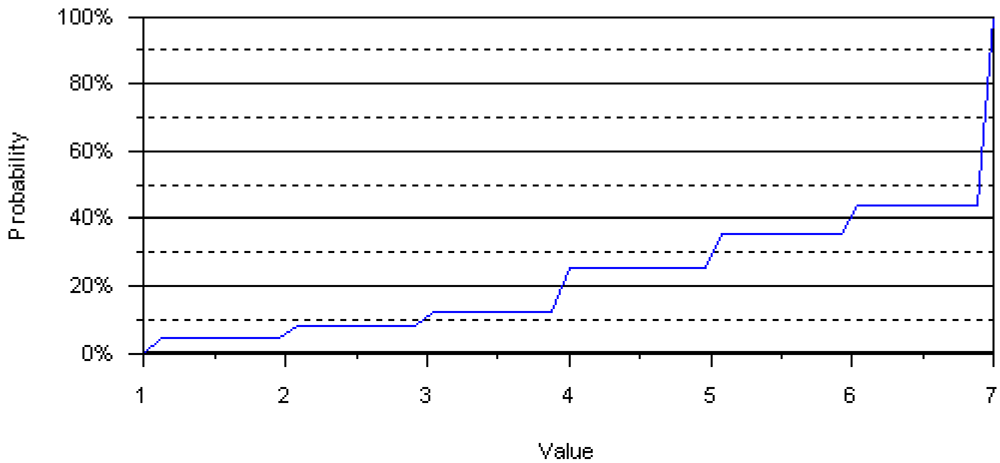
An answer to this question is not required and 52 of 407 respondents chose not to answer.

10b) Fire Scene Evidence Collection, Preservation, and Packaging

Probability Density Function



Cumulative Distribution



Average: 5.70

Standard Deviation: 1.78

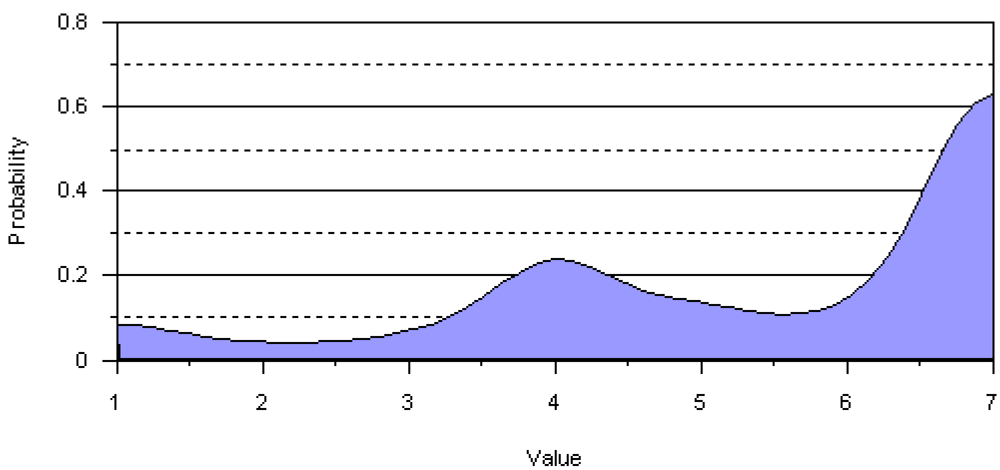
Minimum: 1.00

Maximum: 7.00

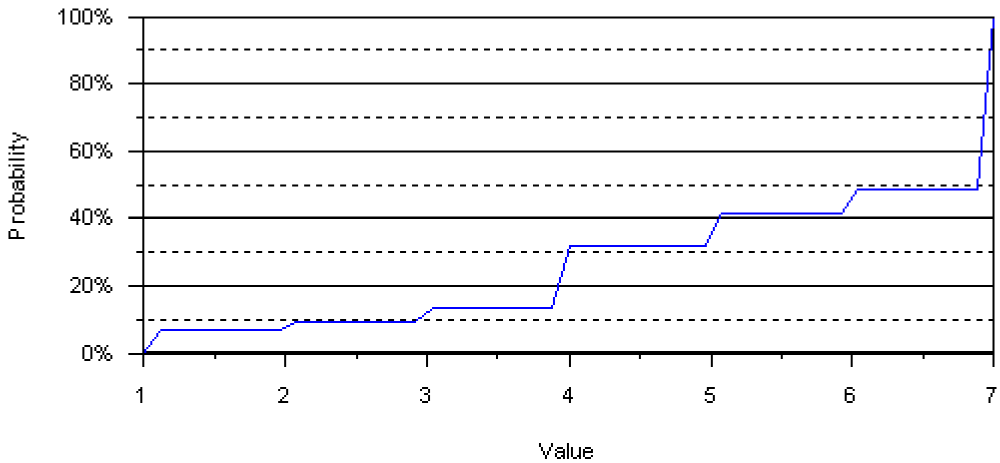
An answer to this question is not required and 30 of 407 respondents chose not to answer.

10c) Explosives Scene Collection, Preservation, and Packaging

Probability Density Function



Cumulative Distribution



Average: 5.49

Standard Deviation: 1.89

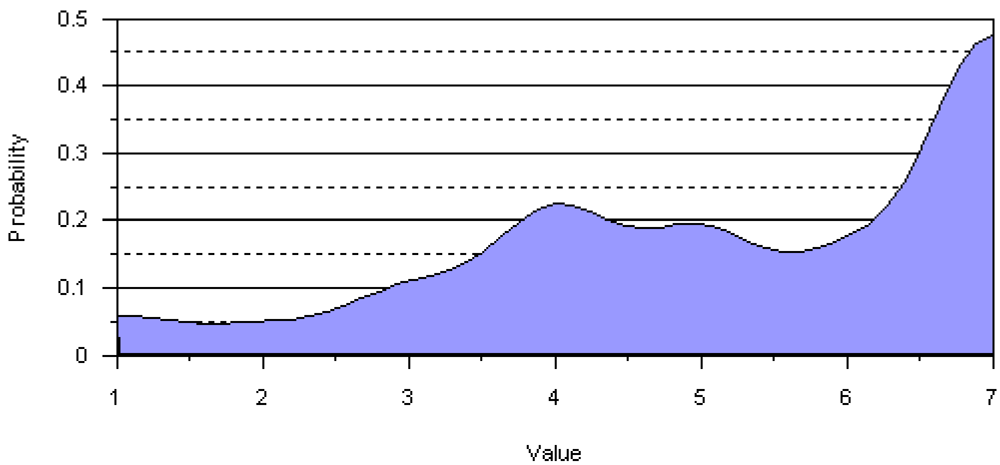
Minimum: 1.00

Maximum: 7.00

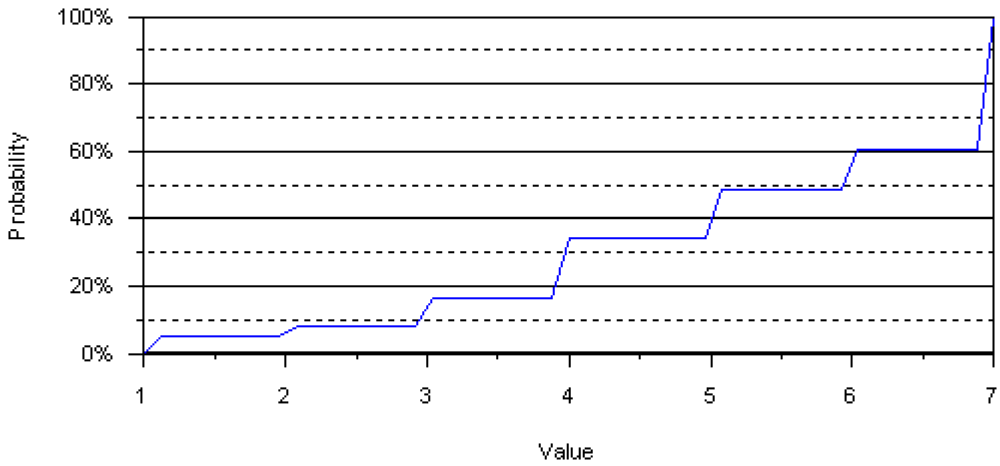
An answer to this question is not required and 36 of 407 respondents chose not to answer.

10d) Fire Dynamics (including Chemistry and Physics)

Probability Density Function



Cumulative Distribution

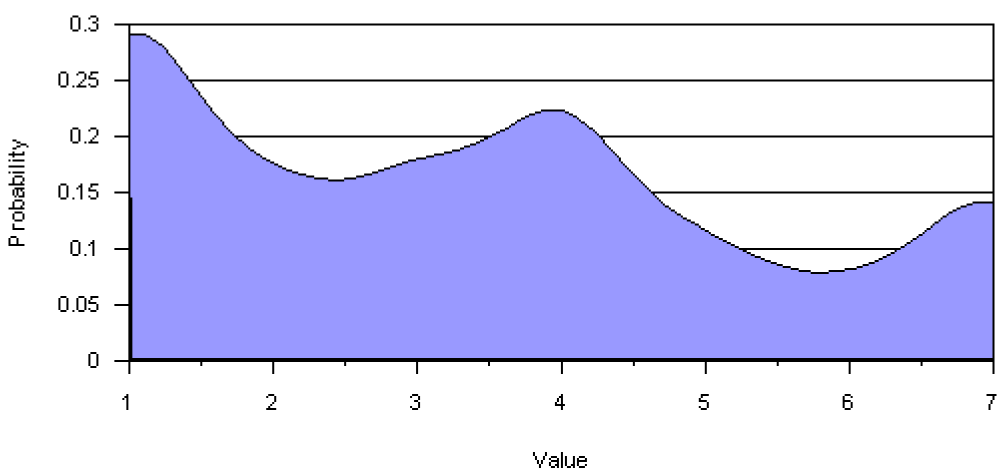


Average:	5.27
Standard Deviation:	1.79
Minimum:	1.00
Maximum:	7.00

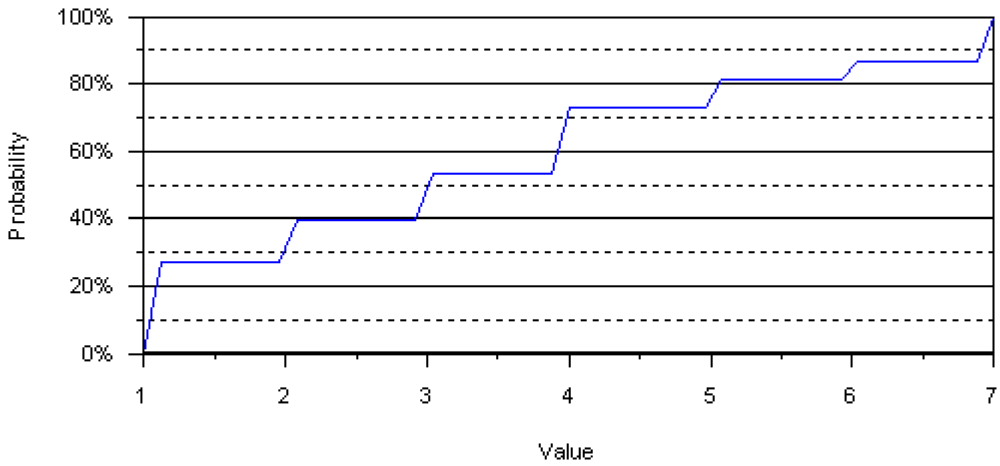
An answer to this question is not required and 34 of 407 respondents chose not to answer.

10e) Petroleum Refining Processes

Probability Density Function



Cumulative Distribution



Average: 3.39

Standard Deviation: 2.05

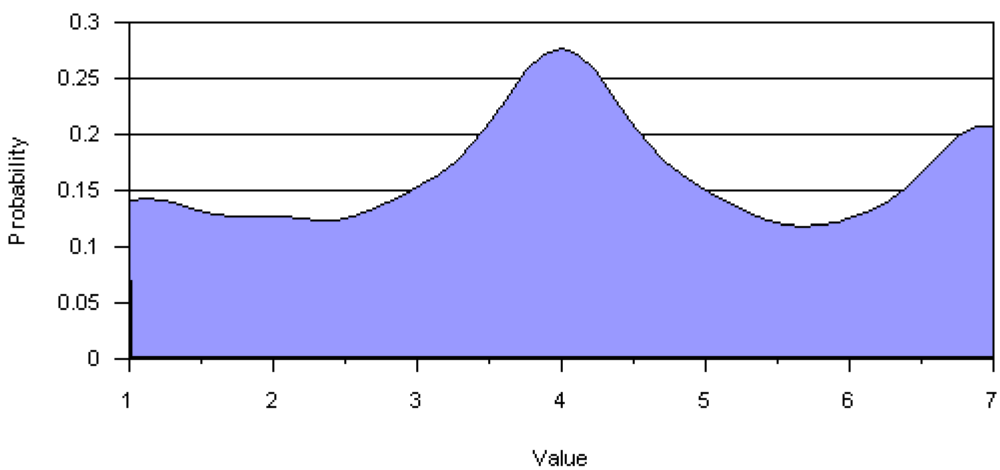
Minimum: 1.00

Maximum: 7.00

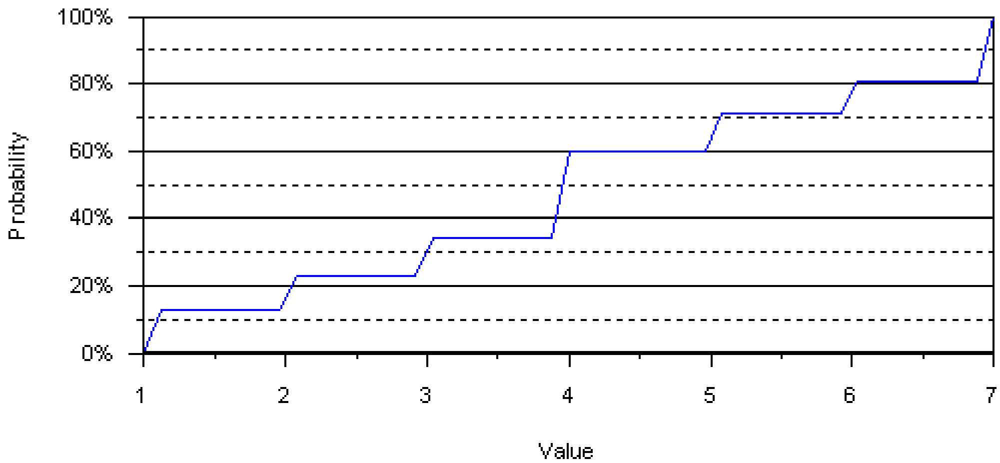
An answer to this question is not required and 54 of 407 respondents chose not to answer.

10f) Ignitable Liquid Classification System

Probability Density Function



Cumulative Distribution

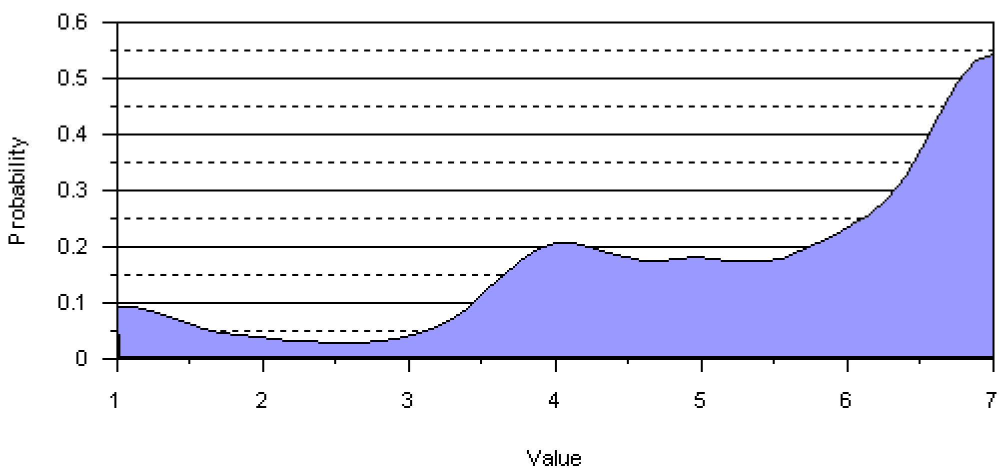


Average:	4.18
Standard Deviation:	1.98
Minimum:	1.00
Maximum:	7.00

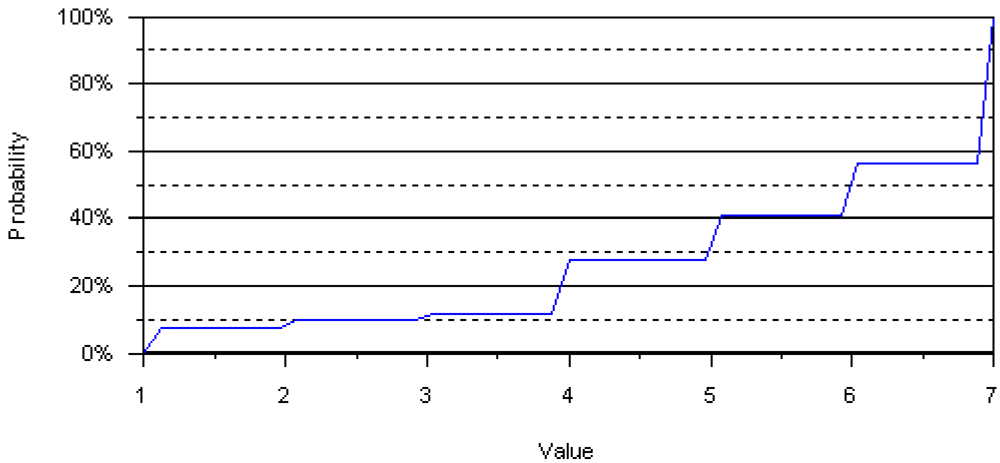
An answer to this question is not required and 50 of 407 respondents chose not to answer.

10g) Electrical circuitry and fire

Probability Density Function



Cumulative Distribution

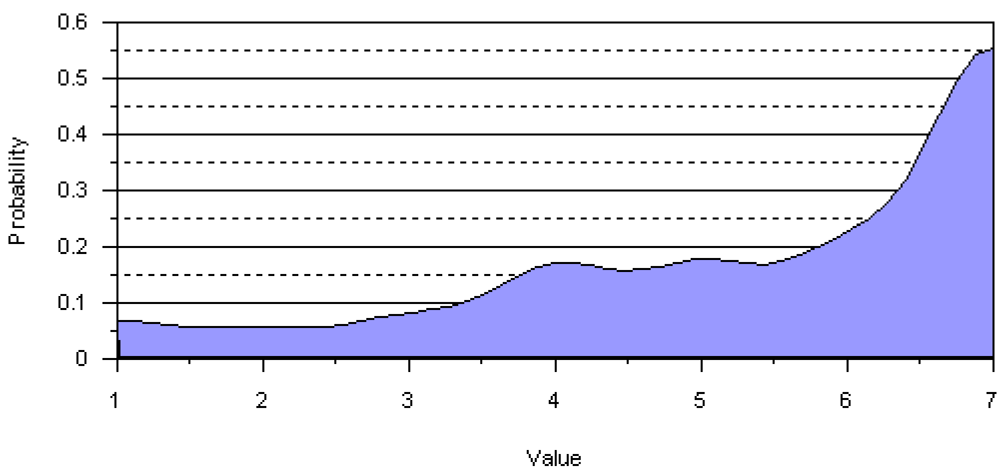


Average:	5.47
Standard Deviation:	1.83
Minimum:	1.00
Maximum:	7.00

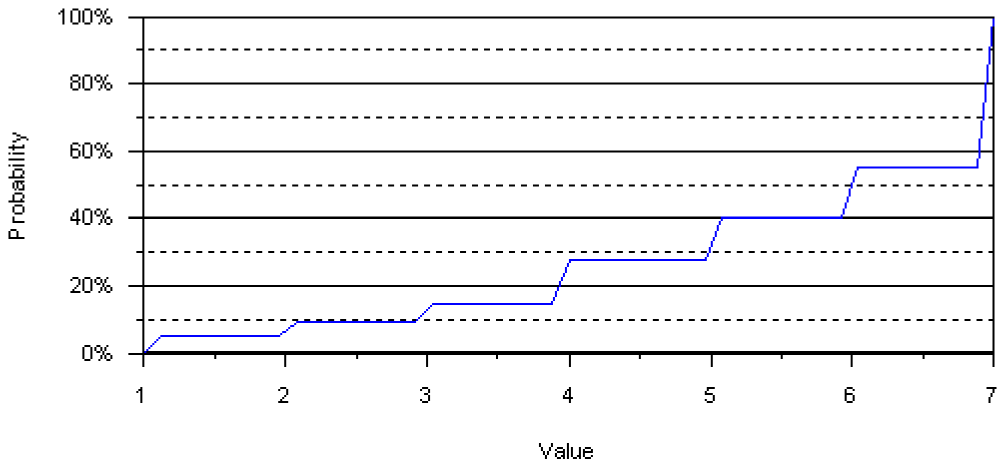
An answer to this question is not required and 30 of 407 respondents chose not to answer.

10h) Testifying as an Expert Witness

Probability Density Function



Cumulative Distribution

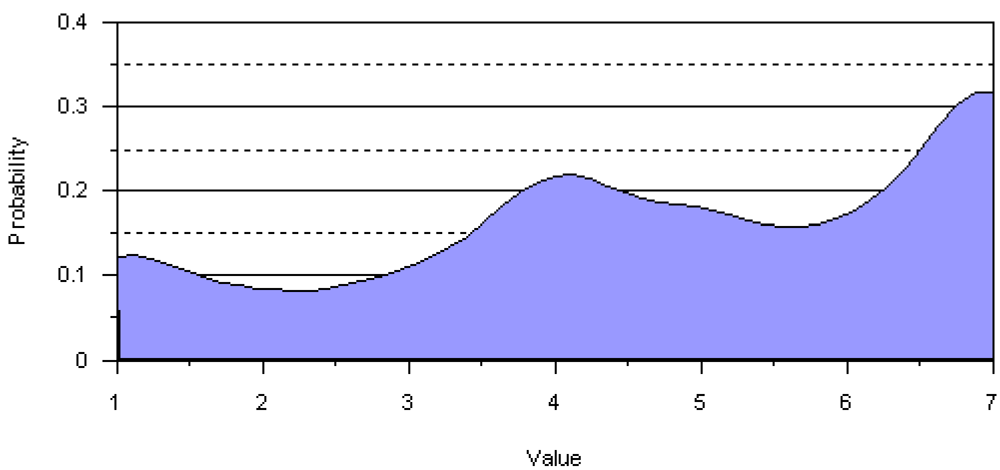


Average:	5.48
Standard Deviation:	1.80
Minimum:	1.00
Maximum:	7.00

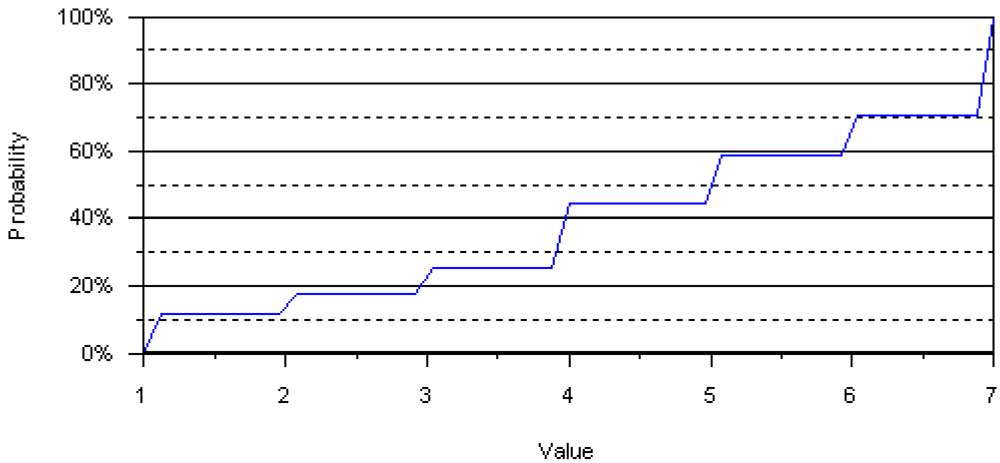
An answer to this question is not required and 33 of 407 respondents chose not to answer.

10i) Explosives Manufacturing Processes

Probability Density Function



Cumulative Distribution



Average: 4.73

Standard Deviation: 2.03

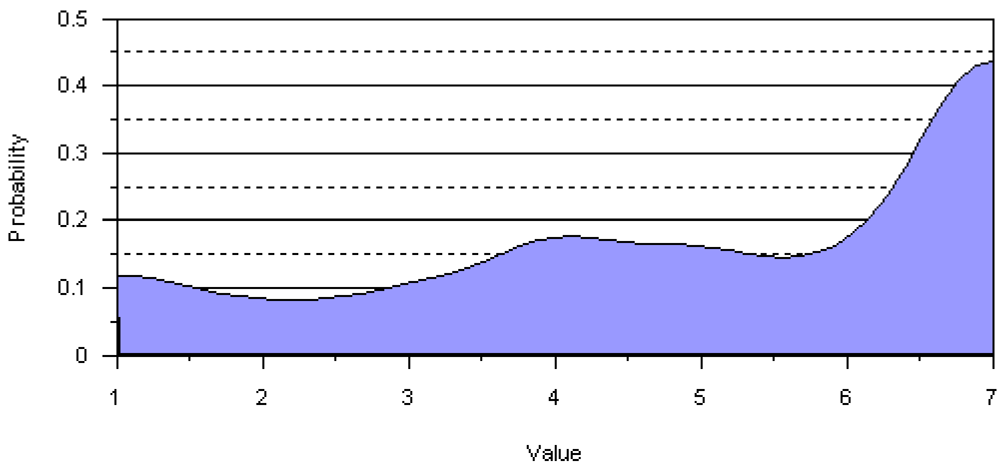
Minimum: 1.00

Maximum: 7.00

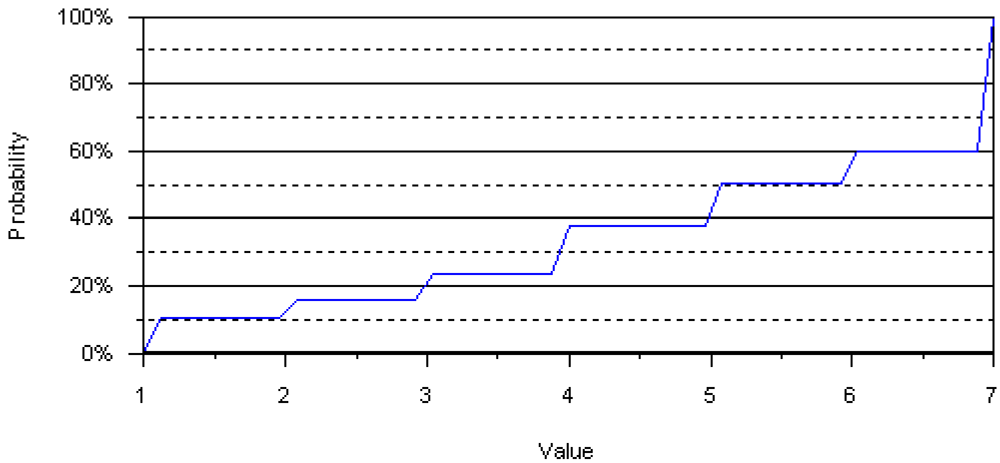
An answer to this question is not required and 46 of 407 respondents chose not to answer.

10j) IED recognition and construction

Probability Density Function



Cumulative Distribution

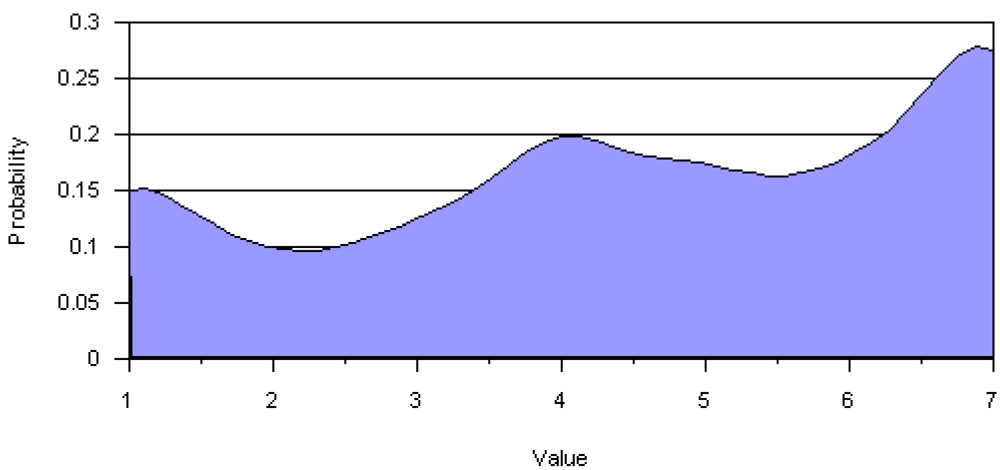


Average:	5.02
Standard Deviation:	2.08
Minimum:	1.00
Maximum:	7.00

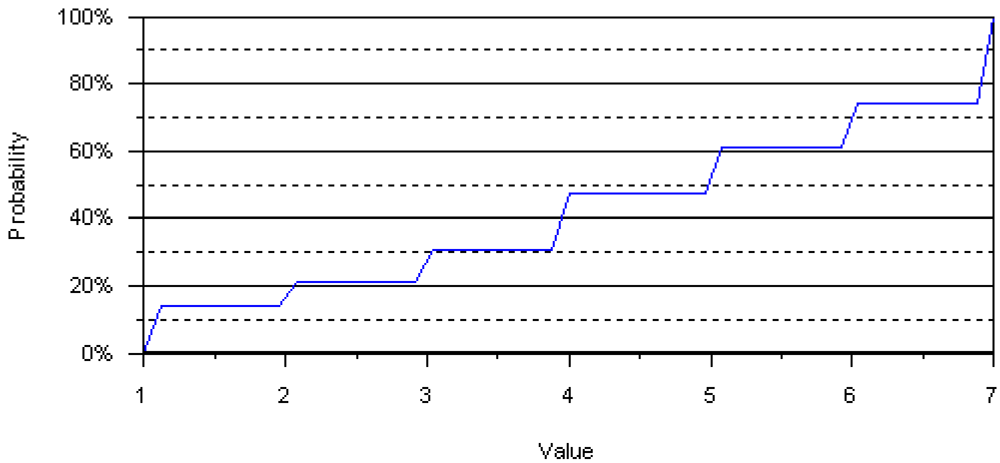
An answer to this question is not required and 52 of 407 respondents chose not to answer.

10k) Computer Fire Modeling

Probability Density Function



Cumulative Distribution

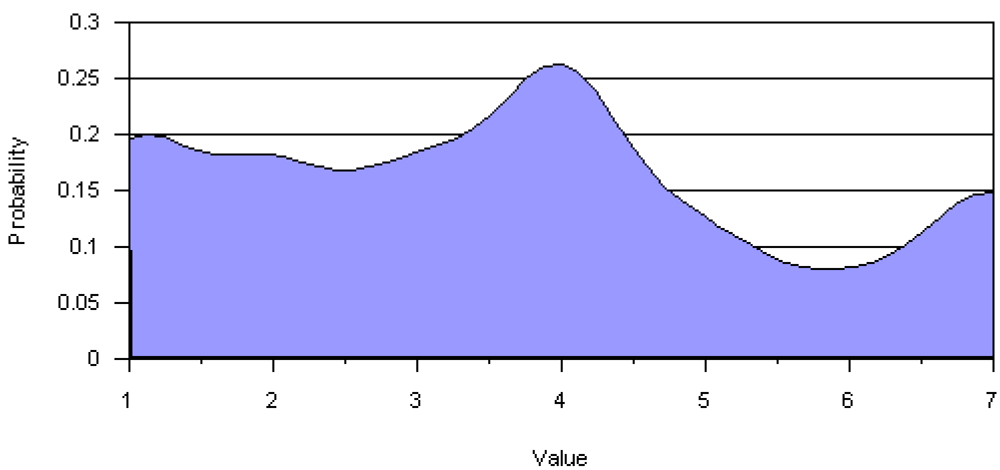


Average:	4.52
Standard Deviation:	2.09
Minimum:	1.00
Maximum:	7.00

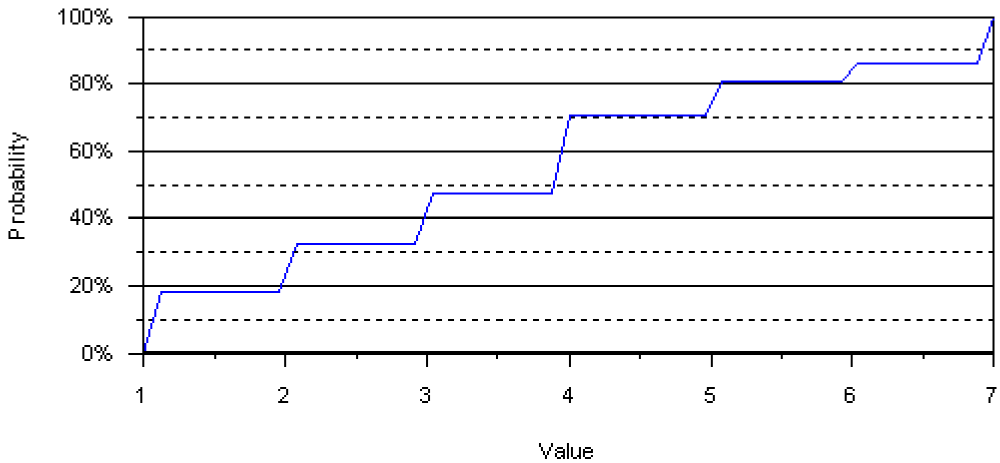
An answer to this question is not required and 46 of 407 respondents chose not to answer.

10l) Gas Chromatography

Probability Density Function



Cumulative Distribution

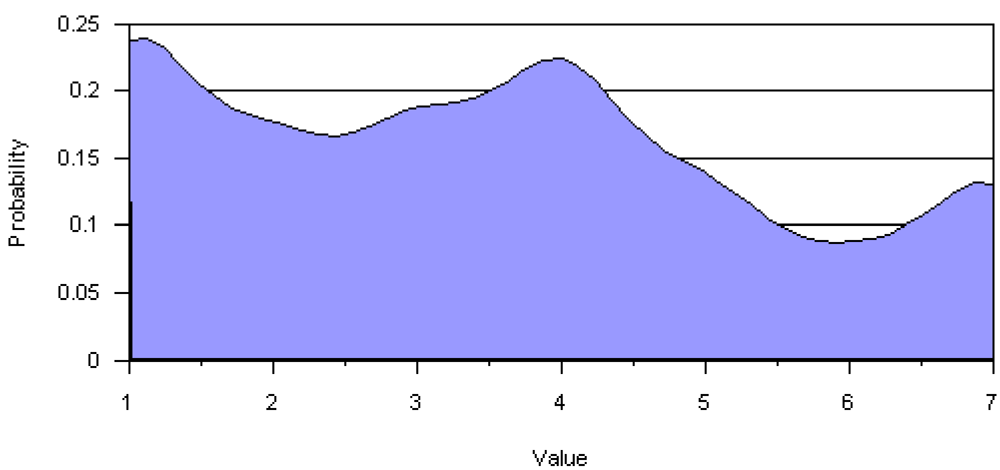


Average:	3.65
Standard Deviation:	1.95
Minimum:	1.00
Maximum:	7.00

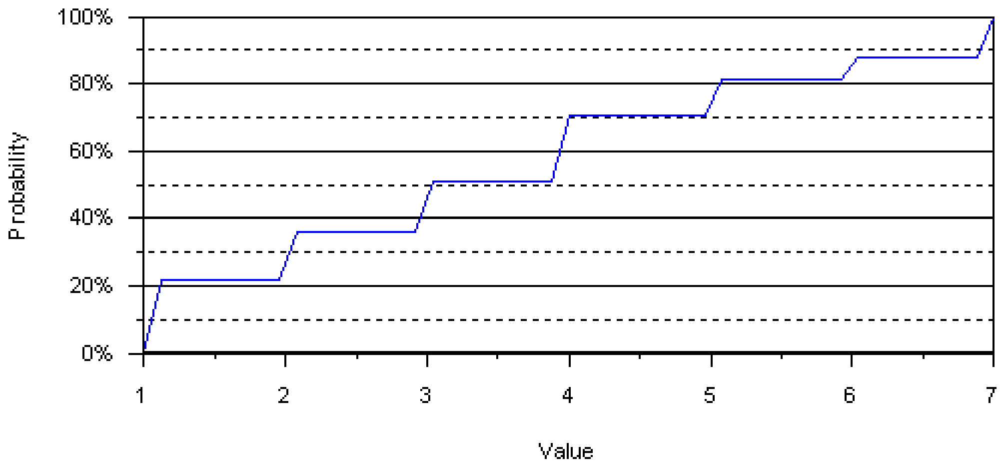
An answer to this question is not required and 55 of 407 respondents chose not to answer.

10m)Mass Spectral Interpretation

Probability Density Function



Cumulative Distribution



Average: 3.52

Standard Deviation: 1.98

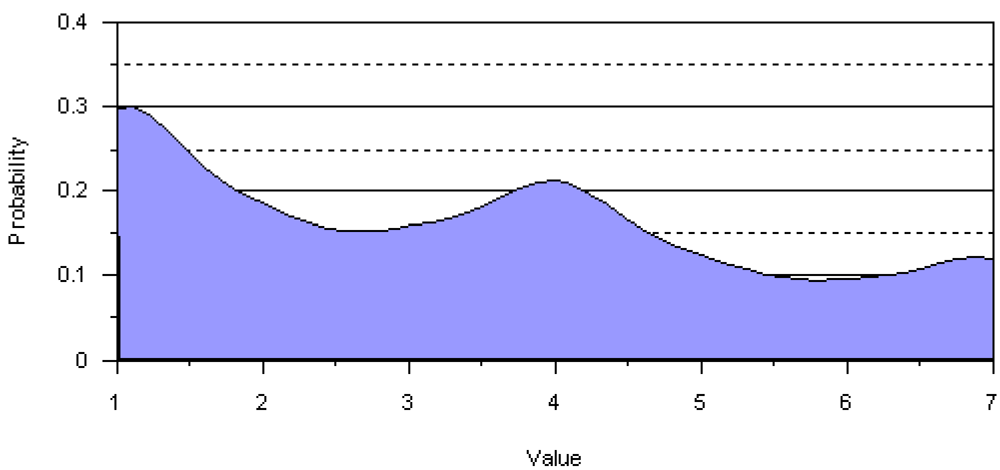
Minimum: 1.00

Maximum: 7.00

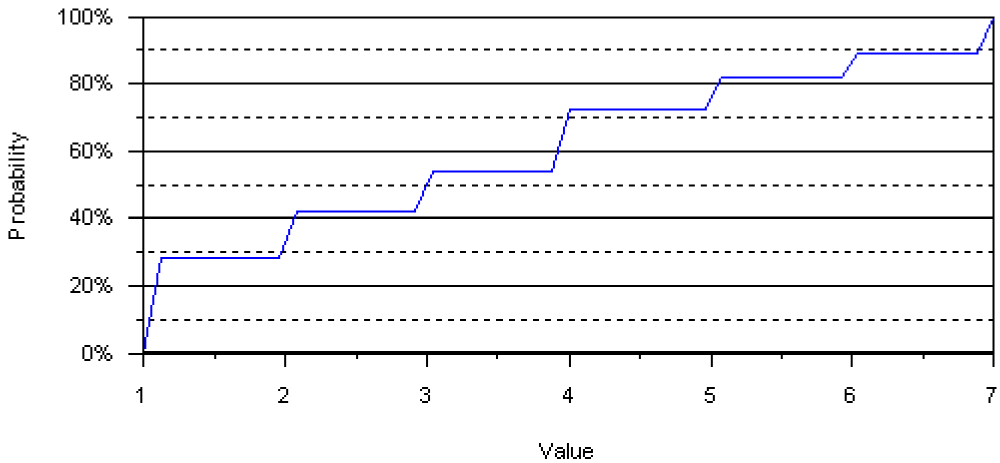
An answer to this question is not required and 57 of 407 respondents chose not to answer.

10n) Raman Spectrosopy for Explosives

Probability Density Function



Cumulative Distribution



Average: 3.34

Standard Deviation: 2.04

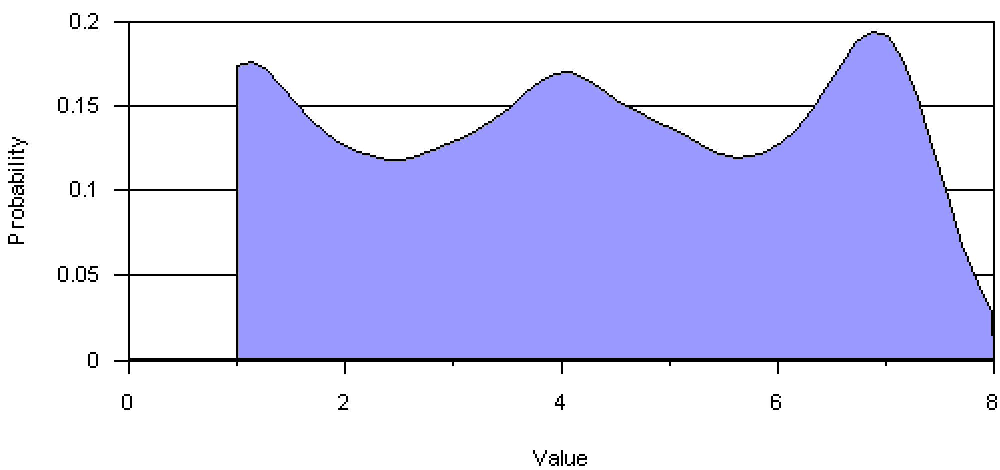
Minimum: 1.00

Maximum: 7.00

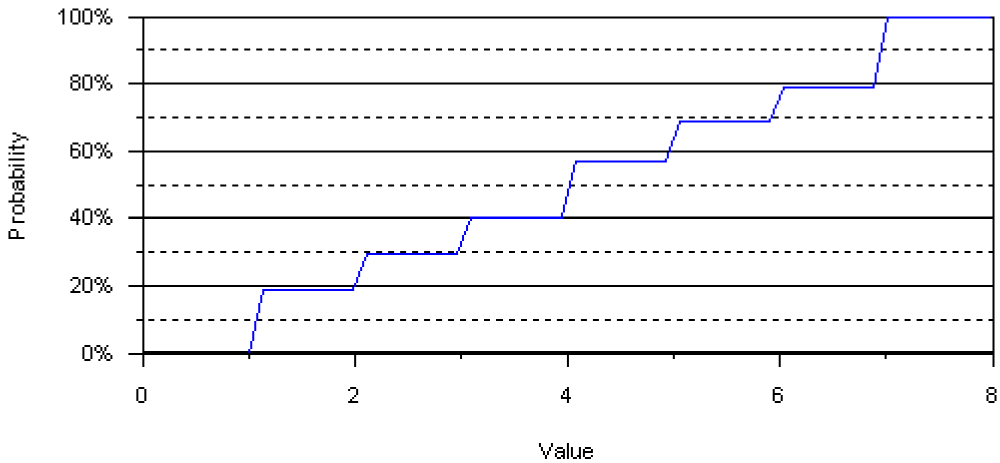
An answer to this question is not required and 57 of 407 respondents chose not to answer.

10o) X-Ray Analysis Techniques (Diffraction, Fluorescence, Energy Dispersive)

Probability Density Function



Cumulative Distribution



Average: 4.08

Standard Deviation: 2.16

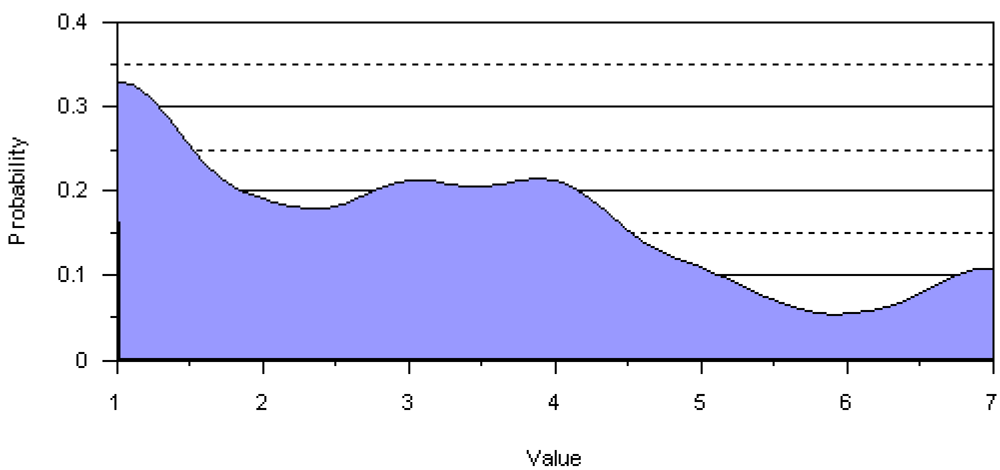
Minimum: 1.00

Maximum: 8.00

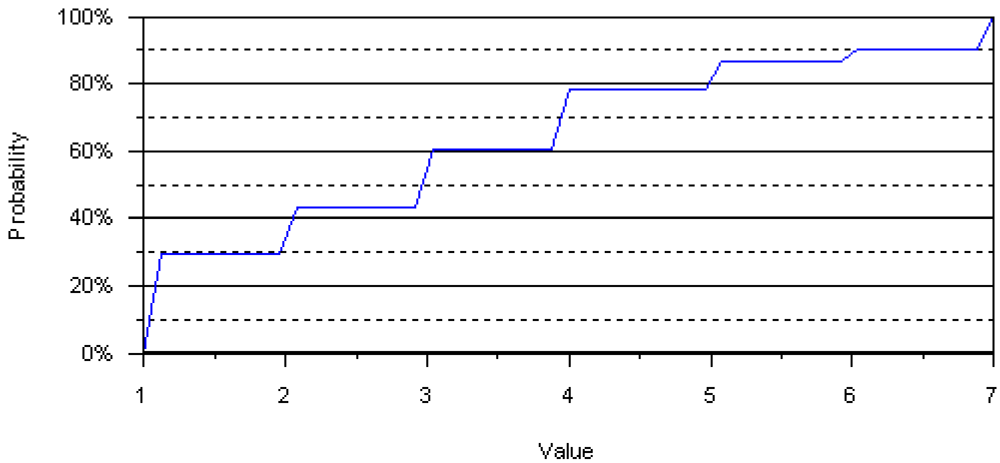
An answer to this question is not required and 54 of 407 respondents chose not to answer.

10p) Ion Chromatography

Probability Density Function



Cumulative Distribution

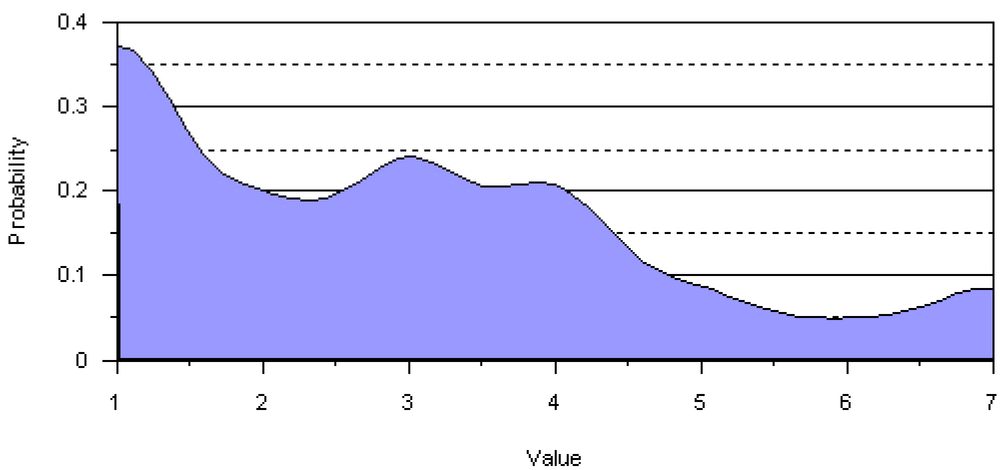


Average:	3.12
Standard Deviation:	1.93
Minimum:	1.00
Maximum:	7.00

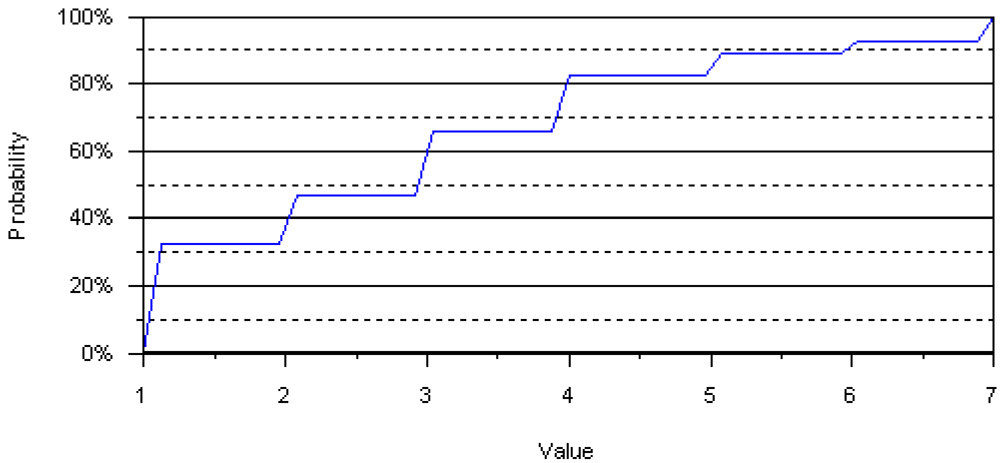
An answer to this question is not required and 63 of 407 respondents chose not to answer.

10q) Capillary Electrophoresis

Probability Density Function



Cumulative Distribution

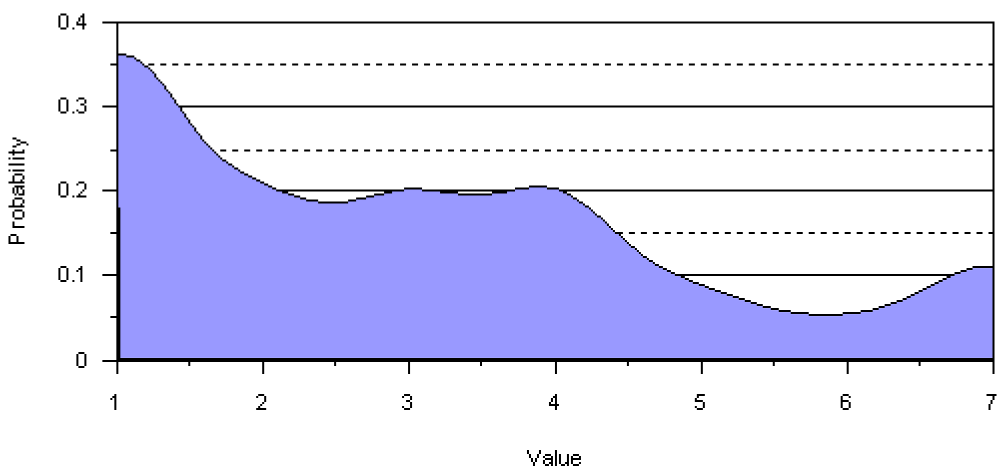


Average:	2.91
Standard Deviation:	1.83
Minimum:	1.00
Maximum:	7.00

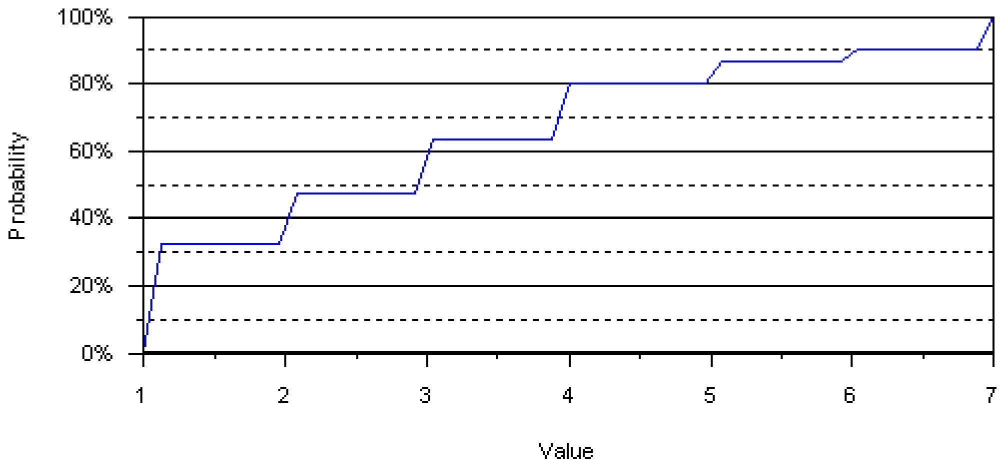
An answer to this question is not required and 66 of 407 respondents chose not to answer.

10r) Fourier Transform Infrared Spectroscopy

Probability Density Function



Cumulative Distribution

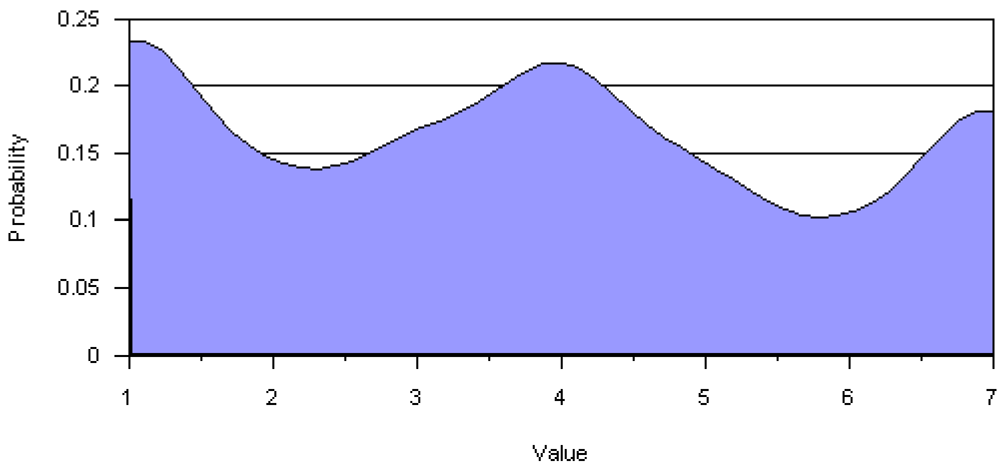


Average:	3.01
Standard Deviation:	1.95
Minimum:	1.00
Maximum:	7.00

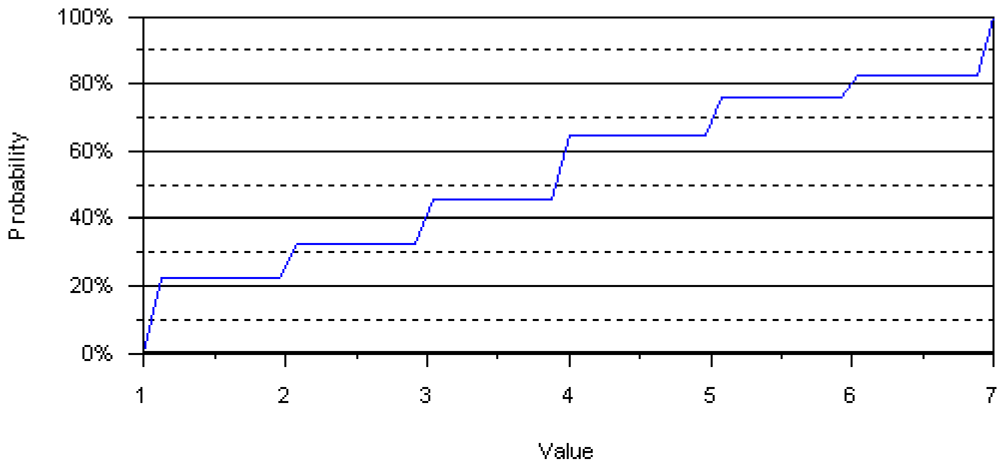
An answer to this question is not required and 67 of 407 respondents chose not to answer.

10s) Advanced Organic Chemistry for Fire Debris Analysis

Probability Density Function



Cumulative Distribution

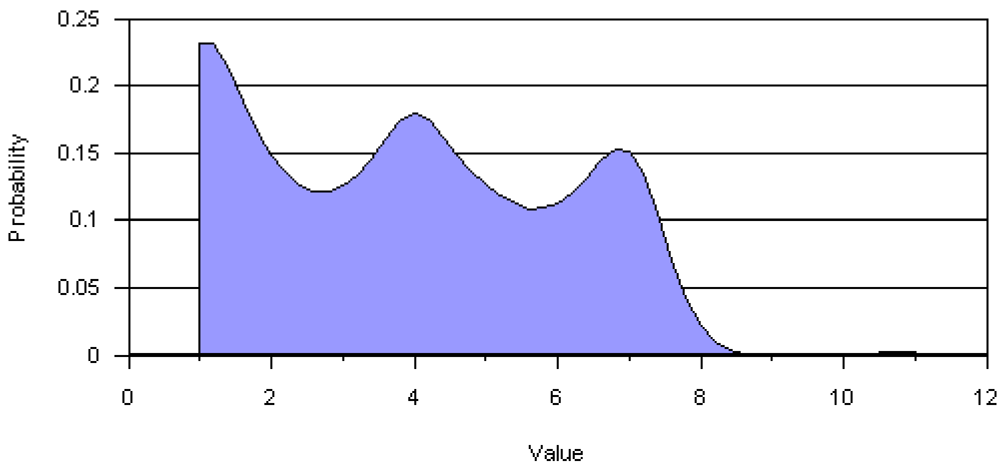


Average:	3.77
Standard Deviation:	2.11
Minimum:	1.00
Maximum:	7.00

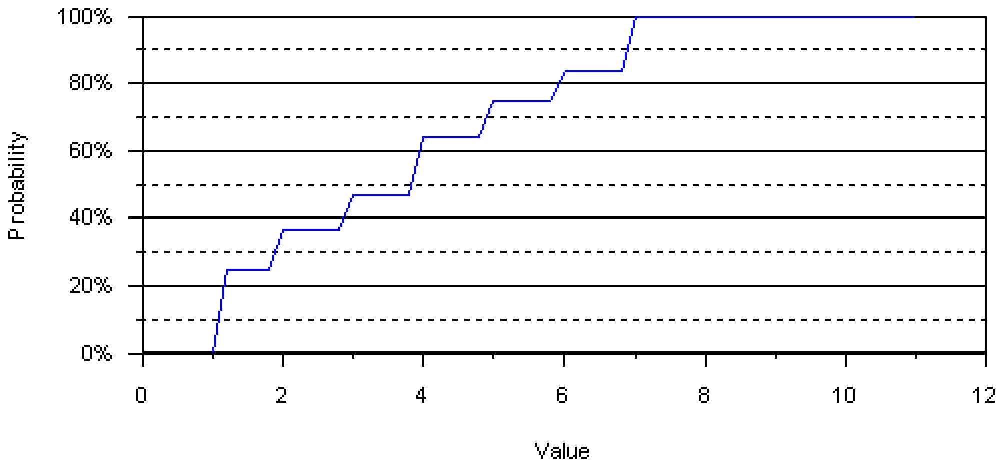
An answer to this question is not required and 58 of 407 respondents chose not to answer.

10t) Advanced Topics in the Chemistry of Organic Explosives

Probability Density Function



Cumulative Distribution



Average: 3.70

Standard Deviation: 2.19

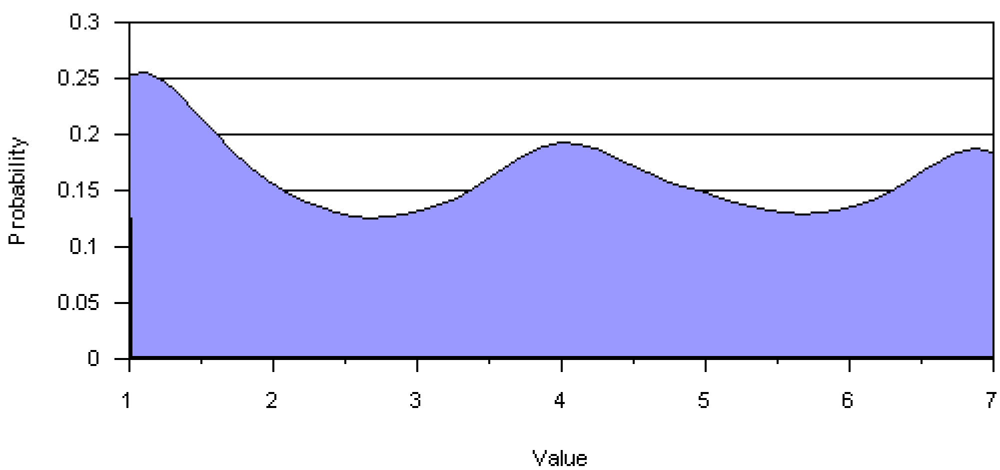
Minimum: 1.00

Maximum: 11.00

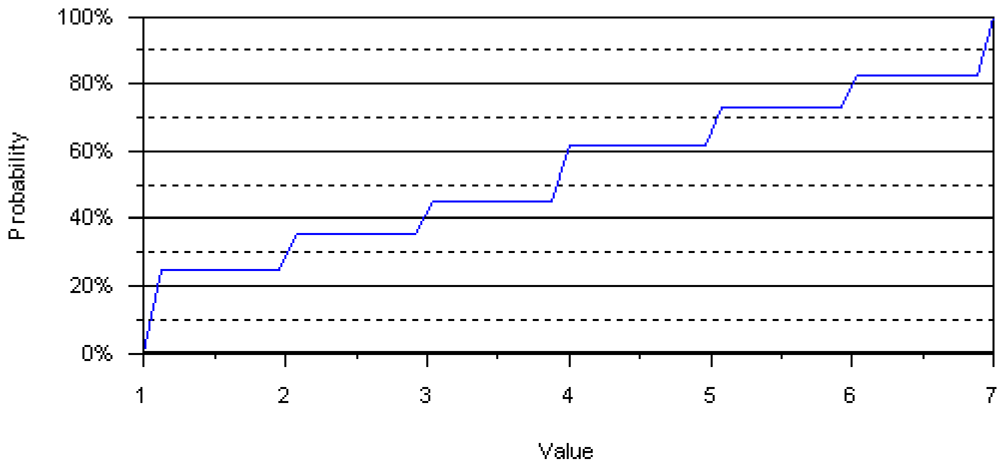
An answer to this question is not required and 58 of 407 respondents chose not to answer.

10u) Advanced Topics in the Chemistry of Inorganic Explosives

Probability Density Function



Cumulative Distribution

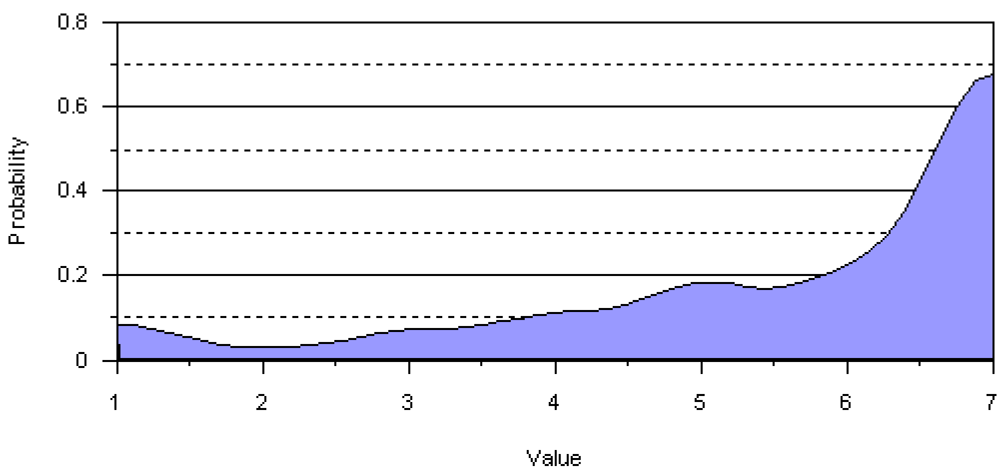


Average:	3.78
Standard Deviation:	2.19
Minimum:	1.00
Maximum:	7.00

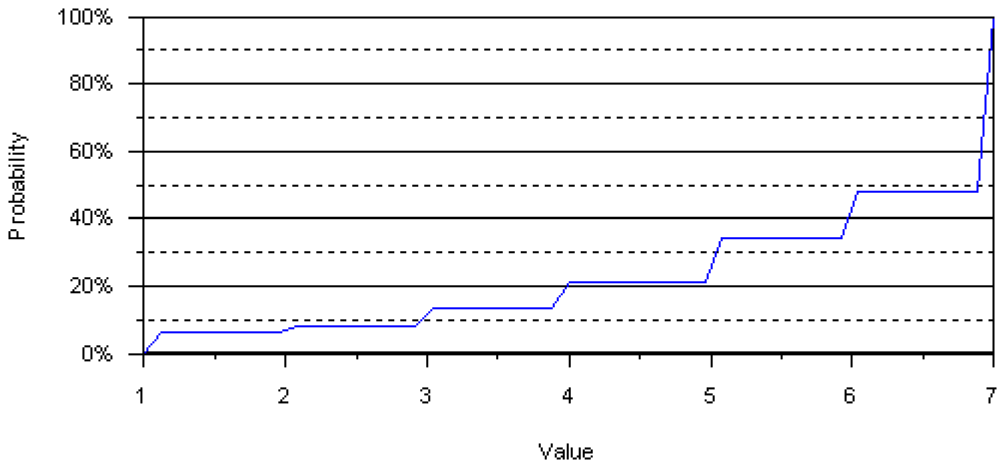
An answer to this question is not required and 61 of 407 respondents chose not to answer.

10v) Forensic Fire Scene Examination

Probability Density Function



Cumulative Distribution

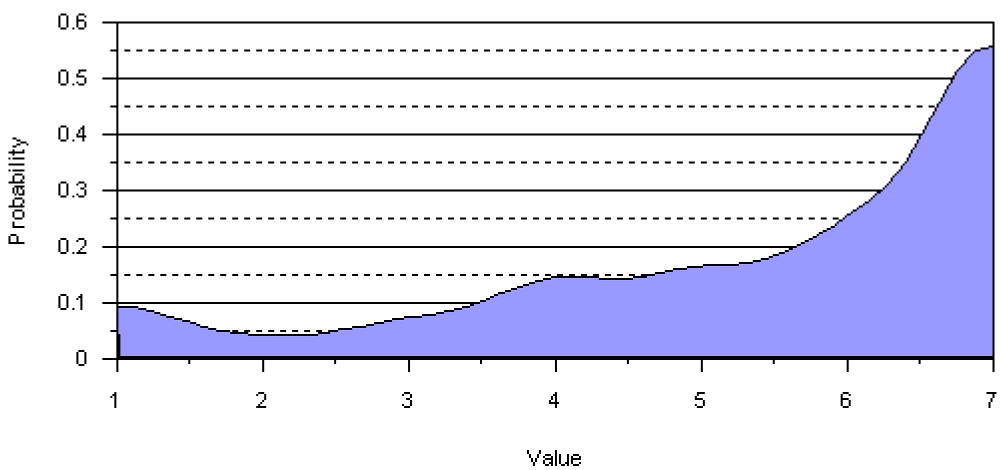


Average:	5.70
Standard Deviation:	1.79
Minimum:	1.00
Maximum:	7.00

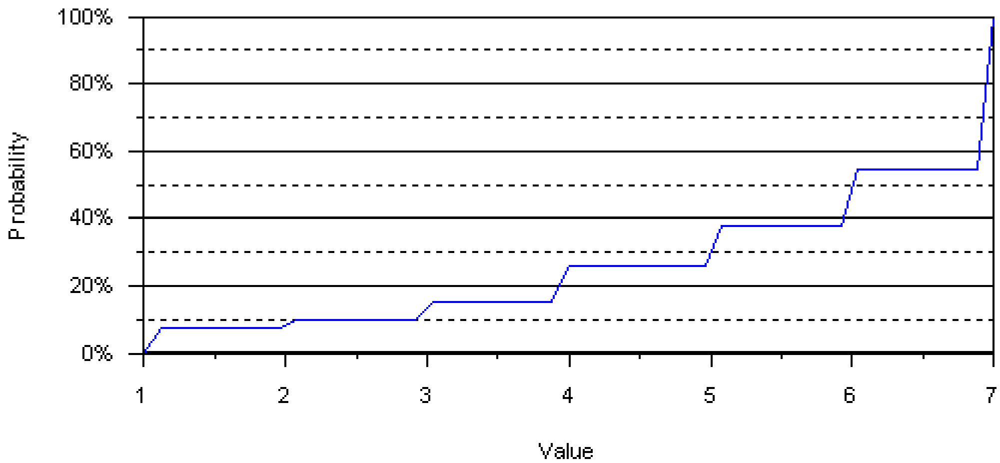
An answer to this question is not required and 34 of 407 respondents chose not to answer.

10w) Forensic Explosive Scene Examination

Probability Density Function



Cumulative Distribution

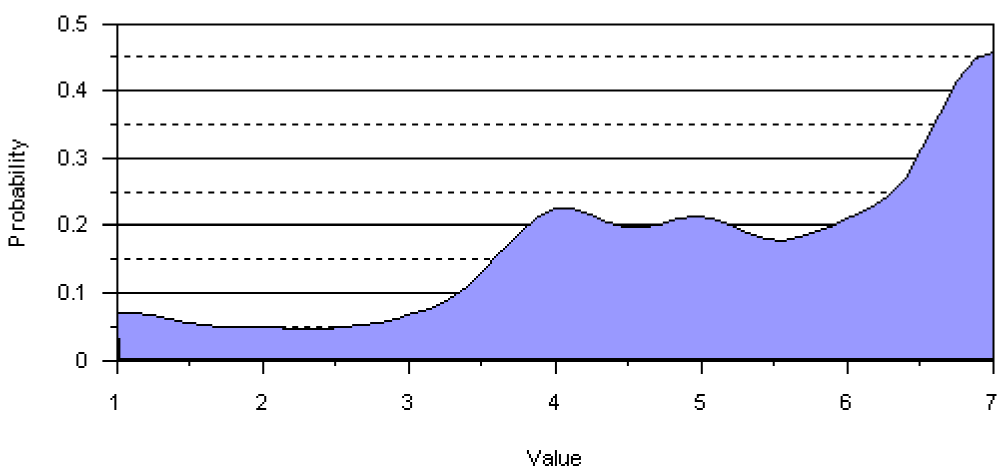


Average:	5.49
Standard Deviation:	1.87
Minimum:	1.00
Maximum:	7.00

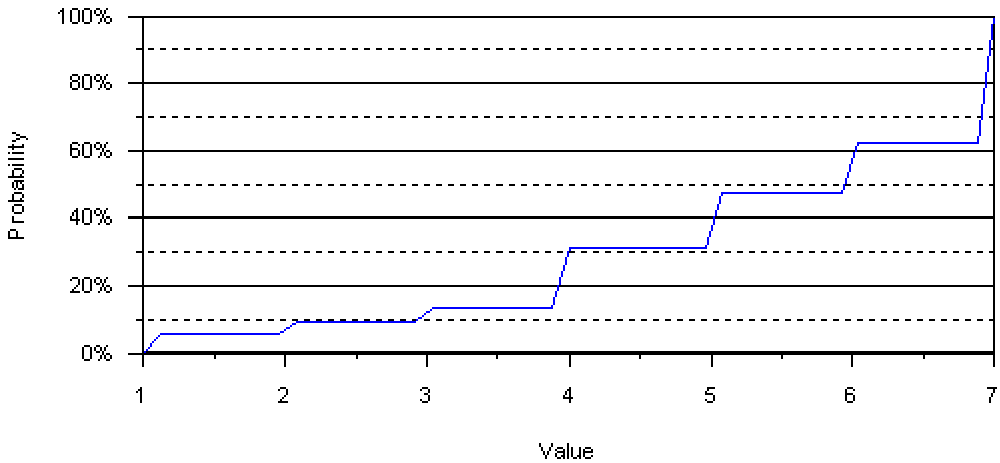
An answer to this question is not required and 49 of 407 respondents chose not to answer.

10x) Communication and Cooperation between Investigators and Analysts in Fire Investigations

Probability Density Function



Cumulative Distribution

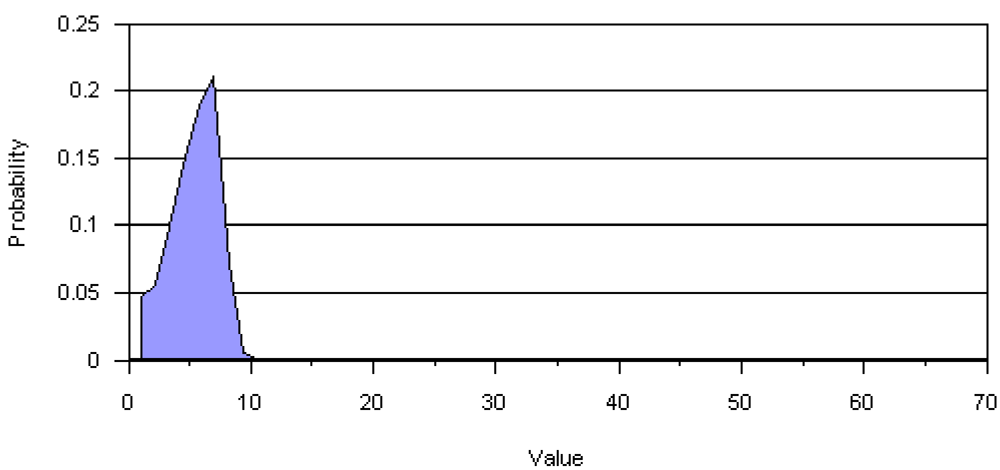


Average:	5.30
Standard Deviation:	1.78
Minimum:	1.00
Maximum:	7.00

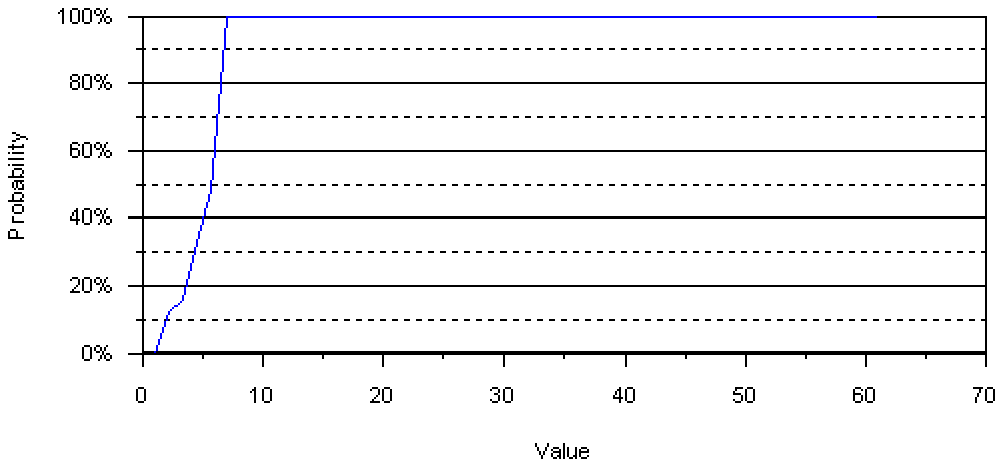
An answer to this question is not required and 41 of 407 respondents chose not to answer.

10y) Communication and Cooperation between Investigators and Analysts in Explosion Investigation

Probability Density Function



Cumulative Distribution



Average: 5.44

Standard Deviation: 3.79

Minimum: 1.00

Maximum: 61.00

An answer to this question is not required and 48 of 407 respondents chose not to answer.

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11) List a maximum of 3 other training / classes that you feel would be helpful to you in order to do your job better?

- Software for data processing
  Macro Writing to customize software for specific needs
- Fire Debris Analysis by GC/MS
  Fire Scene Collection
  Matrix/Ignitable Liquid Classification Identification
  Must have Testimony (did not testify in 2006)
- Hands on scene reconstruction and documentation
  On scene processing of fragile evidence for preservation and collection
  On scene homicide/death investigation
- Pyrolyzates and interfering compunds in fire debris analysis.
  QA issues
- Post Blast Investigations
  Counter Terrorism/IED RSP
- Forensic analysis of intact high explosives, Forensic analysis of explosive residues
- Airport X-Ray Interpretation, Underwater Explosive Recognition and Disruption, Underwater Explosive Scene Investigation and Photography
- A hands on Fire Investigation Class
- Digital photography techniques for the technophobe
- Courtroom Training
  ASCLD Certification
  Evidence Handling
- large and small appliance fire investigation
  advanced vehicle fire investigation

water craft investigations

- Advanced Electronics
  Suicide/Hostage Bomber Investigation
- Previous listing covers it well enough
- Advanced GC/MS class
  Pyrolysis interpretation class
  Advanced Organic Chemistry for Fire Debris Analysis
- Chemistry of Chemical Spot tests
  Chemical Analysis of Clandestine Drug Labs
- lc mass spec
  management
  ion chromatography
- Examination of low order explosives by PLM
- any fire debris analysis training with data interpretation
- If not covered above, Extraction techniques for explosive residue samples
- Fire Scene Digital Photography
  Digital Photograph Printing
- Financial Analysis
- 4
- Report writing
- National level CBRN Training
- Wet chemical analysis of explosives
- Report Writing
  Complex Scene Management
  Data/Document Management
- Fire Pattern analysis
  Vehicle fire investigation
- fire death investigation, burning rates of human bodies, effects of ignitable liquids on the body
- NFPA Life Safety Code
  NFPA Smoke Alarm Code
  Hazards of welding operations
- Insurance aspects of fire investigation
  Effects of fire supression on fire scene
  demolition of fire scene
- NFA and ATF classes as well as Interveiwing and interrogation classes
- Death scene investigation / post mortem evidence collection
- ELECTRICAL WIRING AND/OR APPLIANCE FIRES
  LEGALITIES OF FIRE SCENE INVEST./ COURT PROCEDURES
- CV writting, DIgital photography, TAsk force communications
- Gases - appliances and failure, Crime scene investigation as fire/crime scenes often are one in the same. The necessity of scene and evidence integrity integrity - many cases are void due to lack of scene and evidence integrity being maintained or retained.
- 1. fuel cell technology
  2. IED development
  3. Modern technology concerning electronics and manufacturing if IC's and plastics.
- People Management
  Budget
  Communication Skills
- Hazardous materials sampling and analysis
- Statistical analysis of fire incidents

- Classes which provide information pertaining to the insurance industry and the resources they have that can be used.
- Interviewing
  Interogation
  Evidence collection
- Photography, Reasearch of data, Civil and Criminal Law
- Live fire investigaton trainings
  Site review/site case studies
- Digital imaging classes
- Cooperation between Investigators and Prosecutors.
- advanced burn pattern recognition
- Examinaion of appliances involved with fire
  Vehicle fire investigstions
  Interview interrogation techniques
- auto fire investigations
  heavy equipment (construction, logging, farm) fire inves.
  RV fire inves
- All Classes through ATF and National Fire Academy
- Auto fire investigation
- vehicle
  computer forensic
- Report writing
- Private Public working to gether this would be more local due to various imunity laws
- More advance electrical classes
- Interrogation
- report writing
- interviewing
  interrogation
  fatals
- Interview Techniques
- Accelerant Detection K-9 Utilization
- Fire Fatality Investigation
- Preparing for CFI Examination
- interview/ interogation
  photography/ scketching
  case managment
- Evidence collection and chain of evidence
  Fire scene cross contamination
  Fire scene reconstruction
- Kinesics
  Electrical Issues in fire scene examination
  Kinesics
- Evidence Collection and preservation, Forensic Photography
- Serial Arson Analysis-Planning
  Law Enforcement Operations/Fire-Surviellance
- Crime scene photography
  Total Station for crime scenes
  CAD for crime scenes
- examination of gas appliances
  electrical examination

- interviewing and interrogation techniques
  proper techniques on crime scenes
- general crime scene investigations
  latent fingerprints
  fire scene photography
- Learning to be Objective
  Report writing
  Evidence Collection and Protection
- Homemade explosives
- Vehicle and heavy equipment fire investigation techniques
- On scene vehicle fires
  On scene building fires
- live demonstrations of burns and explosives.
- Interviewing Tech.
  Large Scale Investigations
  wildland
- None
- Interviewing
  Financial Analysis
  Advanced evidecne handling techniques
- identification of fire damaged components/equipment. Vehicle fire investigation.
- Search warrant prep. for post blast investigation.
- finger print preservation and lifting prints
- Interviewing Techniques
- Interview / interrogation techniques
  Forensic Photography
  The role of a fire investigator, engineer, & scientist in fire & explosion investigations
- The scientific method
  NFPA 921
  Avoiding bias
- Report Writing
  Photography of evidence
  Finger Printing
- investigation 2 A and 2B
- fire pattern recognition, digital photography,
- inter-agency ops
  TDY assignments as compared to FBI SABT's out of country assignments

- Commercial Explosives
  Post Blast/Residue Analysis
- Arc tracking/mapping
- Case Law Studies
  Interviewing
  Fire Death Investigations

- Photography
  X-Ray photography
  HAZWOPER
- Car fire origin and cause
  Transponder/Vats/Passlock operation
  eLECTRONIC "SNIFFING" DEVICES
- Car fires, car bombs
- Juvenile Fire Setters, Fraud Case Managment, Interview Tech.
- Digital Photes
  Case Preperation
  Report Writting
- photography, sketching classes and programs
- Standards in Reports.
  Case studies,
  Safety on and around the fire scene during an investigation.
- 1.History of Explosives and composition.
  2.Home Made Explosives (with Range time)
  3.Improvised Explosive recognition and manufacturing
- n/a
- Bulding an arson case
  Investigating Financial Motives
  Health Concerns due to long term exposures
- 1. Digital Photography
  2. ICS for Major Fire and Explosives Scenes.
  3. How to read techinical reports.
- Reasearch areas
  Marine Fire Investigations
  Auto Fires
- Advanced electronics course.
- Court Room Prep
  Report Prep
  Scene Documentation
- Marine fire and explosion investigation
- Advanced arson investigation;
- Electronics circuitry,
- VEHICLE FIRES,FINDING CLUES AFTER FLASHOVER,PSY CLASS OF CRIMINAL MIND TO COVER CRIME WITH FIRE.
- Legal liability in the fire service
  Spoliation
- Advanced Render Safe Procedures
  Use and training in ECM techniques
  Advanced Electronics training with DTMF, collapsing circuits and observation at sites like TEDAC where real world devices, triggers and switches can be examined and evaluated.
- Electronics class, Current trends in IED's, Delivery methods for LVBIED's
- Interviewing techniques.
- Buget and Grant writing
- Fire-Explosion Dynamics
  Fire-Explosion Modeling
  Scene documentation for modeling
- Fire modeling,interview interrogation, frire debris analysis
- Interview/Interrogation Classes by John Reid
- na

- Interview / interogation
  Report writing
- Vessel Fires
  Large Scale, Forestry/Wildland Fire Investigations
  Large Scale Building Construction Techniques
- Serial Arsonists
  Fraud Arson
  Chemical Fires
- Residential Fire Investigation programs
  Improved communication between attorneys, insurance companies, and investigators
- Legal Aspects of Fire Scene Examination
  Cooperation Between Police and Fire Investigators
- advanced on hands explosives course
- Coordination of / Participation in Multi-Agency Investigations; The OSHA perspective on Fire Investigator Safety; Understanding the Legal System for the Non-Sworn Fire Investigator
- Interviewing and Intoerrogation classes e.g. Reid, W-Z Method, Kinesics etc...
  Investigating/Responding to Clan-Lab Fires
  Fire Fatality/Injury Investigations
- Photography
  Drafting/Drawing
  Interveiwing Techniques
- Vehicle Fire Investigation, Report Writing, Appliance Fires
- Interview and Interragation
  Computer Information Systems
  Criminal Back ground investigation
  Agency Overviews(Design and makeup of other agencies for basic information and improved communication.)
- testifing
  report writting
  diagram
- 1. Interview/Interrogation techniques
  2. Courtroom testimony training
  3. Digital photography training
- Mechanical systems and fires.
  Fires in Gas Appliances
- Big bomb disruption tools, standards.
  Training on standard eq.
- survellence and interview techniques
- Use of digital photography
  Interviewing
  Personal protection at fire scene
- report wrting
- mathematical calculations for heat flux, etc.
  legal update re: expert witness exclusion
  report writing for technical experts
- Interviewing techniques
  Available investigation equipment and uses
  Fire patterns
- Scene Preservation
  Scene Reconstruction
  Interviewing
- Management of large loss scene investigations
  Establishing protocols for muti-party bench exams
- Financial alnalyisi of Fire Suspects

- documentation
- Legal guidelines, warrants, evidence issues, roles of the municipality in investigations.
- IED electrical analysis
  Field exercise with improvises explosives (ie TATP)
- Fire scene reconstruction
- Vehicle Fires
- Electronics/ basic Circuitry
- Explosive Breaching, Advanced IED electronics, Advanced X-ray
- Robot Operations, Rigging Operations, Associate Degree Program in Explosives Disposal Technology
- Hands on Arson Investigation classes
- Hands on training.
- Vehicle fires
  Appliance fires
- Investigative writing techniques.
- 80 hour arson investigation course taught at local level for l.e. investigators;
- Legal courtroom analysis and testifying
- Military ordnance recognition, explosive range development/ hazmat osha concerns
- Advanced technologoy in fire scene examination
- Report writing
  Training budget and analysis
- Advanced Vehicle Fire Investigations
  Insurance Fraud Investigations
- Spontaneous combustion fire analysis, Building construction as it relates to the fire investigator,
- Propane explosions and defeat\
  standoff distances for bomb techs
- Legal Updates, Surveillance, Search and Seizure
- WItness interview
  Electrical shorting and arcing
- Refresher courses in all above on an on-going basis
- Advanced scene investigation
  Electrical Investigation
  Case management
- IED, EOD, and Courtroom testamony
- Explosives crime scene management
- x-ray interpretation
- Interviewing and Interrogation
  Report writing
  Multi-juristictional wildland fire investigation case building
- Juvenile firesetting, Fire Scene Reconstruction, Hands on Electrical Fire Investigation
- maritime fires
  equivocal death investigations
  structures/construction
- n/a
- Vehicular systems functions for fire investigators.
  Boating systems functions for fire investigators.
  Ignition chemistry: Spontaneous combustion
- Interview and Interrogation
  Fatal fire scene examination
- Physical chemistry

- new automobile fire causes/possible heat sources/possible danger zones
  new building material burn and heat related failure compared to older more conventional building components
  health hazards/related cancer studies/ studies on safe levels of atmosphere on post fire scenes
- Evidence Collection
- Interviewing and Report writing
- Court room testimony, trial preparation, interrogation
- Forensic Analysis of Explosive Residues

An answer to this question is not required and 227 of 407 respondents chose not to answer.

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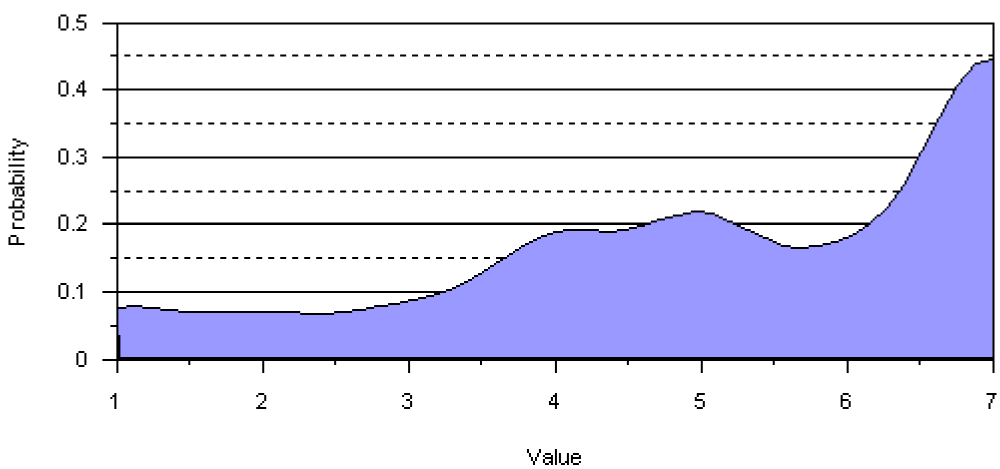
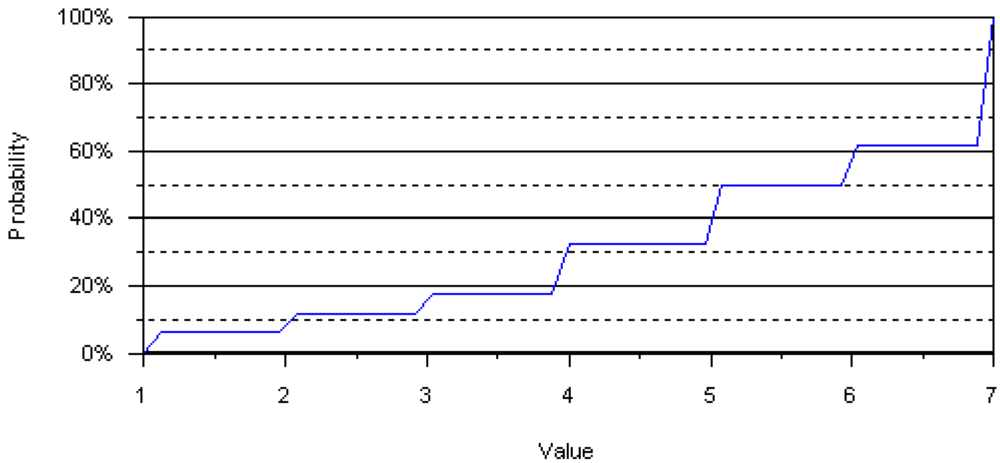
12) Rank how important would each of the following resources be to you? (1-7 where: 1 = Not at all, 7 = Very Important)

12a) Comprehensive Listing of people working in the field (private and government)

Probability Density Function



Cumulative Distribution

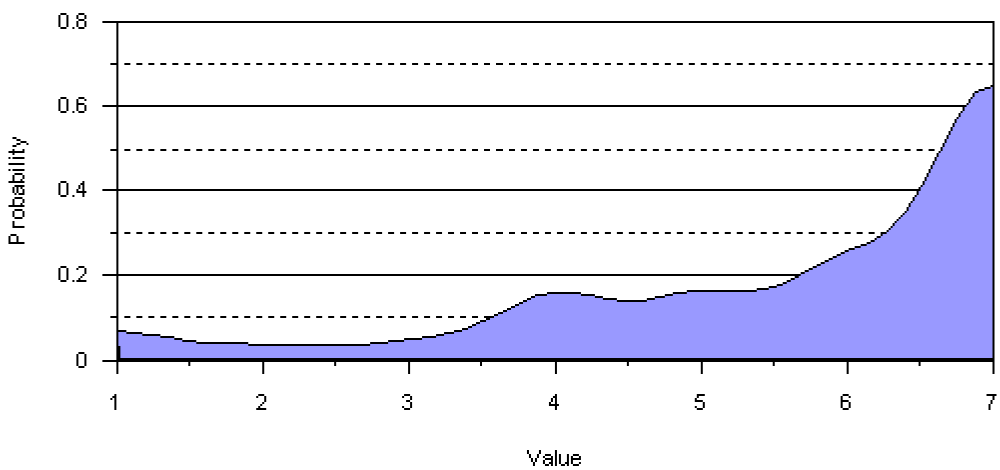


Average:	5.20
Standard Deviation:	1.87
Minimum:	1.00
Maximum:	7.00

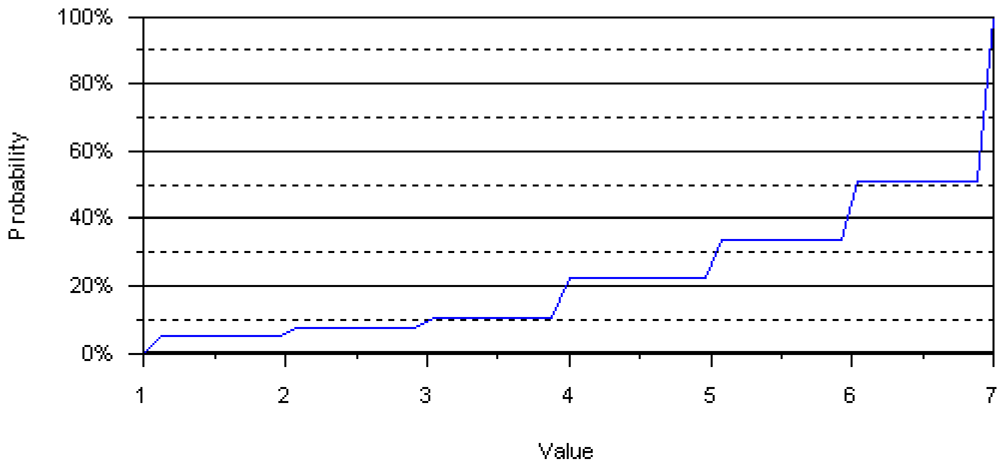
An answer to this question is not required and 46 of 407 respondents chose not to answer.

12b) Creation of a secure Internet link for E-mail and information exchange between professionals in the field of explosives and fire debris analysis

Probability Density Function



Cumulative Distribution

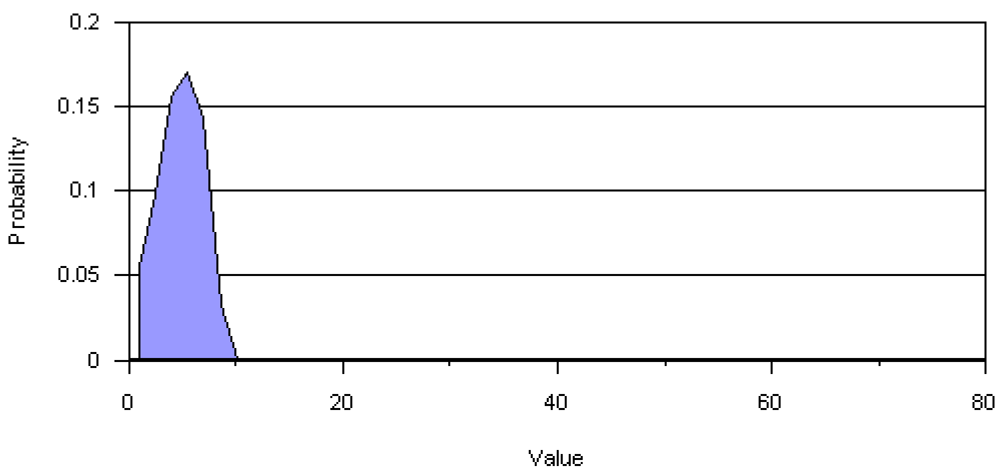


Average:	5.70
Standard Deviation:	1.71
Minimum:	1.00
Maximum:	7.00

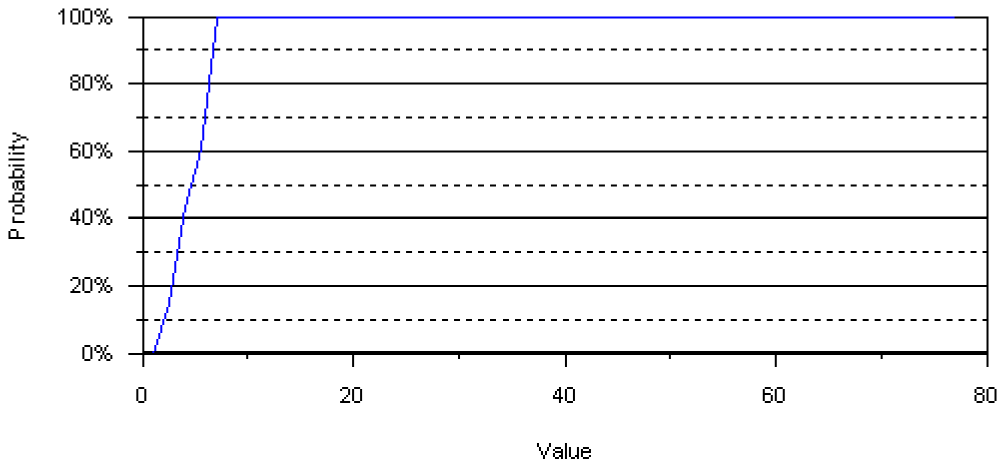
An answer to this question is not required and 48 of 407 respondents chose not to answer.

12c) Establishment of a collection of sample laboratory reports

Probability Density Function



Cumulative Distribution

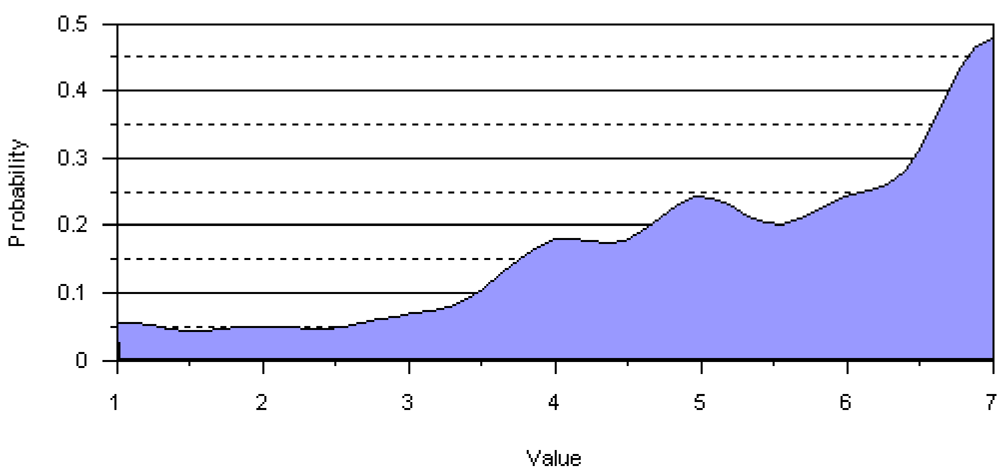


Average:	4.95
Standard Deviation:	4.32
Minimum:	1.00
Maximum:	77.00

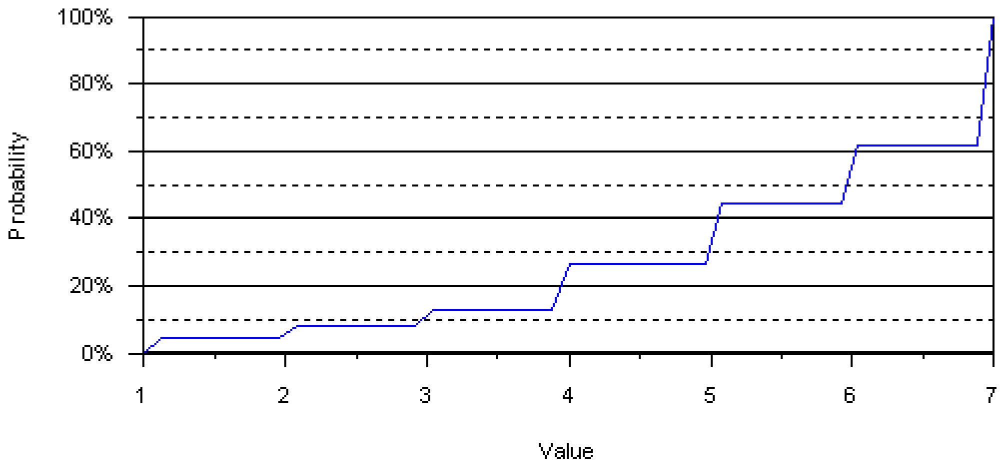
An answer to this question is not required and 60 of 407 respondents chose not to answer.

12d) Creation of a glossary of analytical, explosives, and fire debris-related technology

Probability Density Function



Cumulative Distribution



Average: 5.42

Standard Deviation: 1.69

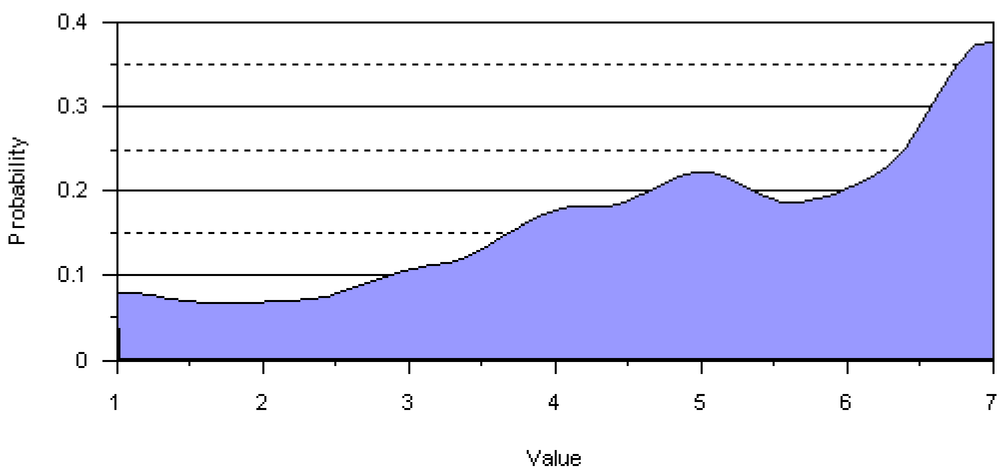
Minimum: 1.00

Maximum: 7.00

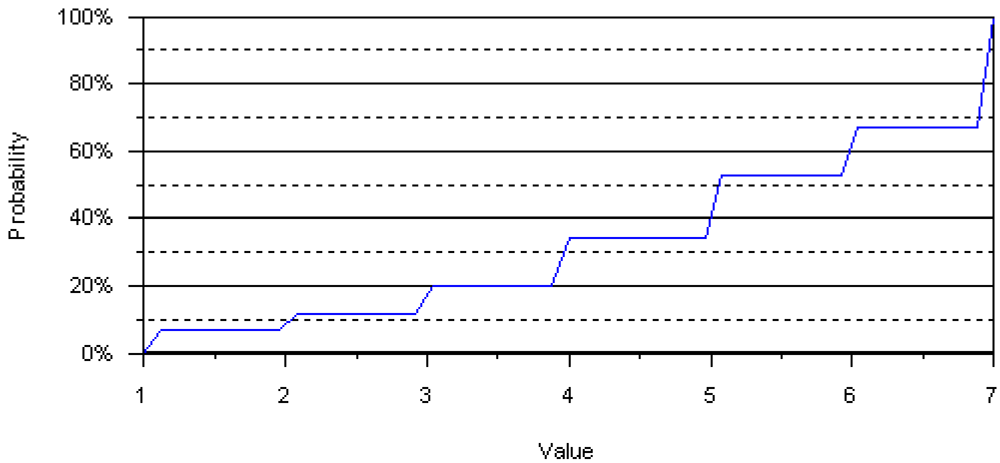
An answer to this question is not required and 53 of 407 respondents chose not to answer.

12e) Creation of information templates for evidence submission

Probability Density Function



Cumulative Distribution



Average: 5.08

Standard Deviation: 1.87

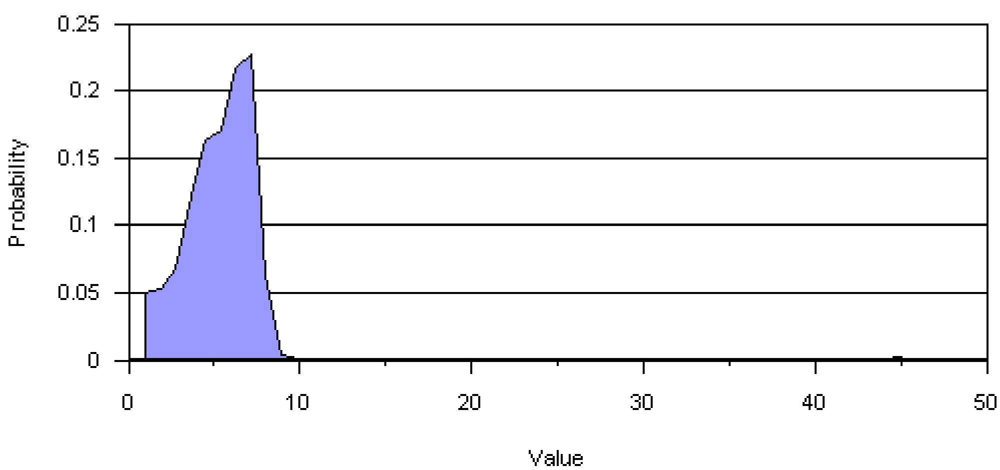
Minimum: 1.00

Maximum: 7.00

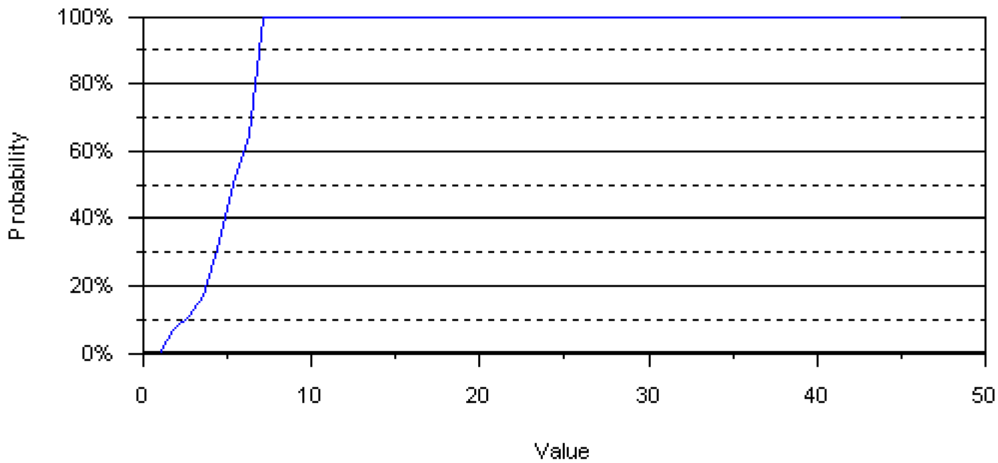
An answer to this question is not required and 54 of 407 respondents chose not to answer.

12f) Establishment of a collection of methods and protocols for analytical techniques

Probability Density Function



Cumulative Distribution



Average: 5.28

Standard Deviation: 2.82

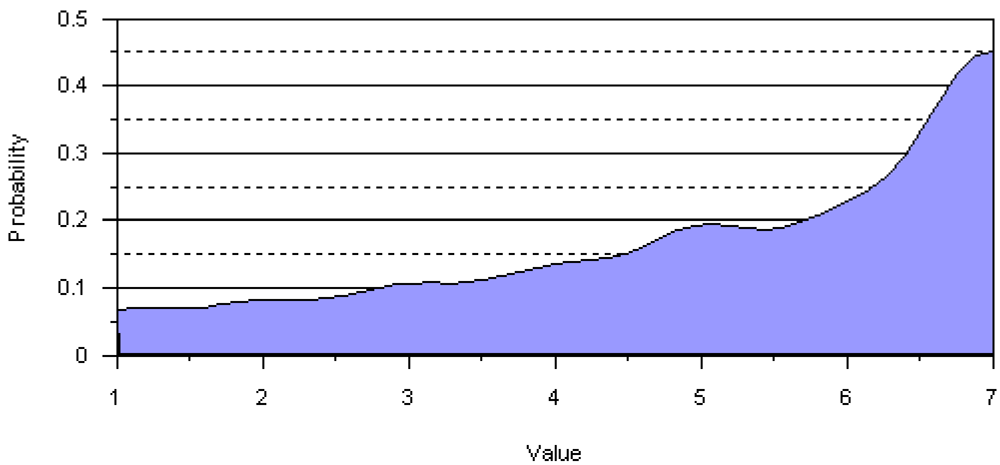
Minimum: 1.00

Maximum: 45.00

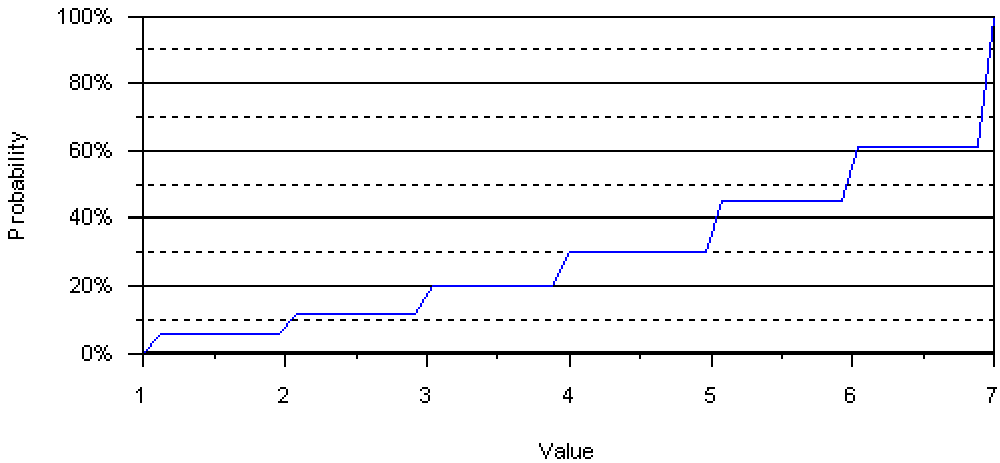
An answer to this question is not required and 59 of 407 respondents chose not to answer.

12g) Establishment of databases of reference materials for analytical techniques

Probability Density Function



Cumulative Distribution



Average: 5.27

Standard Deviation: 1.88

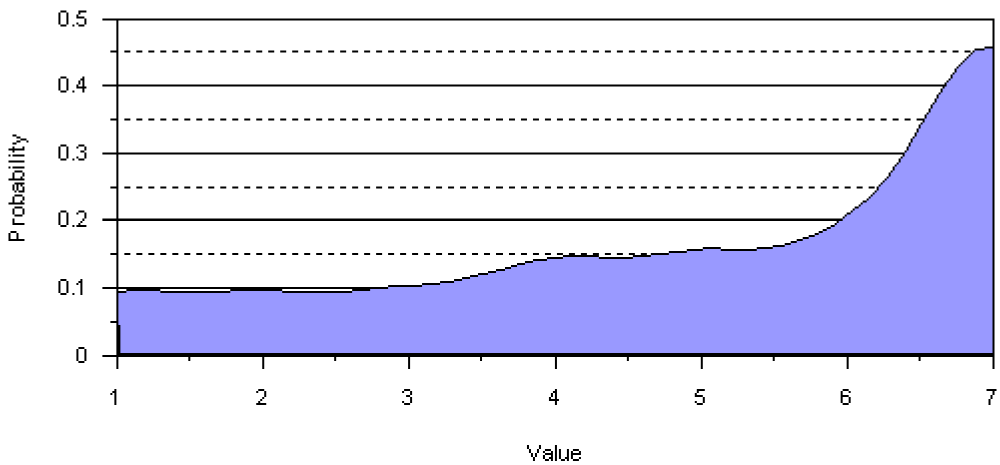
Minimum: 1.00

Maximum: 7.00

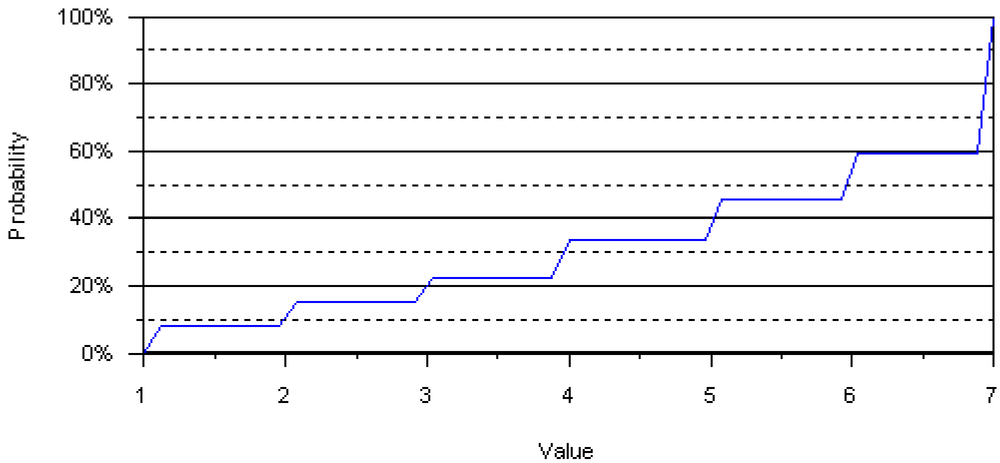
An answer to this question is not required and 64 of 407 respondents chose not to answer.

12h) Creation of a national database for tracking bombing matters

Probability Density Function



Cumulative Distribution

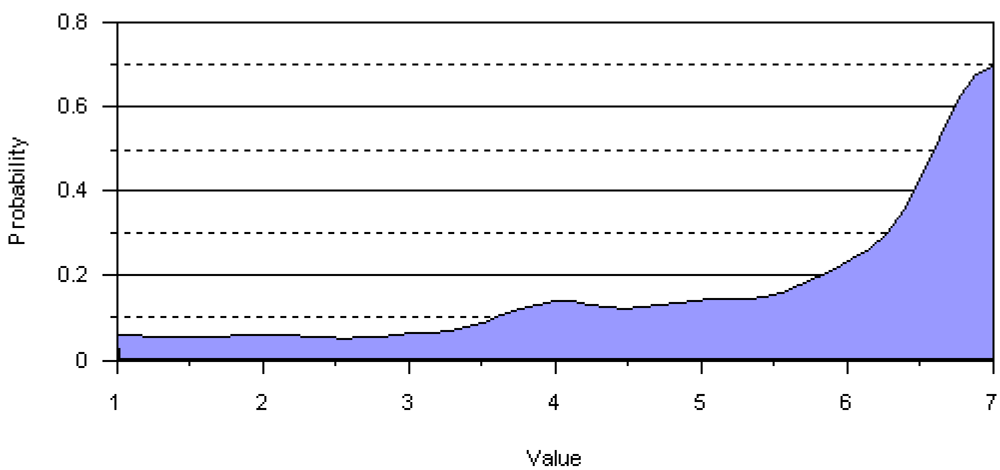


Average:	5.16
Standard Deviation:	2.02
Minimum:	1.00
Maximum:	7.00

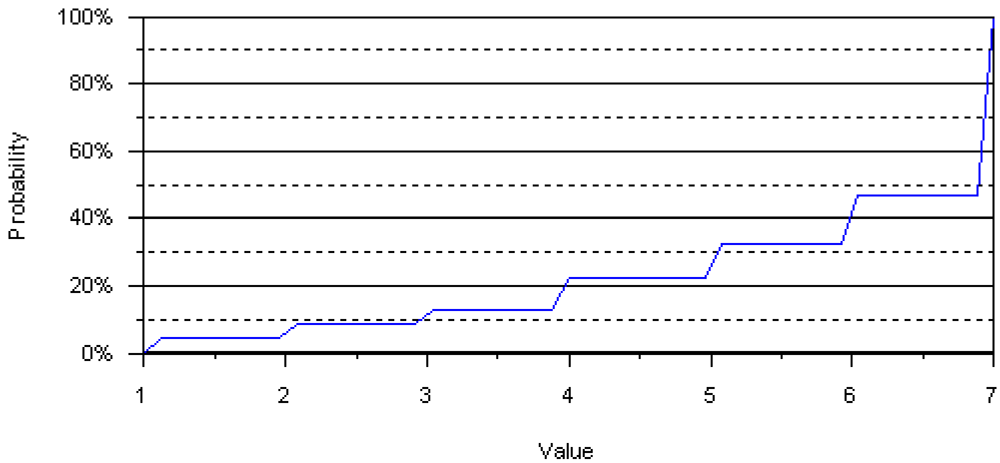
An answer to this question is not required and 62 of 407 respondents chose not to answer.

12i) Creation of a national database for tracking arson matters

Probability Density Function



Cumulative Distribution



Average: 5.73

Standard Deviation: 1.76

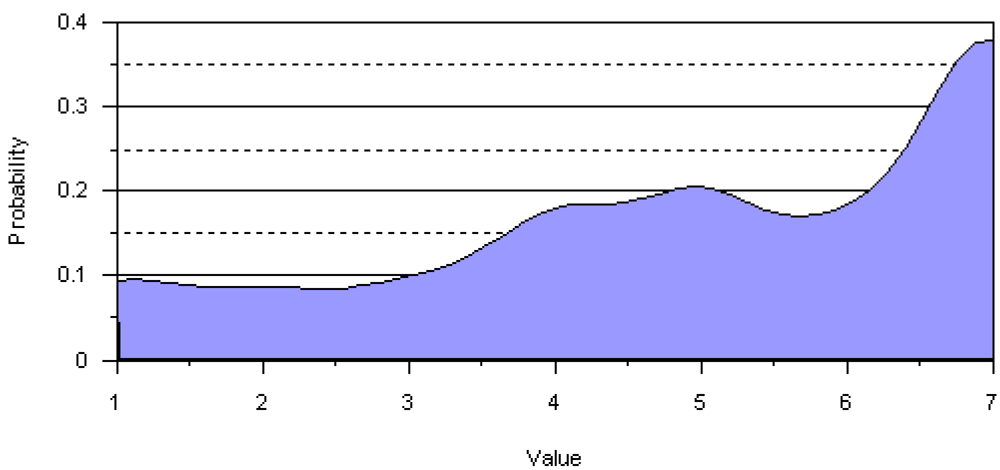
Minimum: 1.00

Maximum: 7.00

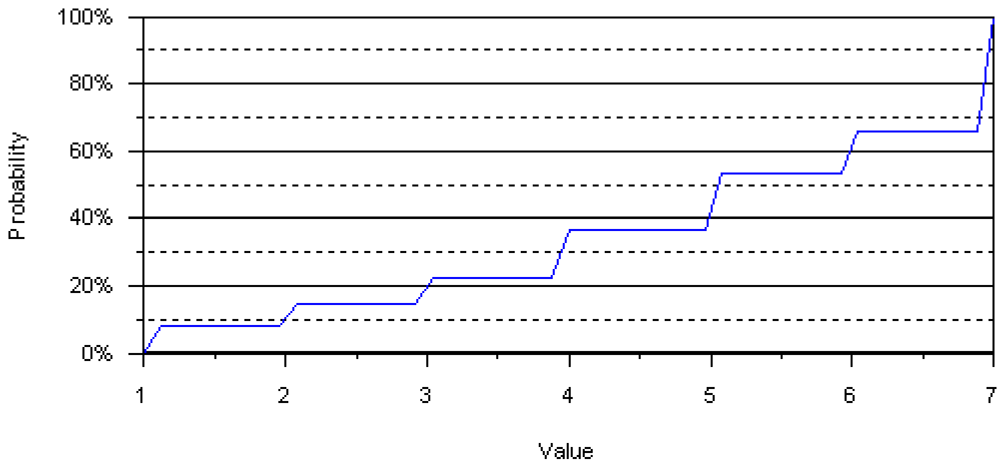
An answer to this question is not required and 57 of 407 respondents chose not to answer.

12j) Establishment of a national resource database (for lab equipment, expertise, etc.)

Probability Density Function



Cumulative Distribution



Average: 4.99

Standard Deviation: 1.96

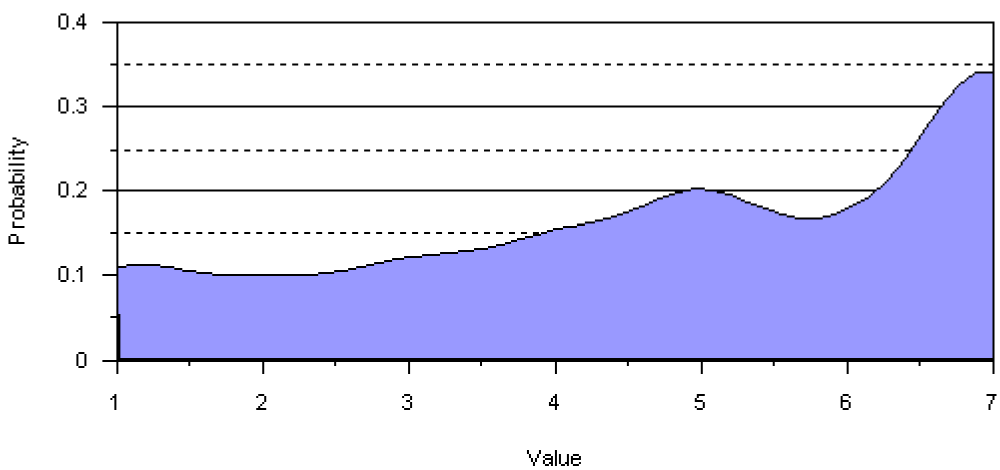
Minimum: 1.00

Maximum: 7.00

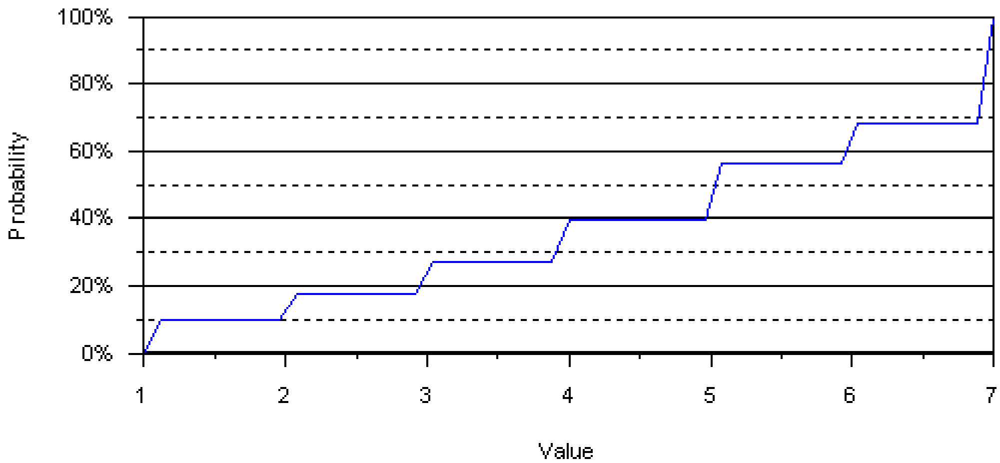
An answer to this question is not required and 64 of 407 respondents chose not to answer.

12k) Establishment of a national explosives formulation database

Probability Density Function



Cumulative Distribution



Average: 4.82

Standard Deviation: 2.04

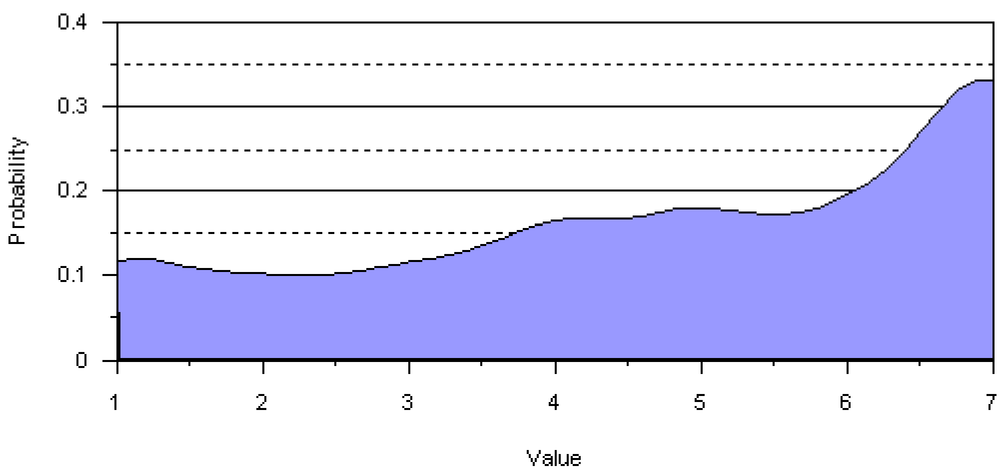
Minimum: 1.00

Maximum: 7.00

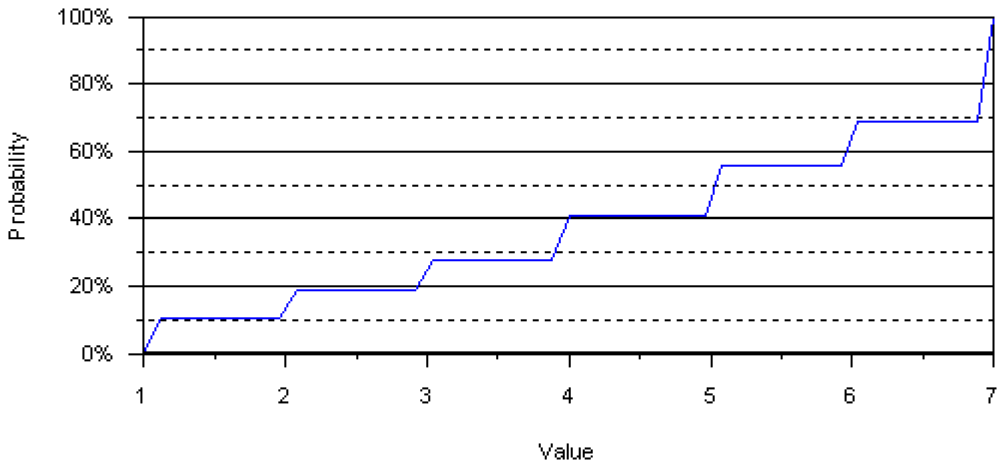
An answer to this question is not required and 66 of 407 respondents chose not to answer.

12l) Creation of a bulletin board for communication between explosives analysts

Probability Density Function



Cumulative Distribution



Average: 4.78

Standard Deviation: 2.06

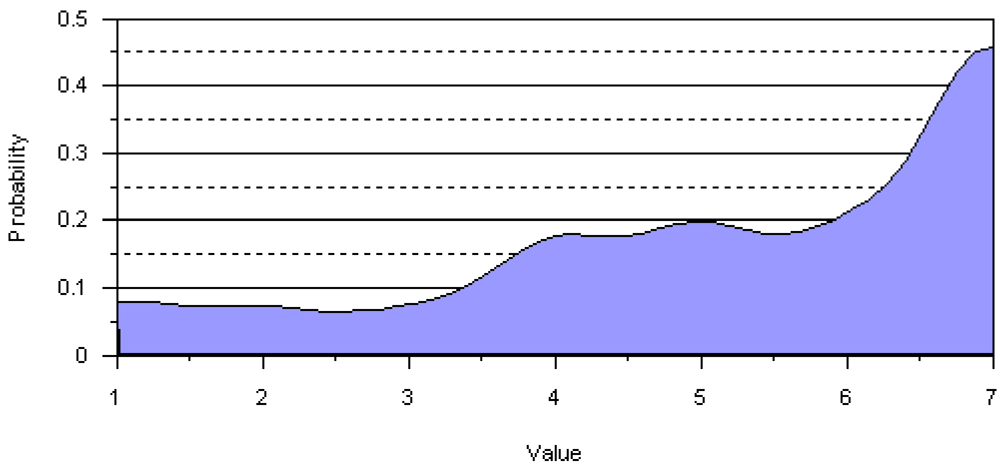
Minimum: 1.00

Maximum: 7.00

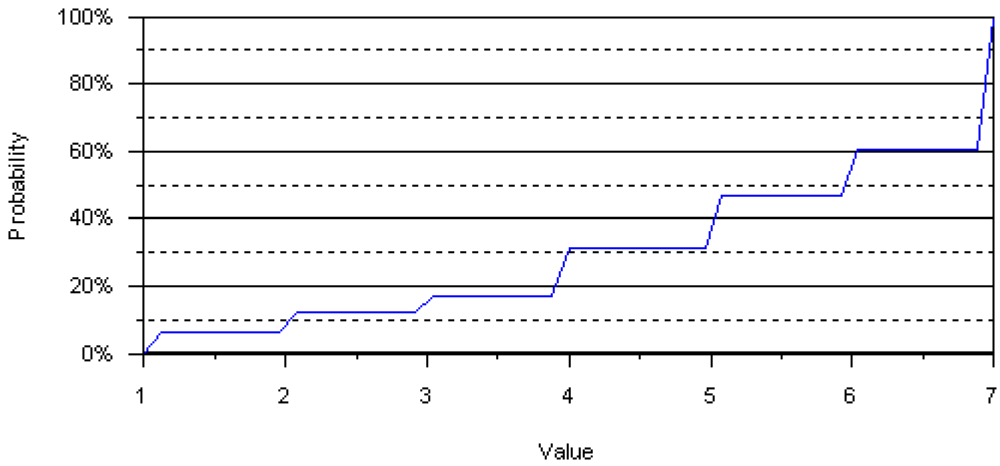
An answer to this question is not required and 71 of 407 respondents chose not to answer.

12m)Creation of a bulletin board for communication between fire debris

Probability Density Function



Cumulative Distribution



Average: 5.26

Standard Deviation: 1.88

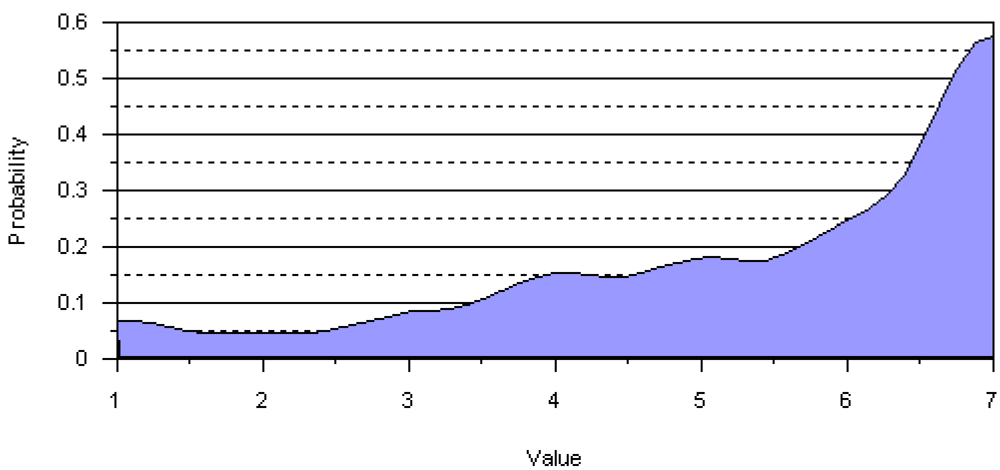
Minimum: 1.00

Maximum: 7.00

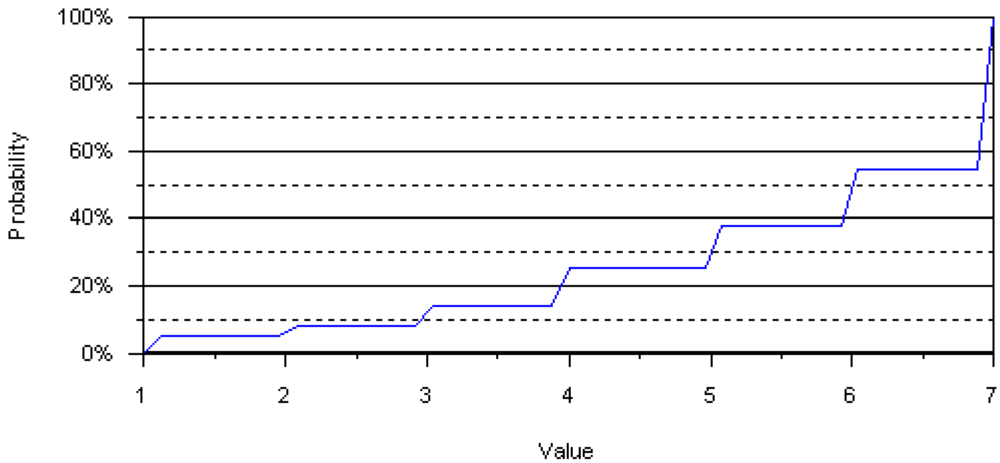
An answer to this question is not required and 69 of 407 respondents chose not to answer.

12n) Creation of an library of manufacturers' literature

Probability Density Function



Cumulative Distribution

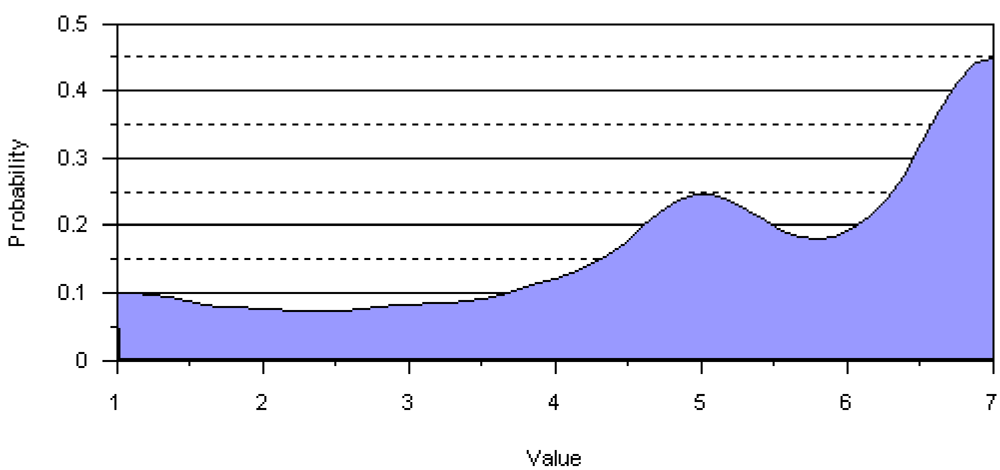


Average:	5.55
Standard Deviation:	1.77
Minimum:	1.00
Maximum:	7.00

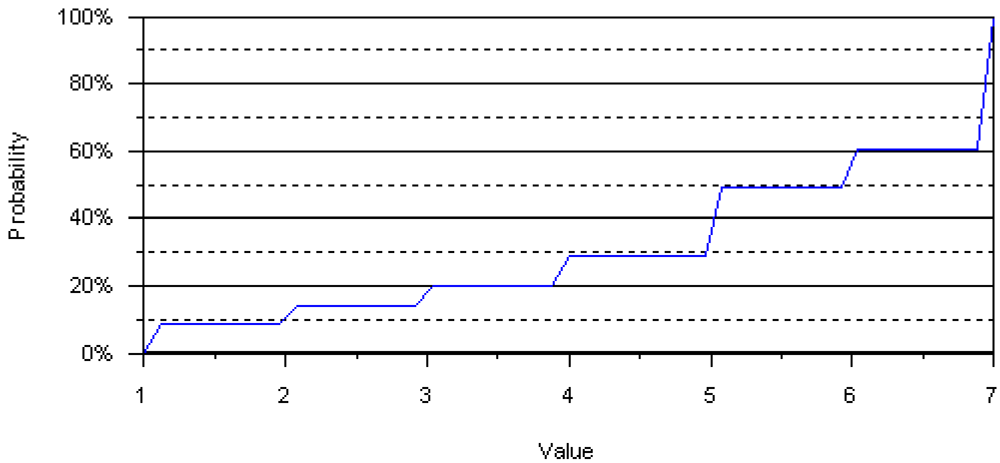
An answer to this question is not required and 60 of 407 respondents chose not to answer.

12o) Database of explosives analyst training manuals and materials

Probability Density Function



Cumulative Distribution



Average: 5.19

Standard Deviation: 1.96

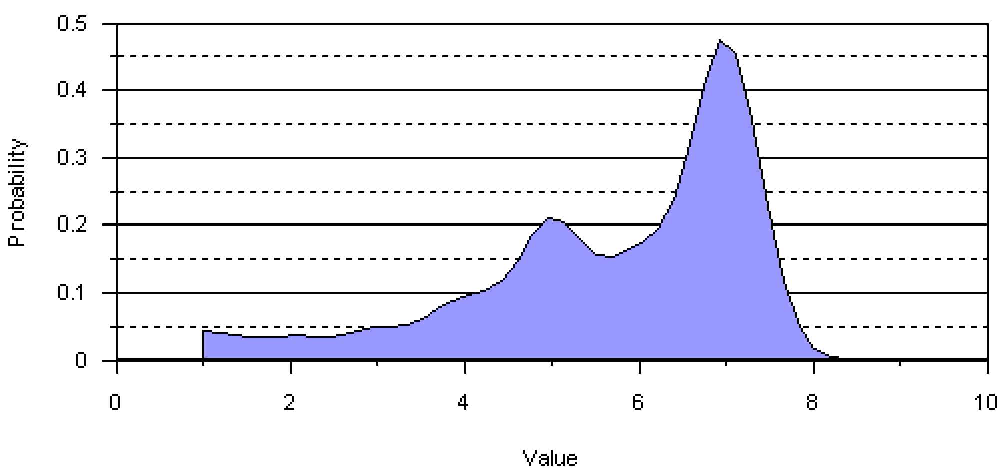
Minimum: 1.00

Maximum: 7.00

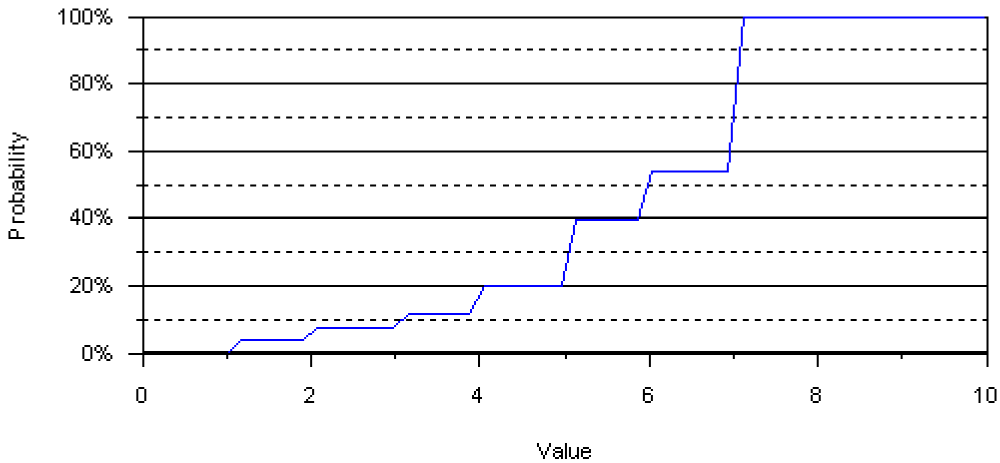
An answer to this question is not required and 65 of 407 respondents chose not to answer.

12p) Information center for inter-agency training exercises

Probability Density Function



Cumulative Distribution



Average:	5.65
Standard Deviation:	1.68
Minimum:	1.00
Maximum:	10.00

An answer to this question is not required and 60 of 407 respondents chose not to answer.

---

13) Are you given time and resources to perform research in your field(s)?

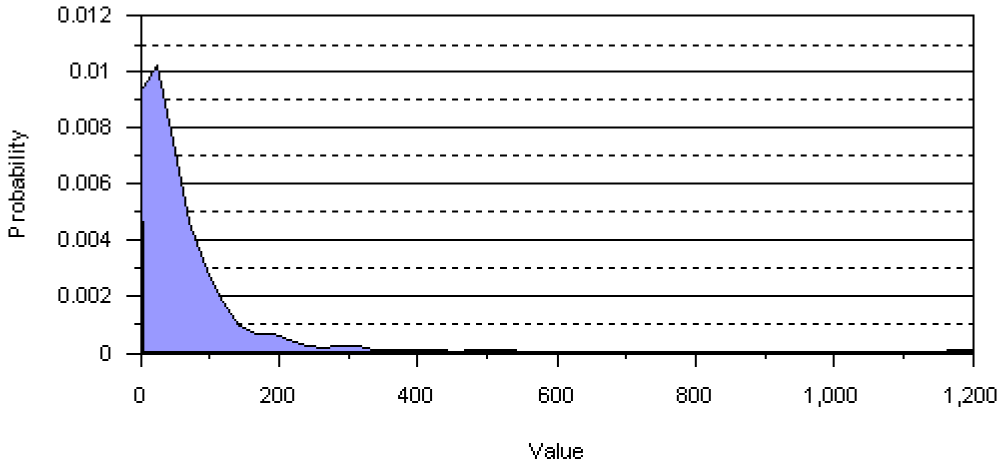
Yes	(203)	54.1%
No	(172)	45.9%
Total	(375)	

An answer to this question is not required and 32 of 407 respondents chose not to answer.

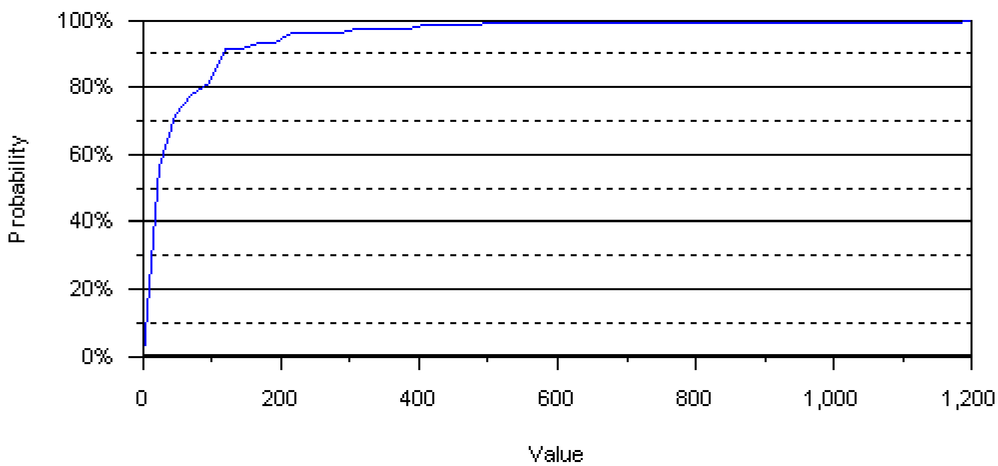
14) If so, approximately how many hours in 2006?

14a) Fire debris analysis

Probability Density Function



Cumulative Distribution



Average:	57.12
Standard Deviation:	128.15
Minimum:	0.00
Maximum:	1,200.00

An answer to this question is not required and 281 of 407 respondents chose not to answer.

14b) Explosives Analysis

- 120
- 20
- 0
- 0
- 0

- 0
- 0
- 20
- 0
- 0
- 10
- 0
- 0
- 0
- 30
- 40
- 25
- 200
- 12
- NA
- 0
- 12
- 0
- 0
- 0
- 25
- 10
- 20
- 20
- 50
- 0
- 1
- 5
- 10
- 0
- 100
- 0
- 50
- 0
- 20
- 0
- 20
- 10
- 0
- 40
- 0
- 40
- 10
- 10
- 0

- 3
- 25
- 0
- 400
- 35
- 0
- 30
- 20
- 10
- 0
- 40
- 0
- 100
- 24
- 300
- 40
- 0
- 96
- 100
- 0
- 0
- 0
- 40
- 1650
- 80
- 0
- 10
- 100
- 0
- 50
- 0
- 10
- n/a
- 0
- 700
- 0
- 0
- 0
- 200
- 80
- na
- 0
- 0
- 144
- 0

- 20
- 1
- 5
- 0
- 0
- 40
- 0
- 25
- 0
- 0
- 30
- 0
- 0
- 50
- 0
- 80
- 0
- 10

An answer to this question is not required and 294 of 407 respondents chose not to answer.

14c) Fire Scenes

- 0
- 100
- 0
- 0
- 60
- 40
- 0
- 0
- 25
- 0
- 0
- 0
- 40
- 0
- 40
- 75
- 40
- 0
- 40

- 0
- 25
- 100
- 100
- NA
- 80
- 100
- 25
- 48
- 0
- 200
- 50
- 1000
- 100
- 6240
- 0
- 50
- 4
- 100
- 25
- 120
- 20
- 1000
- 50
- 1
- 100
- 40
- 250
- 50
- 80
- 75
- 10
- 10
- 200
- 100
- 8
- 300
- 24
- 100
- 80
- 40
- 30
- 500
- 60
- 1000

- 20
- 80
- 10
- 0
- 12
- 20
- 40
- 100
- 40
- 20
- 50
- 10
- 80
- 0
- 40
- 200
- 60
- 50
- 1000
- 24
- 100
- 80
- 100
- 250
- 20
- 25
- 1000
- 25
- 30
- 60
- 150
- 40
- 900
- 15
- 1100
- 100
- 80
- 40
- 1800
- 96
- 70
- 8
- 0
- 120
- 20

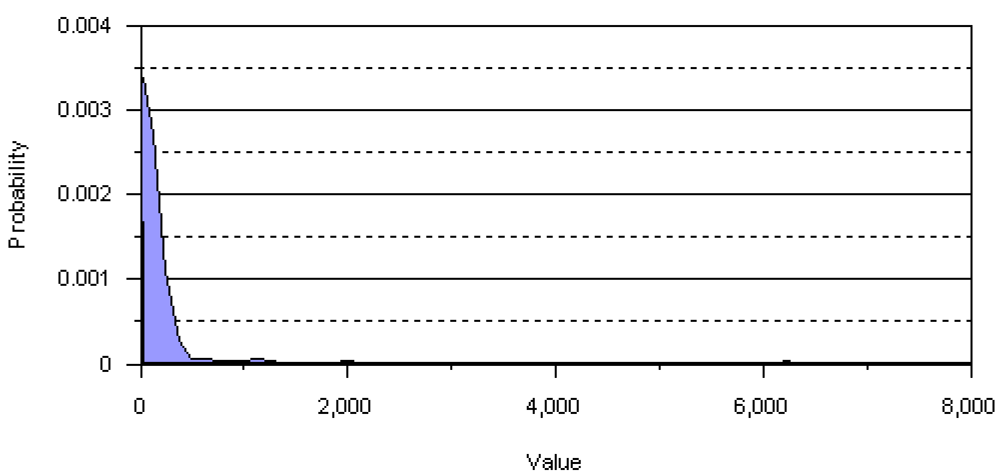
- 60
- 55
- 300
- 50
- 60
- 75
- 500
- 50
- 0
- 30
- 48
- 4
- 40
- 80
- 40
- 20
- 200
- 100
- 56
- 20
- 20
- 40
- >100
- >80
- 100
- 150
- n/a
- 200
- 4
- 25
- 24
- 50
- 20
- 40
- 40
- 40
- 0
- 100
- 0
- na
- 80
- 131
- 10
- 100
- 0

- 0
- 0
- 4
- 100
- 40
- 40
- 10
- 40
- 0
- 100
- 2
- 0
- 50
- 80
- 0
- 150
- 0
- 200
- 20
- 0

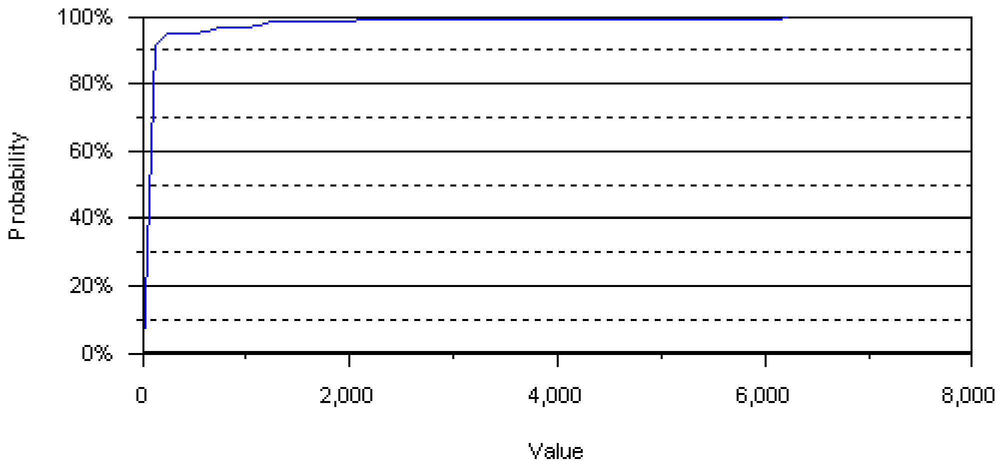
An answer to this question is not required and 233 of 407 respondents chose not to answer.

14d) Explosive Scenes

Probability Density Function



Cumulative Distribution



Average:	121.92
Standard Deviation:	614.91
Minimum:	0.00
Maximum:	6,240.00

An answer to this question is not required and 288 of 407 respondents chose not to answer.

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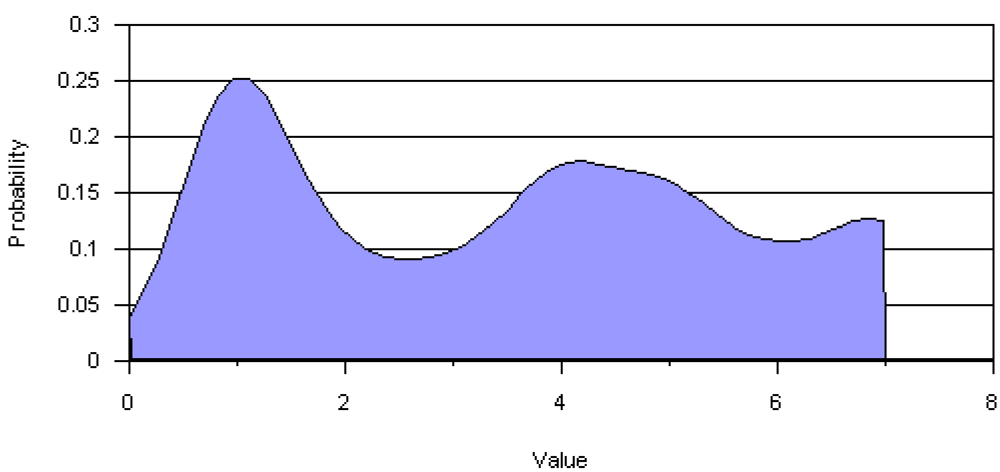
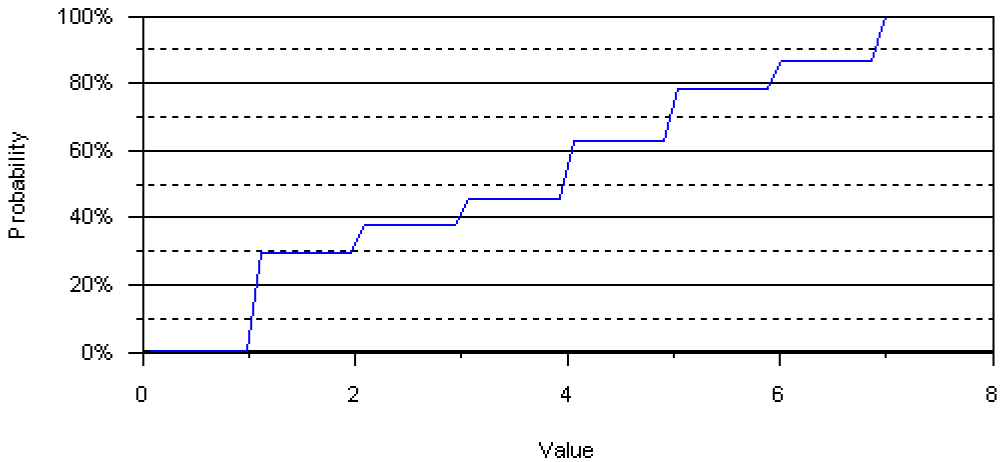
15) Rate each of the following statements as they apply to your laboratory or to you using the scale given below: (1-7 where: 1 = Not at all, 7 = Very)

15a) How sufficient are the explosives and fire debris publications provided by your laboratory?

Probability Density Function



Cumulative Distribution



Average: 3.60

Standard Deviation: 2.16

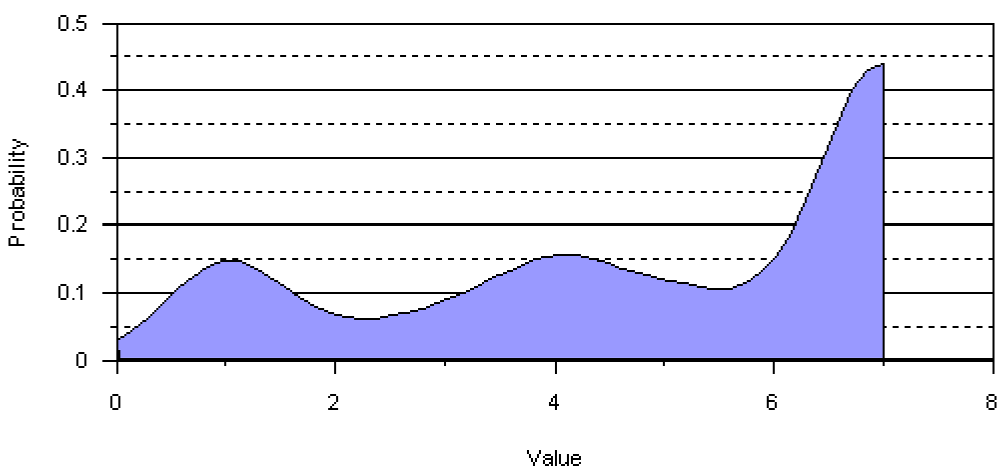
Minimum: 0.00

Maximum: 7.00

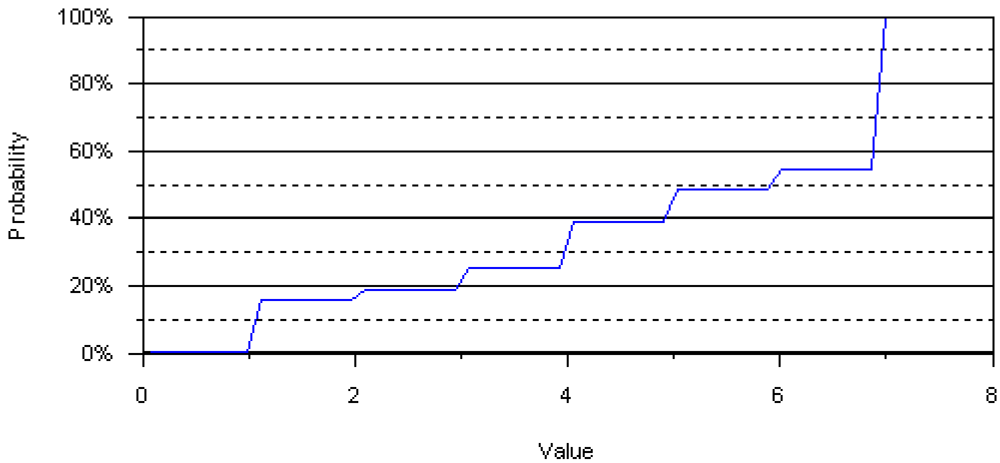
An answer to this question is not required and 229 of 407 respondents chose not to answer.

15b) How interested would your laboratory be in receiving a library of ignitable liquid standards on a regular basis?

Probability Density Function



Cumulative Distribution



Average: 4.98

Standard Deviation: 2.27

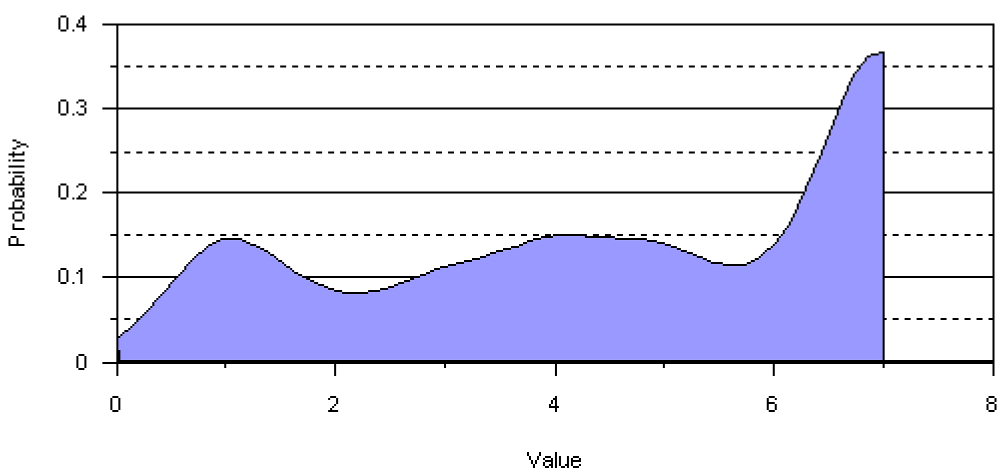
Minimum: 0.00

Maximum: 7.00

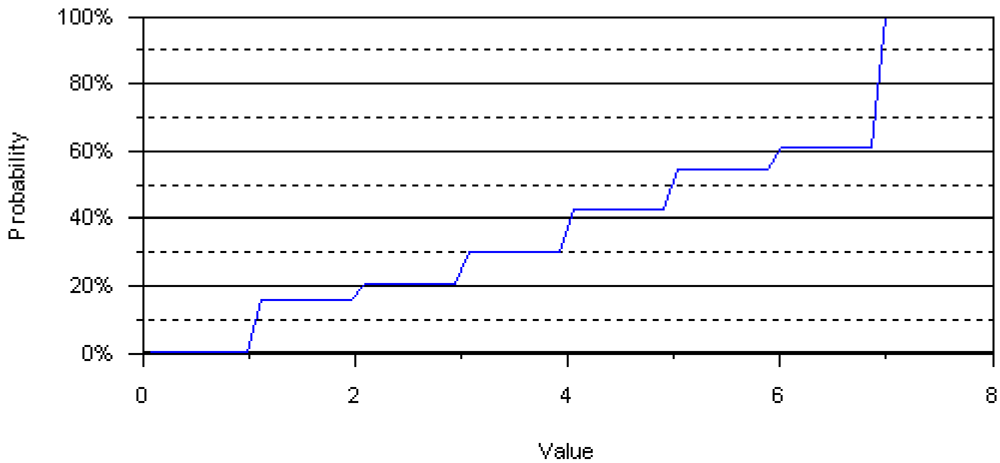
An answer to this question is not required and 233 of 407 respondents chose not to answer.

15c) How interested would your laboratory be in receiving a library of pyrolysis standards on a regular basis?

Probability Density Function



Cumulative Distribution



Average: 4.75

Standard Deviation: 2.26

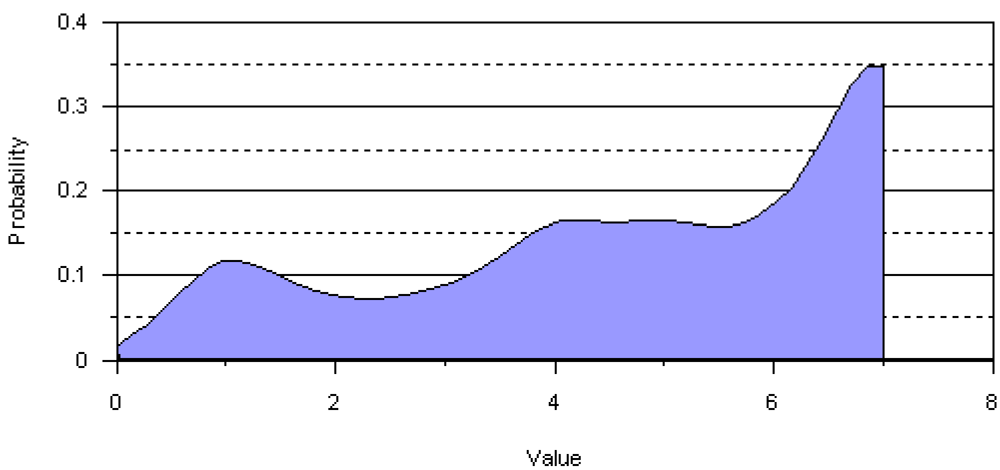
Minimum: 0.00

Maximum: 7.00

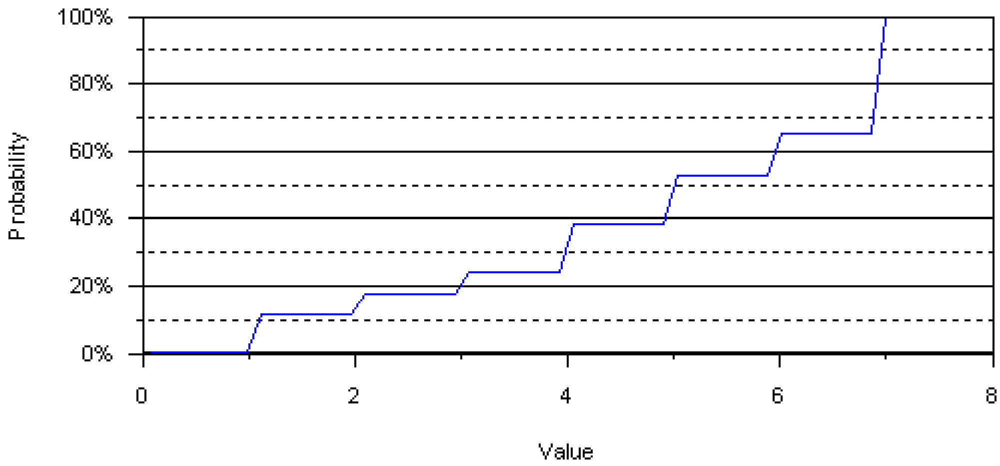
An answer to this question is not required and 233 of 407 respondents chose not to answer.

15d) How important do you feel it would be to have national standards for report writing?

Probability Density Function



Cumulative Distribution



Average: 4.90

Standard Deviation: 2.10

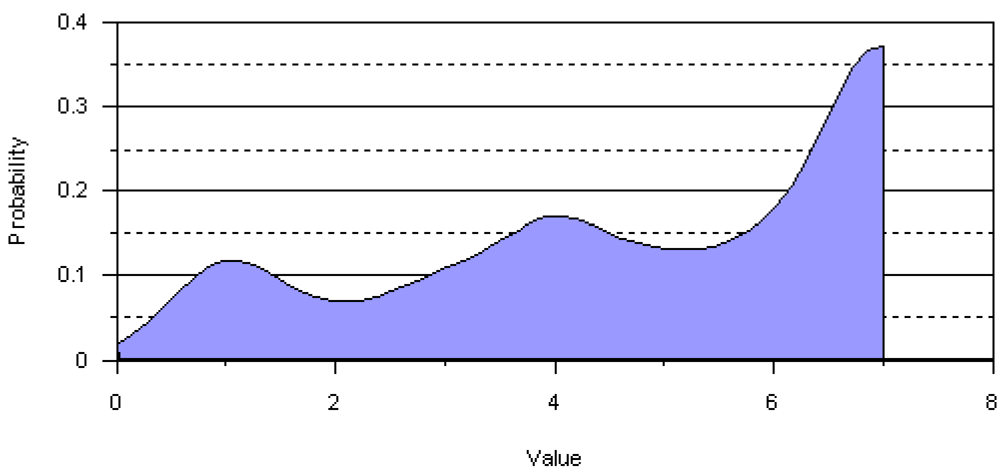
Minimum: 0.00

Maximum: 7.00

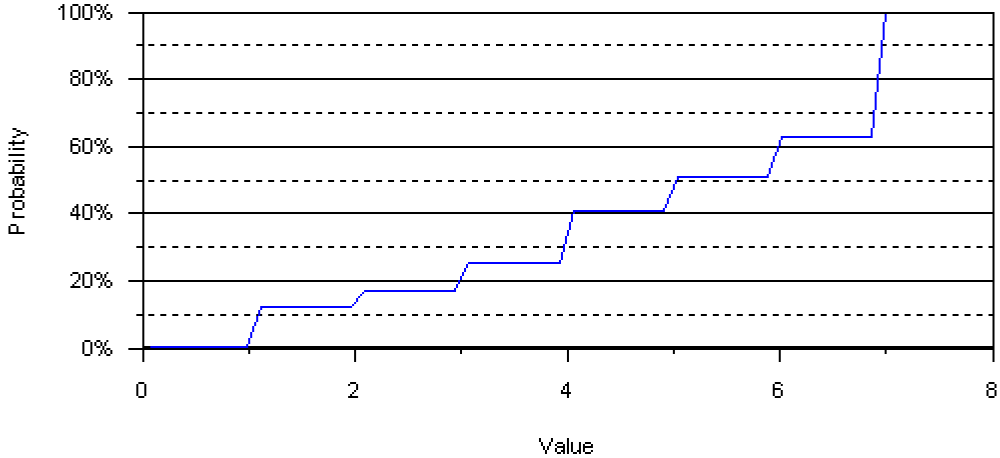
An answer to this question is not required and 197 of 407 respondents chose not to answer.

15e) How important would it be to have a specific protocol for wording of both positive and negative samples?

Probability Density Function



Cumulative Distribution



Average: 4.91

Standard Deviation: 2.13

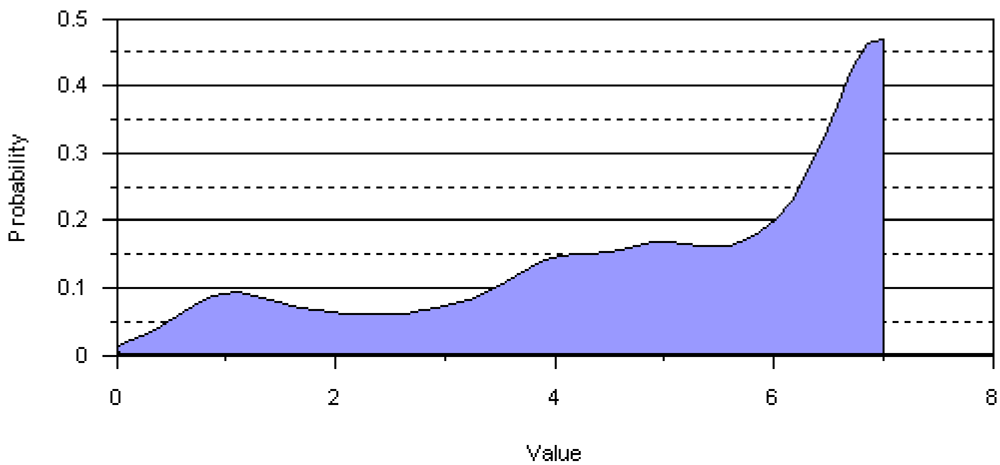
Minimum: 0.00

Maximum: 7.00

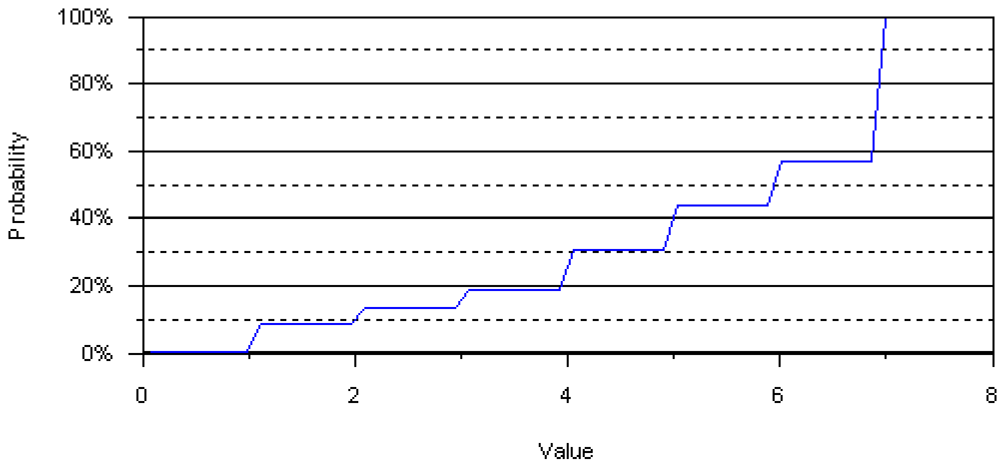
An answer to this question is not required and 210 of 407 respondents chose not to answer.

15f) How important would it be to have a national database for chromatographic data for ignitable liquids?

Probability Density Function



Cumulative Distribution



Average: 5.28

Standard Deviation: 2.00

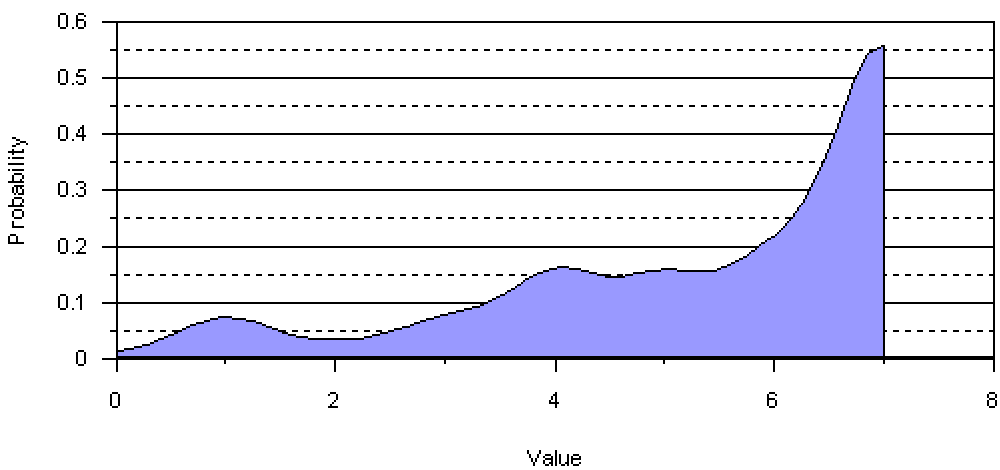
Minimum: 0.00

Maximum: 7.00

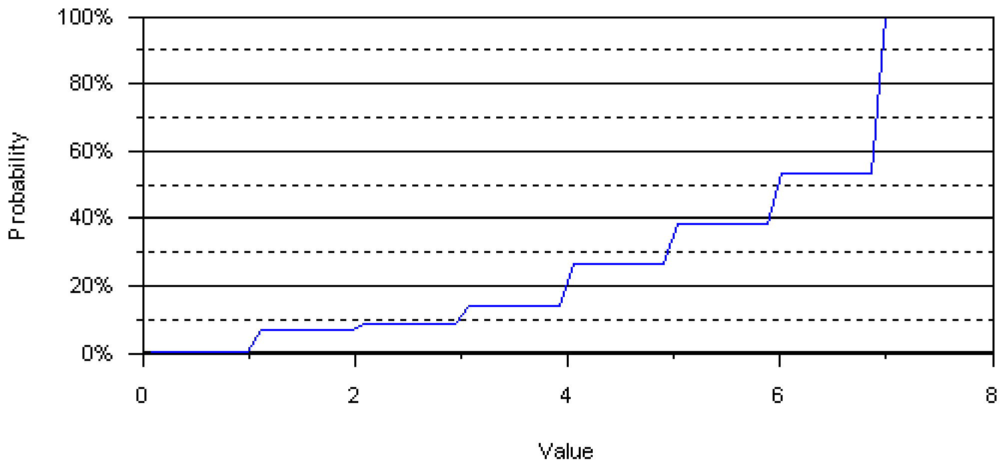
An answer to this question is not required and 213 of 407 respondents chose not to answer.

15g) How important would it be to have a national source for ignitable liquid standards?

Probability Density Function



Cumulative Distribution



Average: 5.52

Standard Deviation: 1.84

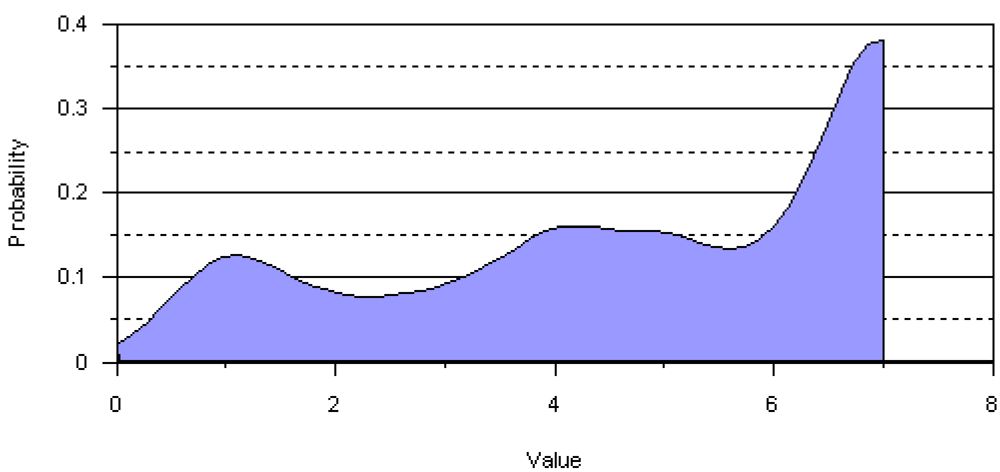
Minimum: 0.00

Maximum: 7.00

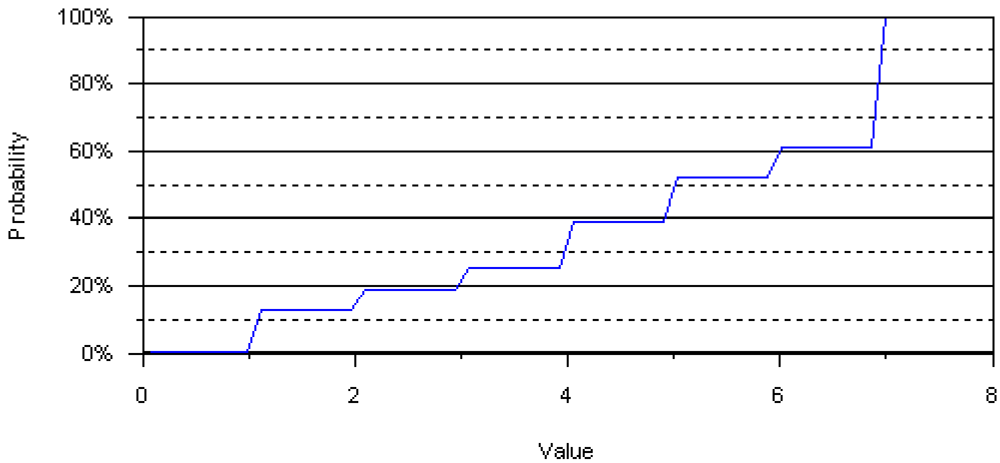
An answer to this question is not required and 209 of 407 respondents chose not to answer.

15h) How interested are you in participating in the fire and explosives debris analysis technical working group?

Probability Density Function



Cumulative Distribution



Average:	4.90
Standard Deviation:	2.16
Minimum:	0.00
Maximum:	7.00

An answer to this question is not required and 203 of 407 respondents chose not to answer.

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iii) **Part C. Fire Debris Analysis Case Work (Check an answer only on those questions which apply to you)**

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16) Indicate the total number of fire debris samples analyzed/processed in 2006 by all the analysts within your agency (check one):

1-50	(87)	60.4%
51-100	(16)	11.1%
101-250	(13)	9.0%
251-500	(8)	5.6%
501-750	(6)	4.2%
751-1000	(4)	2.8%
1001-2000	(3)	2.1%
>2000	(7)	4.9%
Total	(144)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 263 of 407 respondents chose not to answer.

16a) Indicate the total number of ignitable liquid samples analyzed/processed in 2006 by all the analysts within your agency (check one):

1-50	(94)	70.1%
51-100	(11)	8.2%
101-250	(12)	9.0%
251-500	(9)	6.7%
501-750	(3)	2.2%
751-1000	(0)	0.0%
1001-2000	(1)	0.7%
>2000	(4)	3.0%
Total	(134)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 273 of 407 respondents chose not to answer.

iv) **Part D. Fire Debris Analytical Methods (Check an answer only on those questions which apply to you)**

17) Extraction method routinely used for fire debris analysis (check one):

activated charcoal (passive headspace sampling - includes strips, "tea bags", wires, and ribbons)	(64)	76.2%
activated charcoal (dynamic headspace sampling)	(17)	20.2%
TENAX (passive or dynamic headspace sampling)	(3)	3.6%
SPME (please indicate the phase used):	(1)	1.2%
Other absorbent:	(7)	8.3%
Total	(84)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 323 of 407 respondents chose not to answer.

17a) If you checked *"SPME"* (Please indicate the phase used here):

- none
- n/a

An answer to this question is not required and 405 of 407 respondents chose not to answer.

17b) If you checked *"Other* absorbent" above, (please specify which one used here):

- N/A
- solid or bulk sample
- gauze pads
- n/a
- non-bleached flour
- clay chips/ sterile pads

An answer to this question is not required and 401 of 407 respondents chose not to answer.

18) Indicate which eluting solvent used for extracts from fire debris:

no eluting solvent used (e.g. thermal desorption or SPME)	(11)	16.4%
carbon disulfide (CS2)	(38)	56.7%
dichloromethane (CH2Cl2)	(5)	7.5%
diethyl ether	(6)	9.0%
pentane	(11)	16.4%
Other (specify):	(4)	6.0%
Total	(67)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 340 of 407 respondents chose not to answer.

18a) If you checked *"Other"* above (please specify which one was used here):

- CS2/Pentane 1:1
- none
- N/A
- n/a
- unknown
- not preformed

An answer to this question is not required and 401 of 407 respondents chose not to answer.

---

19) Internal standard routinely added to fire debris?

Yes	(11)	15.1%
No	(62)	84.9%
Total	(73)	

An answer to this question is not required and 334 of 407 respondents chose not to answer.

19a) If "Yes", (please specify which compound(s) used):

- 3 pphenyl toluene used in lab can controls for recovery
- 3PT
- trichloroethylene
- but BHT is in ether
- 3-phenyltoluene
- 3 phenyl toluene
- 3-phenyltoluene
- none
- 3-phenyltoluene
- N/A
- kflex

An answer to this question is not required and 396 of 407 respondents chose not to answer.

---

20) Internal standard routinely added to eluting solvent (if solvent used to elute absorbent)?

Yes	(10)	15.2%
No	(56)	84.8%
Total	(66)	

An answer to this question is not required and 341 of 407 respondents chose not to answer.

20a) If "Yes", (please specify which compound(s) used):

- Trichloroethane
- PCE
- diphenylmethane
- Alane mix
- thiophene
- none
- perchloroethylene
- N/A
- alcohols, gas, kerosene, diesel fuel

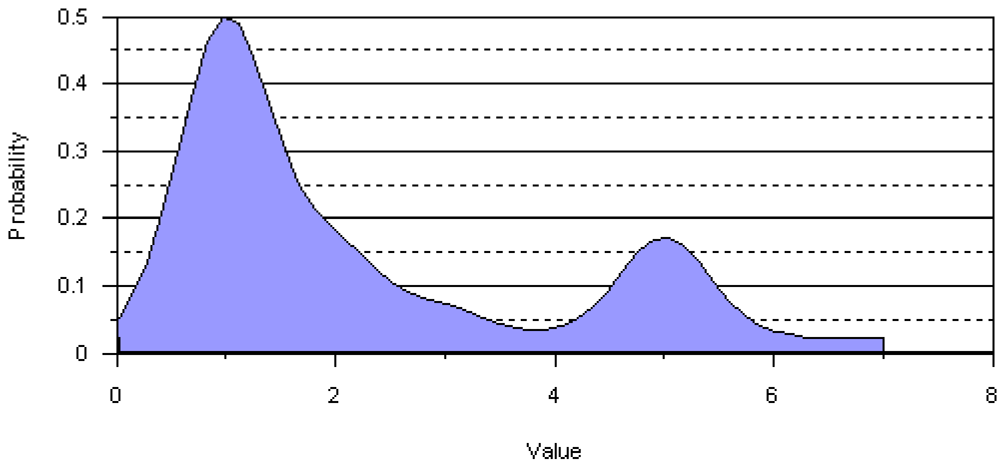
An answer to this question is not required and 398 of 407 respondents chose not to answer.

---

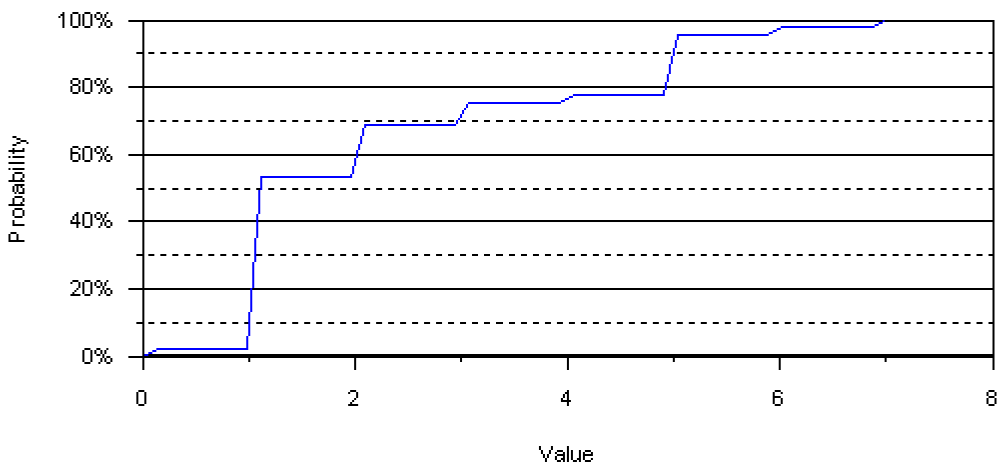
21) For Instrumentation used in fire debris and/or ignitable liquid analysis, how often do you use each of the following analytical techniques? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

21a) GC-FID

Probability Density Function



Cumulative Distribution

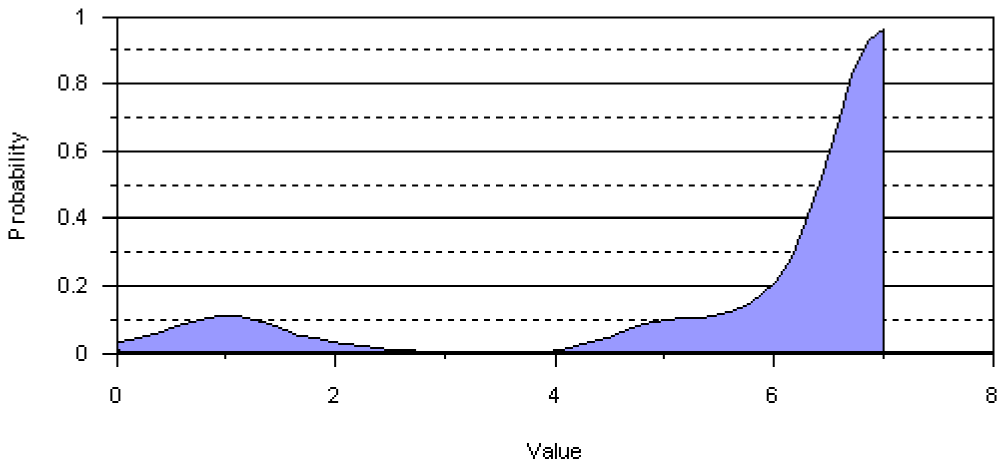


Average:	2.29
Standard Deviation:	1.80
Minimum:	0.00
Maximum:	7.00

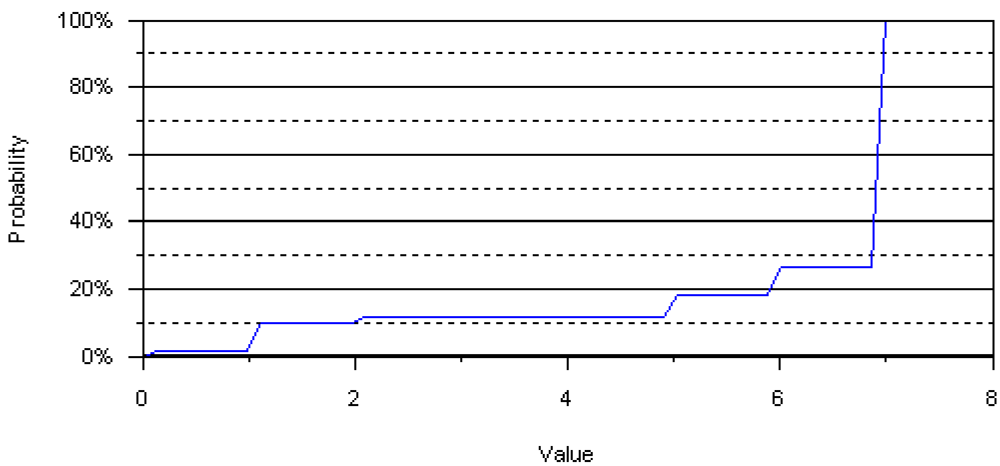
An answer to this question is not required and 362 of 407 respondents chose not to answer.

21b) GC-MS

Probability Density Function



Cumulative Distribution

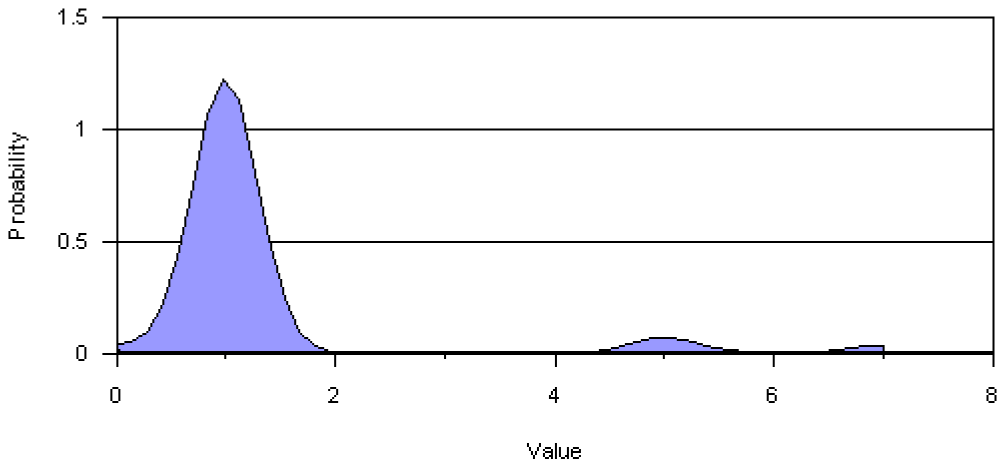


Average:	6.08
Standard Deviation:	1.95
Minimum:	0.00
Maximum:	7.00

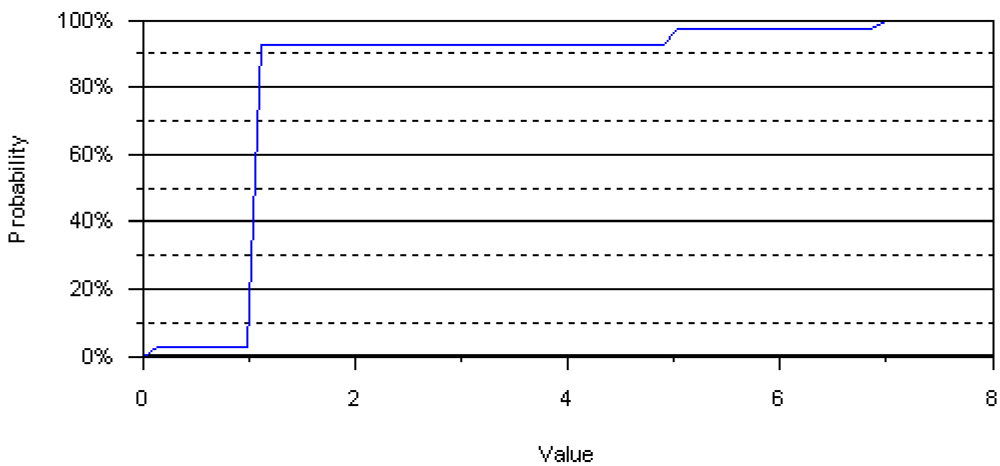
An answer to this question is not required and 347 of 407 respondents chose not to answer.

21c) GC-MS-MS

Probability Density Function



Cumulative Distribution

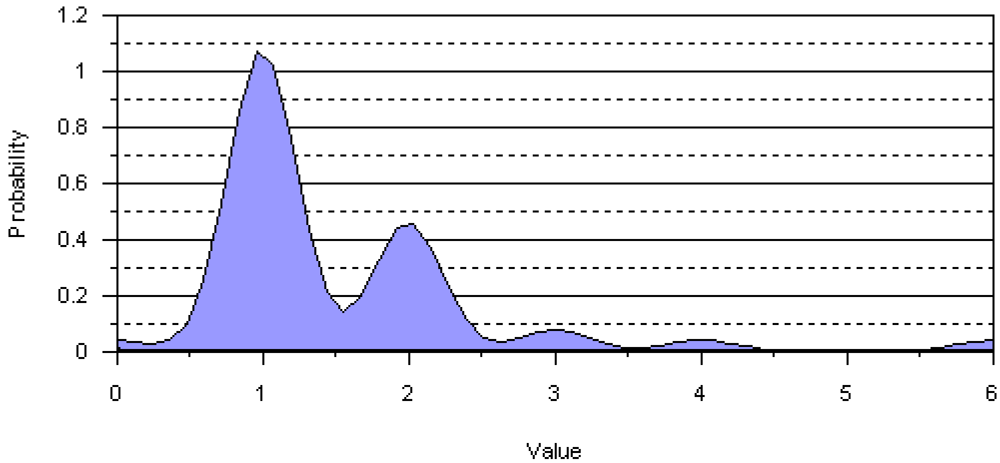


Average:	1.32
Standard Deviation:	1.27
Minimum:	0.00
Maximum:	7.00

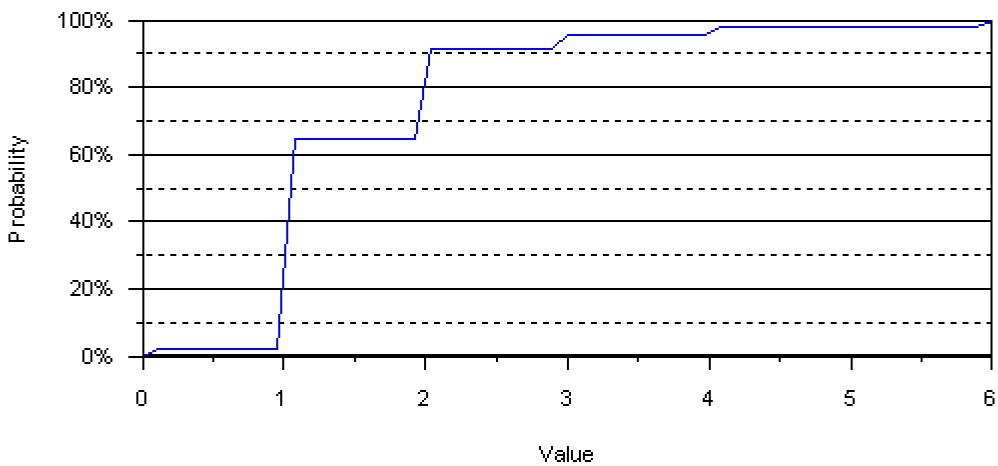
An answer to this question is not required and 366 of 407 respondents chose not to answer.

21d) FTIR

Probability Density Function



Cumulative Distribution

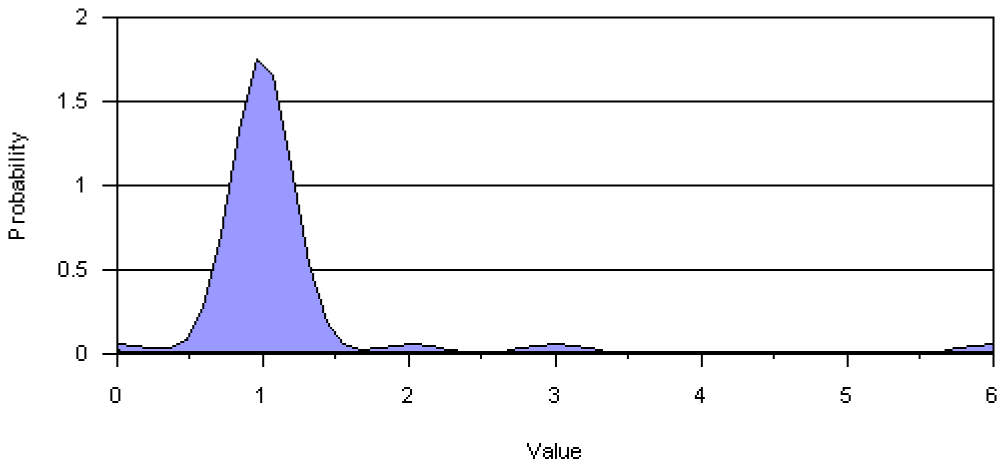


Average:	1.51
Standard Deviation:	0.99
Minimum:	0.00
Maximum:	6.00

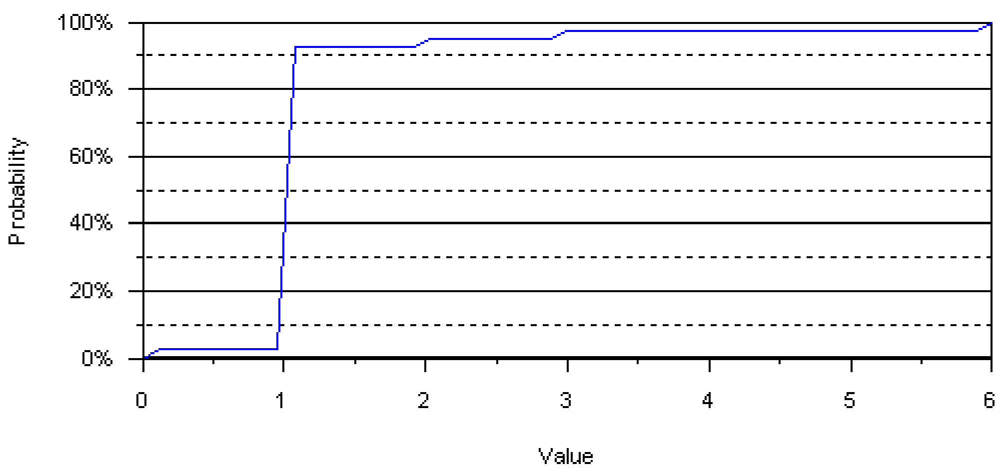
An answer to this question is not required and 362 of 407 respondents chose not to answer.

21e) GC-FTIR

Probability Density Function



Cumulative Distribution

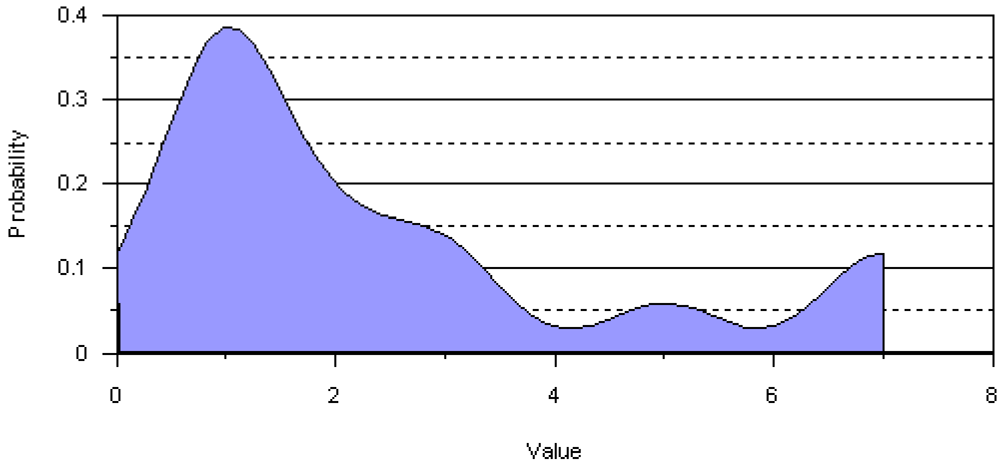


Average:	1.18
Standard Deviation:	0.87
Minimum:	0.00
Maximum:	6.00

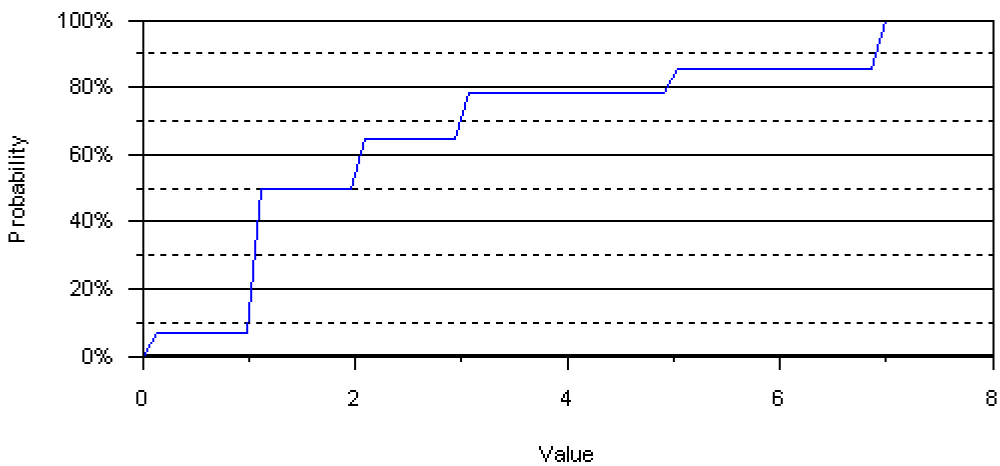
An answer to this question is not required and 367 of 407 respondents chose not to answer.

21f) other: (specify)

Probability Density Function



Cumulative Distribution



Average:	2.50
Standard Deviation:	2.28
Minimum:	0.00
Maximum:	7.00

An answer to this question is not required and 393 of 407 respondents chose not to answer.

21g) If you checked "Other", (please specify which technique(s) used):

- SEM/EDS
- Headspace analyzer
- sem/eds
- none
- N/A

- outsource
- FLASH POINT
- fed lab
- n/a
- 1
- XRF, SEM-EDS, Py GC/MS

An answer to this question is not required and 396 of 407 respondents chose not to answer.

---

22) Sample introduction to GC

22a) (check one):

split solvent injection	(34)	69.4%
splitless solvent injection	(7)	14.3%
thermal desorption	(7)	14.3%
SPME (please indicate the phase used):	(0)	0.0%
Other: (specify)	(1)	2.0%
Total	(49)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 358 of 407 respondents chose not to answer.

22b) If you checked "*SPME*" above, (please specify phase used):

- n/a

An answer to this question is not required and 406 of 407 respondents chose not to answer.

22c) If you checked "*Other*" above, (please specify which was used):

- splitless 5973, split VArian 2000

- headspace
- none
- N/A

An answer to this question is not required and 403 of 407 respondents chose not to answer.

---

23) Type of column phase routinely used for GC separation (check all that apply):

100% polydimethylsiloxane (e.g. DB-1, DB-1ms, HPMS-1, OV-1, Rtx-1, DB-PETRO, etc.)	(30)	58.8%
(5% phenyl)-methylpolysiloxane (e.g. DB-5, DB-5ms, HPMS-5, OV-5, Rtx-5, etc.)	(21)	41.2%
(14%-Cyanopropyl-phenyl)-methylpolysiloxane (e.g. DB-1701, SPB-1701, Rtx-1701, etc.)	(0)	0.0%
polyethylene glycol (e.g. DB-WAX, Carbowax, HP-20M, Supelcowax 10, HP-Innowax, etc.)	(1)	2.0%
other: (specify)	(1)	2.0%
Total	(51)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 356 of 407 respondents chose not to answer.

23a) If you checked "*Other*" above, (please specify column phase used):

- none
- N/A
- n/a

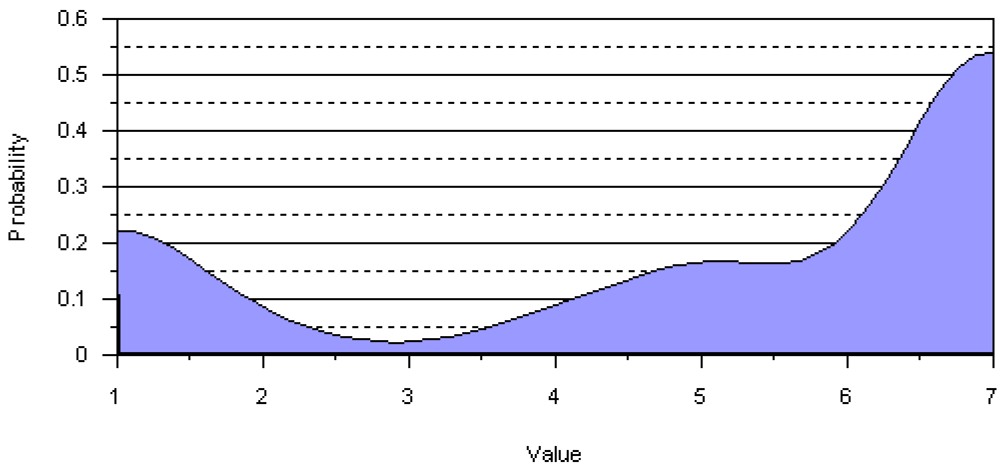
An answer to this question is not required and 404 of 407 respondents chose not to answer.

---

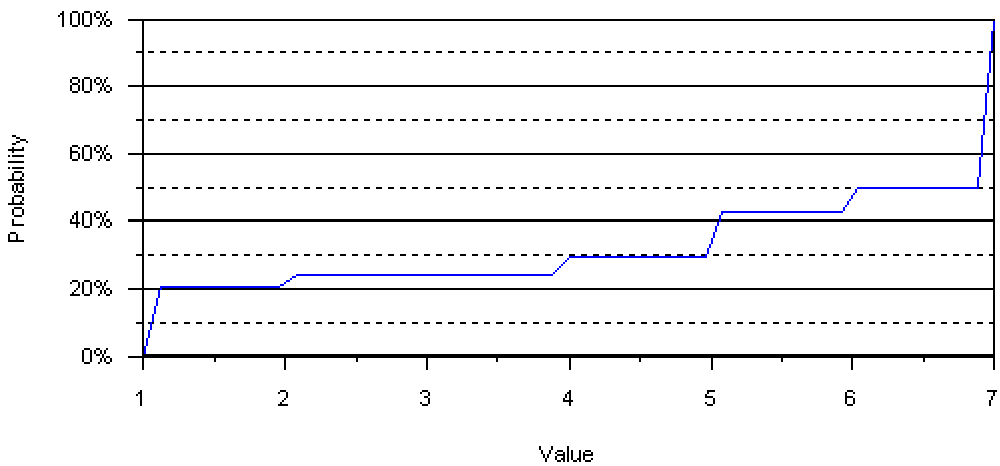
24) For fire debris analyses, how often do you use the following QA/QC tests? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

24a) ASTM 1387 test mix or similar mixture

Probability Density Function



Cumulative Distribution

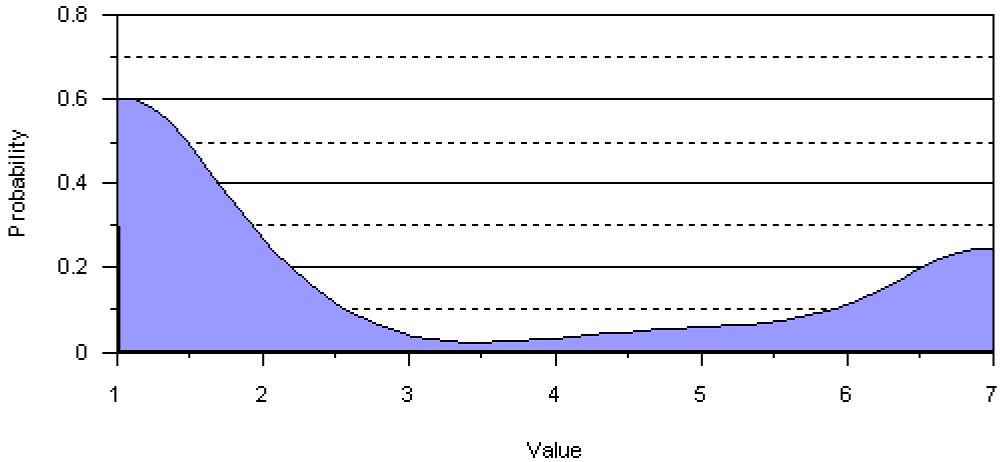


Average:	5.09
Standard Deviation:	2.41
Minimum:	1.00
Maximum:	7.00

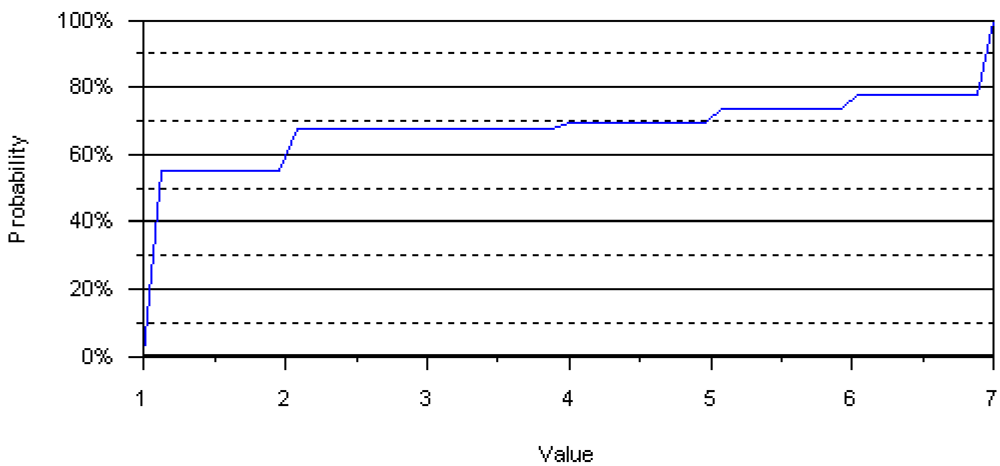
An answer to this question is not required and 353 of 407 respondents chose not to answer.

24b) Internal Standards (e.g., 3-phenyltoluene)

Probability Density Function



Cumulative Distribution

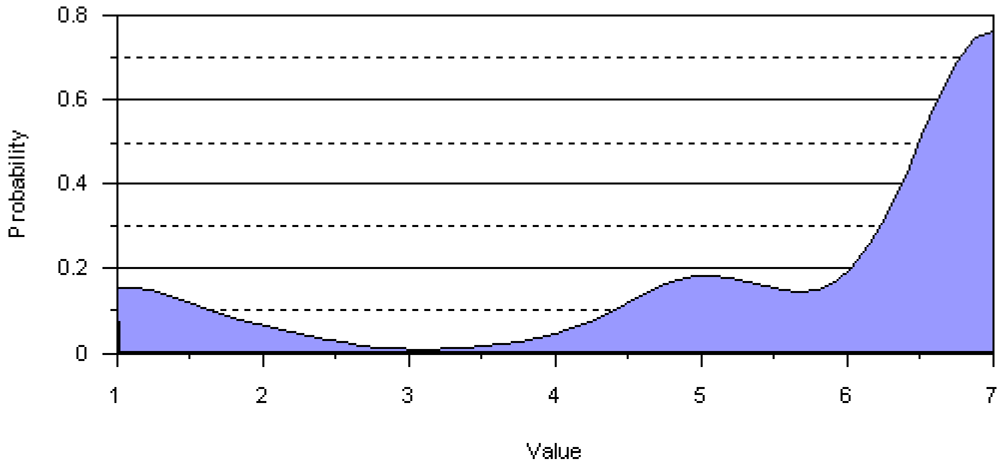


Average:	2.90
Standard Deviation:	2.57
Minimum:	1.00
Maximum:	7.00

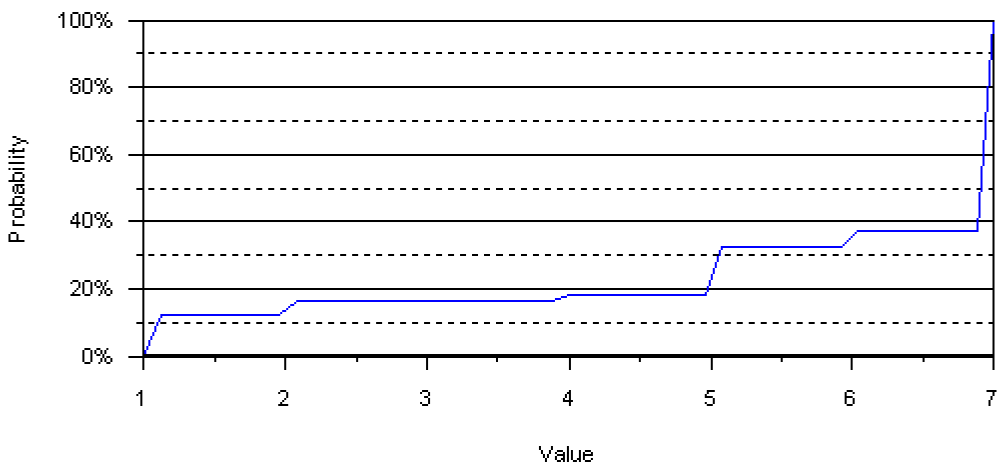
An answer to this question is not required and 358 of 407 respondents chose not to answer.

24c) Solvent Blanks

Probability Density Function



Cumulative Distribution

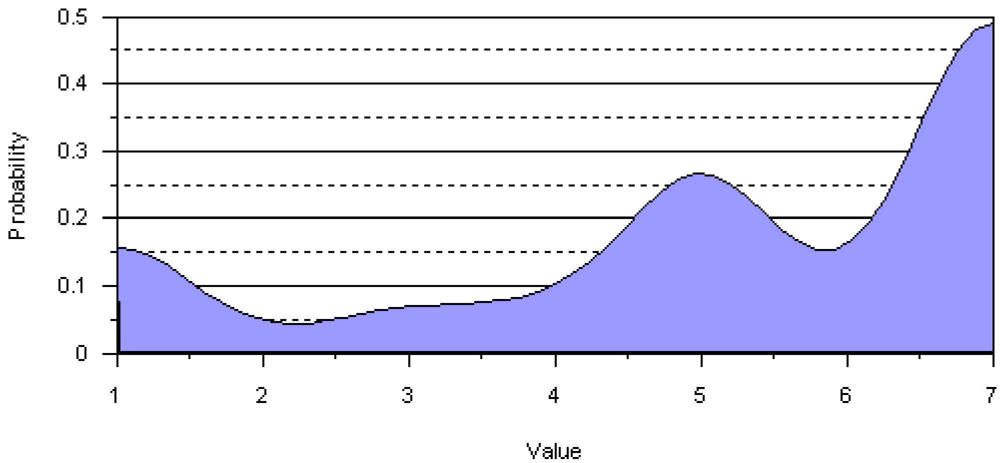


Average:	5.68
Standard Deviation:	2.12
Minimum:	1.00
Maximum:	7.00

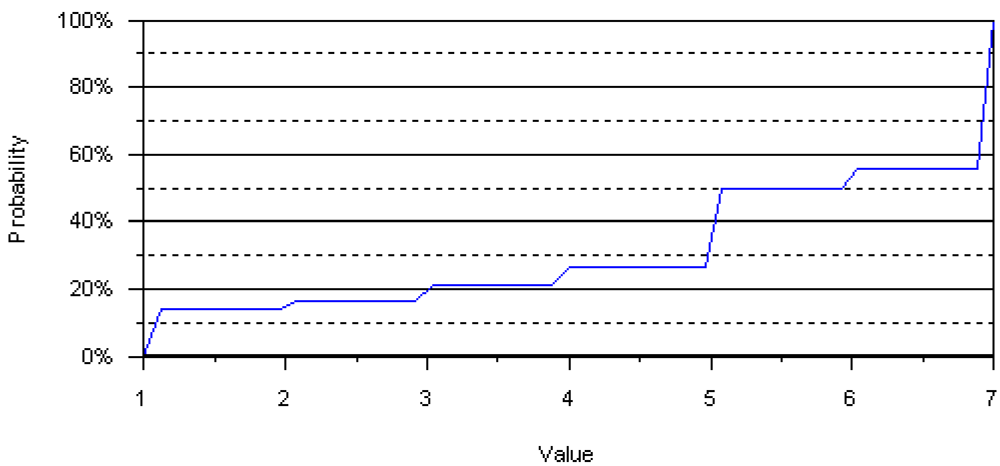
An answer to this question is not required and 351 of 407 respondents chose not to answer.

24d) Apparatus Blanks (e.g., strips, glassware)

Probability Density Function



Cumulative Distribution

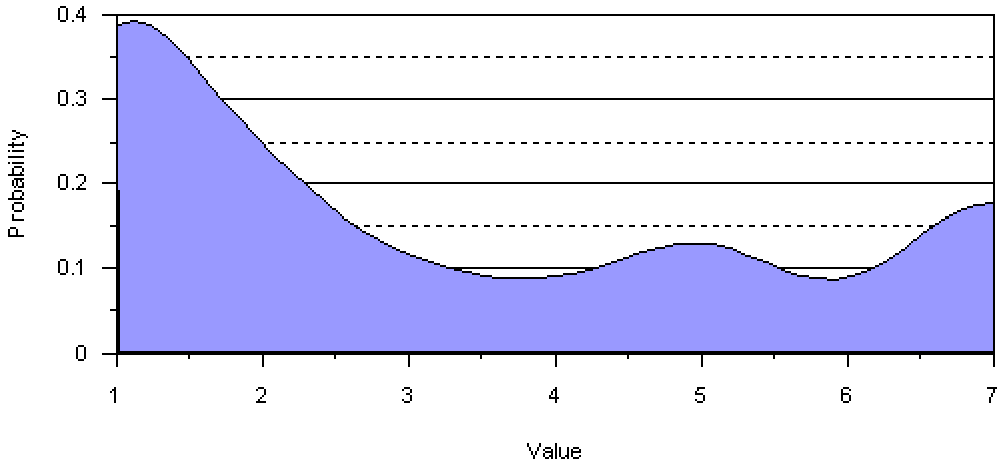


Average:	5.16
Standard Deviation:	2.15
Minimum:	1.00
Maximum:	7.00

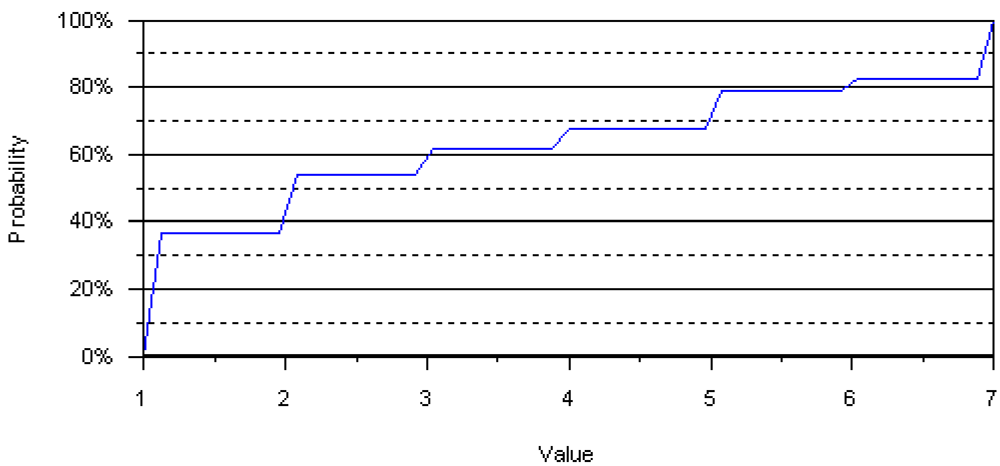
An answer to this question is not required and 351 of 407 respondents chose not to answer.

24e) Recovery Checks (e.g., simulated case extractions

Probability Density Function



Cumulative Distribution

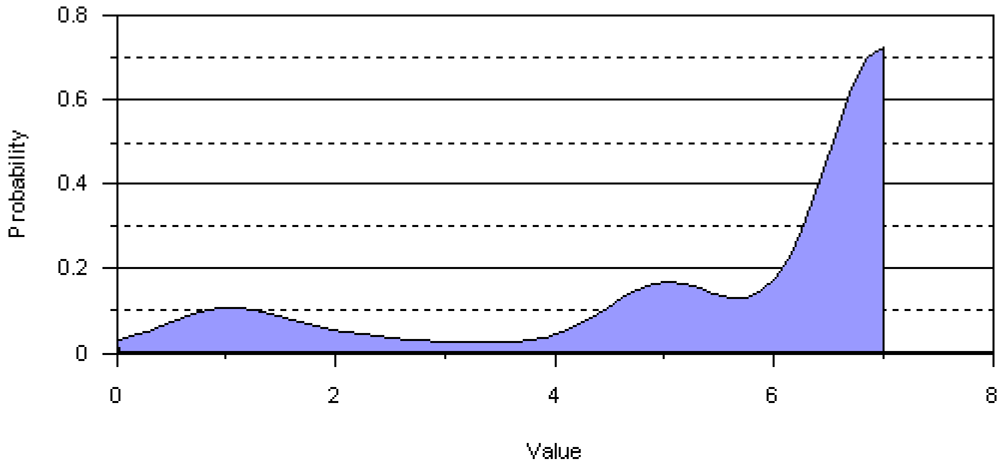


Average:	3.19
Standard Deviation:	2.31
Minimum:	1.00
Maximum:	7.00

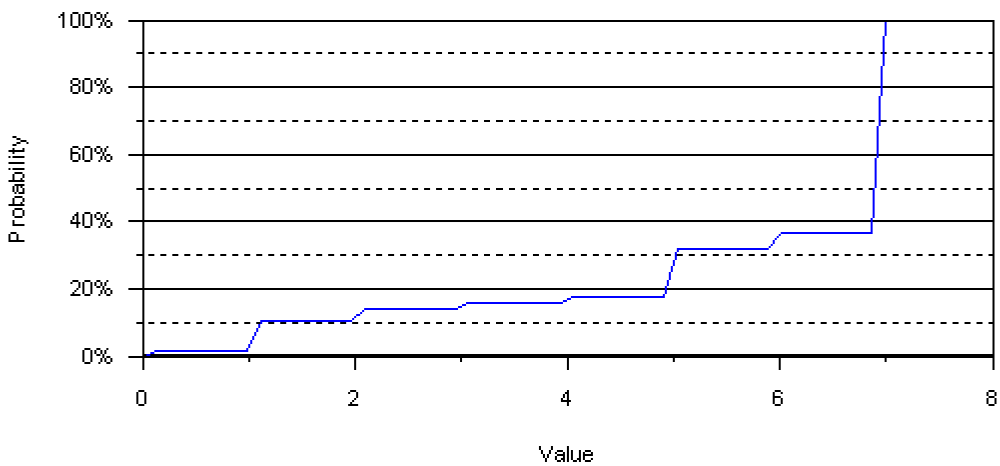
An answer to this question is not required and 355 of 407 respondents chose not to answer.

24f) Peer Review

Probability Density Function



Cumulative Distribution

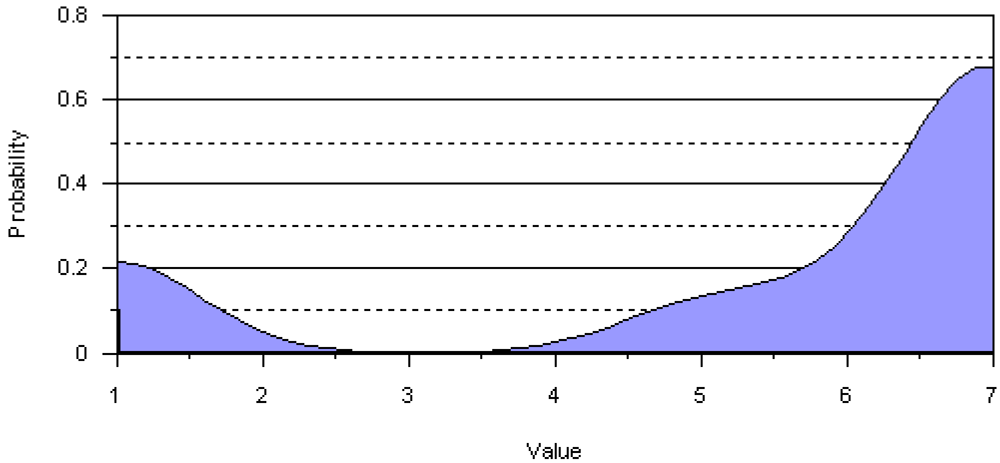


Average:	5.72
Standard Deviation:	2.09
Minimum:	0.00
Maximum:	7.00

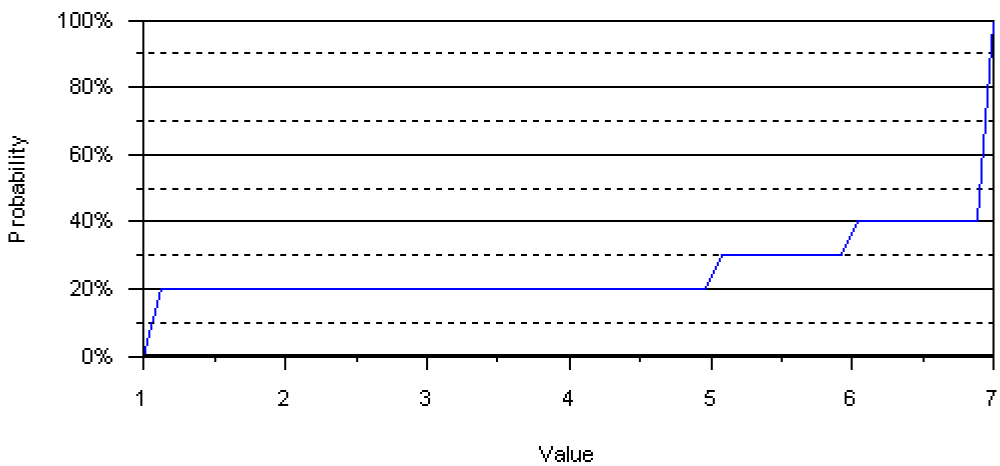
An answer to this question is not required and 350 of 407 respondents chose not to answer.

24g) Other: (specify)

Probability Density Function



Cumulative Distribution



Average:	5.50
Standard Deviation:	2.46
Minimum:	1.00
Maximum:	7.00

An answer to this question is not required and 397 of 407 respondents chose not to answer.

24h) If you checked "Other" above, (please specify QA/QC tests used):

- NFSTC Validation Kit performed also each batch a blank strip can, an IS recovery can, a gasoline kerosene diesel recovery can and a 50% evaporated can are run We also work with canine for testing of dog and our imethods
- proficiency testing also running known standards on our instruments
- proficency testing
- known IL standards

- n/a
- GC-FID and GC/MS on all fire debris samples
- Run ASTM1387 monthly, gasoline and method blank with each run, and solvent blank between each sample
- SAM mixture
- Daily Gasoline Standard

An answer to this question is not required and 398 of 407 respondents chose not to answer.

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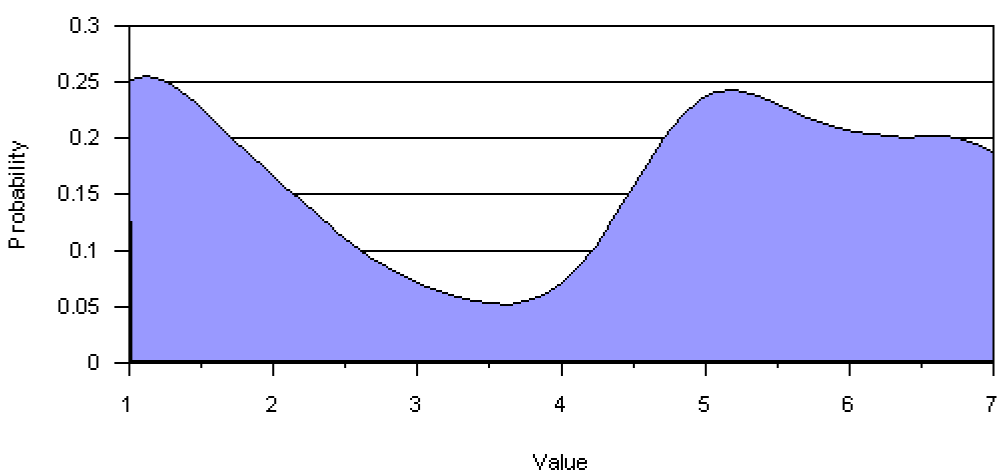
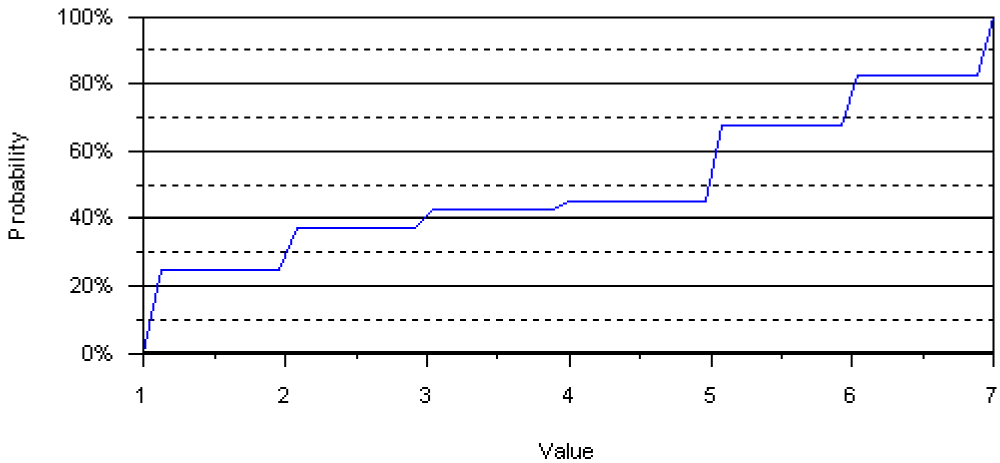
25) If you adhere to the following ASTM standards and guides, please indicate how closely you follow them? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

25a) ASTM-E 1387-01 (Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography)

Probability Density Function



Cumulative Distribution

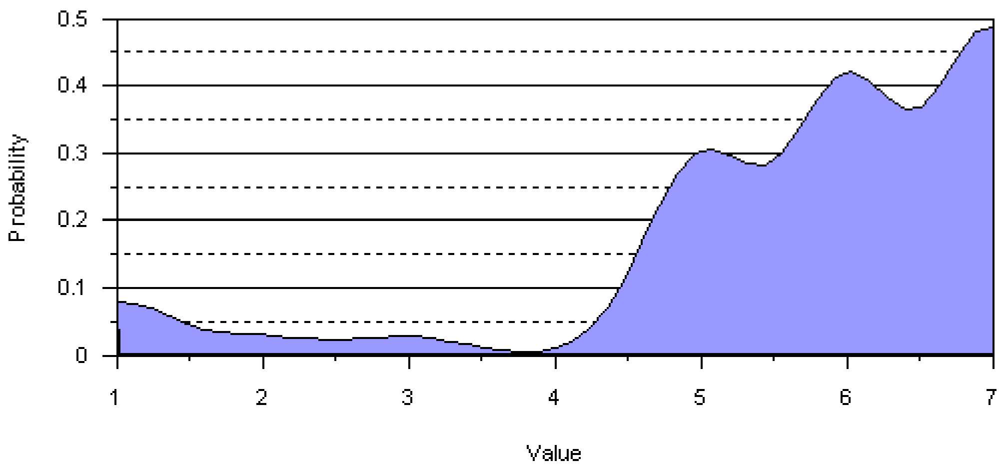


Average:	4.00
Standard Deviation:	2.31
Minimum:	1.00
Maximum:	7.00

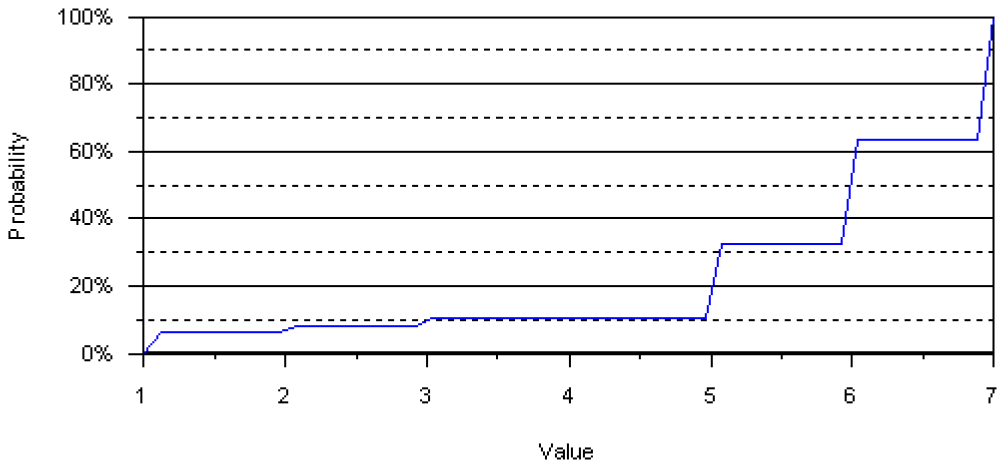
An answer to this question is not required and 367 of 407 respondents chose not to answer.

25b) ASTM-E 1618-06 (Standard Test Method for Ignitable Liquid Extracts by Gas Chromatography – Mass Spectrometry)

Probability Density Function



Cumulative Distribution

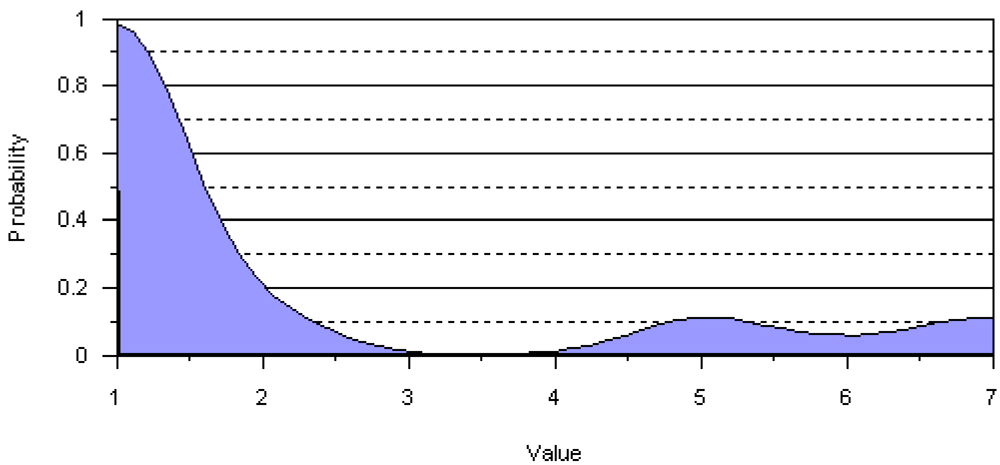


Average:	5.69
Standard Deviation:	1.61
Minimum:	1.00
Maximum:	7.00

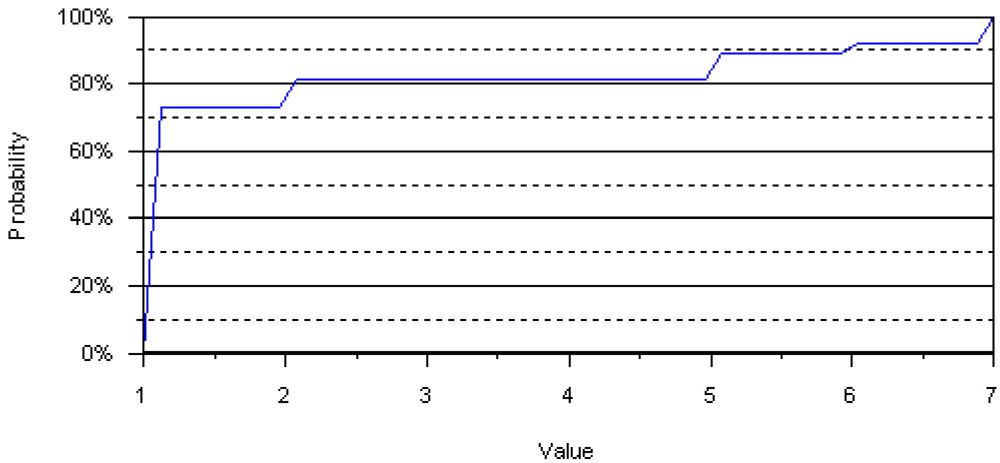
An answer to this question is not required and 358 of 407 respondents chose not to answer.

25c) ASTM-E 1385-00 (Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Steam Distillation)

Probability Density Function



Cumulative Distribution

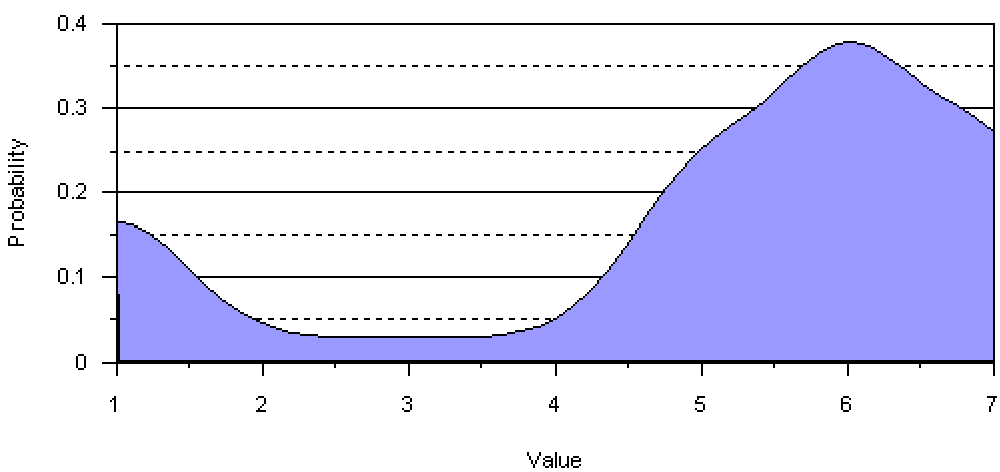


Average:	2.03
Standard Deviation:	2.01
Minimum:	1.00
Maximum:	7.00

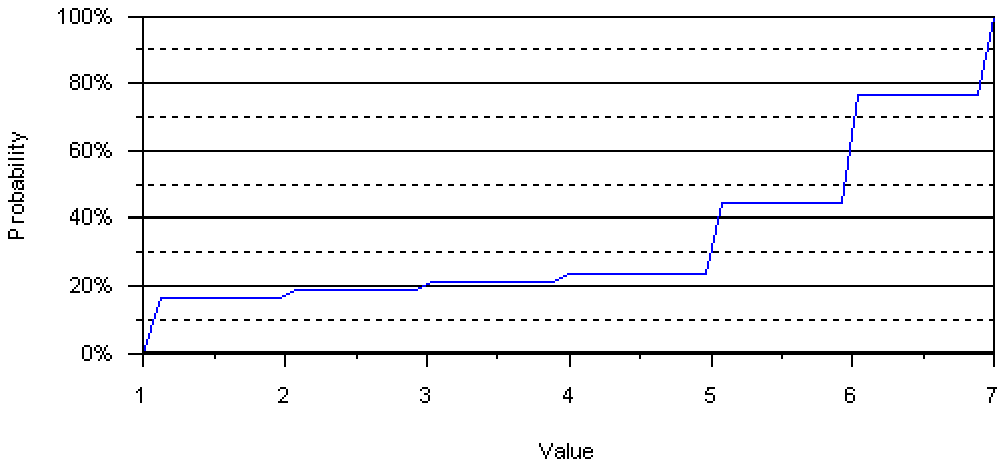
An answer to this question is not required and 370 of 407 respondents chose not to answer.

25d) ASTM-E 1412-00(2005) (Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration)

Probability Density Function



Cumulative Distribution



Average: 5.00

Standard Deviation: 2.07

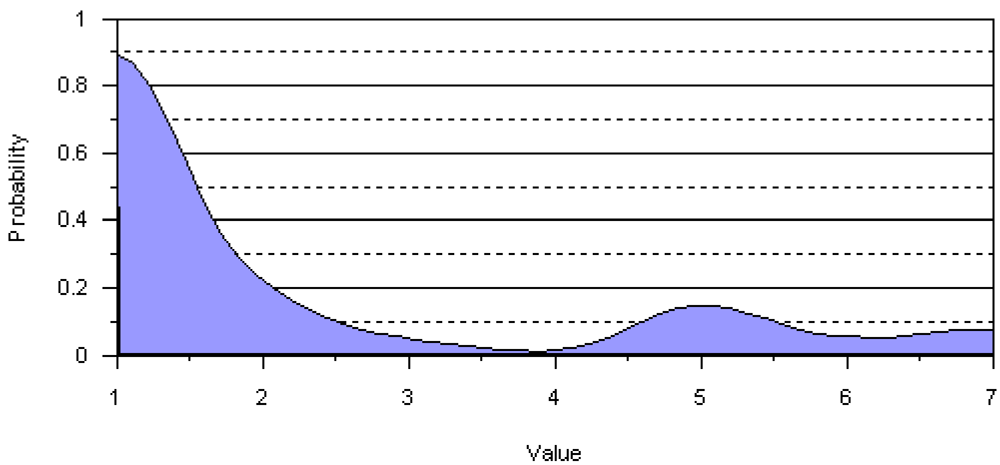
Minimum: 1.00

Maximum: 7.00

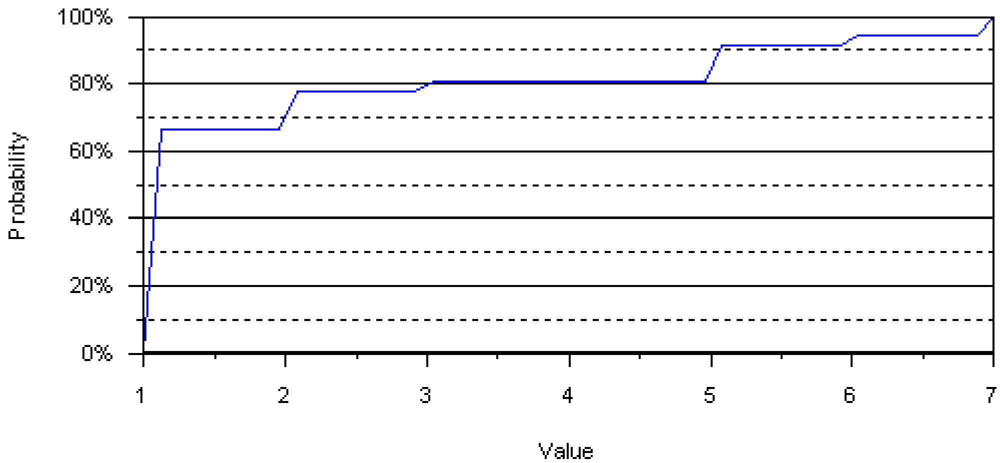
An answer to this question is not required and 364 of 407 respondents chose not to answer.

25e) ASTM-E 1413-06 (Standard Practice for Separation and Concentration of Liquid Residues from Fire Debris Samples by Dynamic Headspace Concentration)

Probability Density Function



Cumulative Distribution



Average: 2.08

Standard Deviation: 1.90

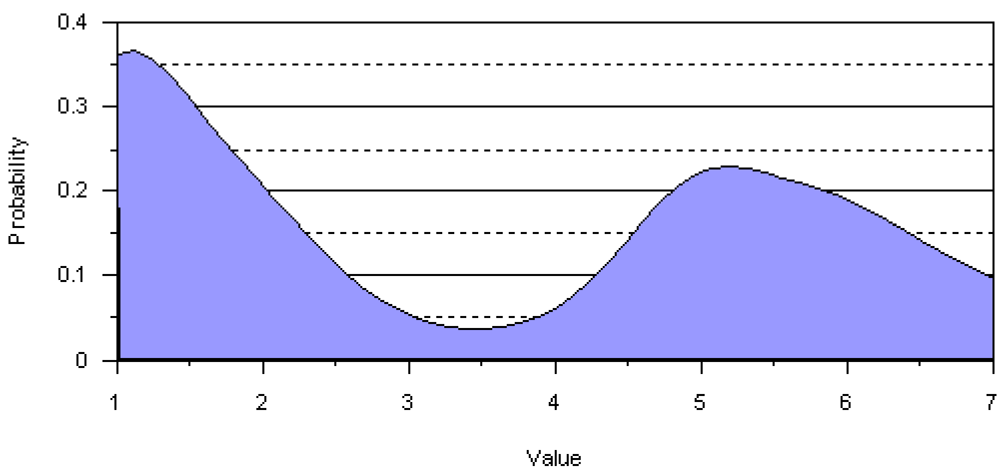
Minimum: 1.00

Maximum: 7.00

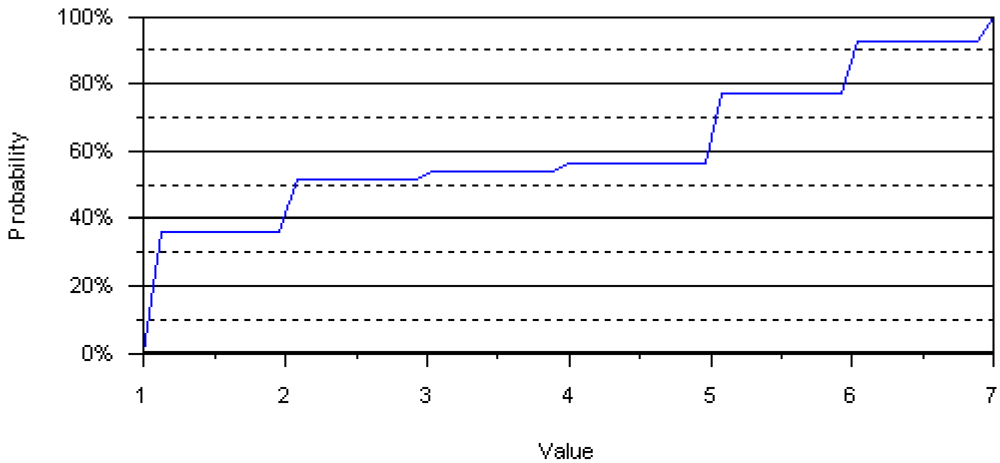
An answer to this question is not required and 371 of 407 respondents chose not to answer.

25f) ASTM-E 1388-05 (Standard Practice for Sampling of Vapors from Fire Debris Samples)

Probability Density Function



Cumulative Distribution

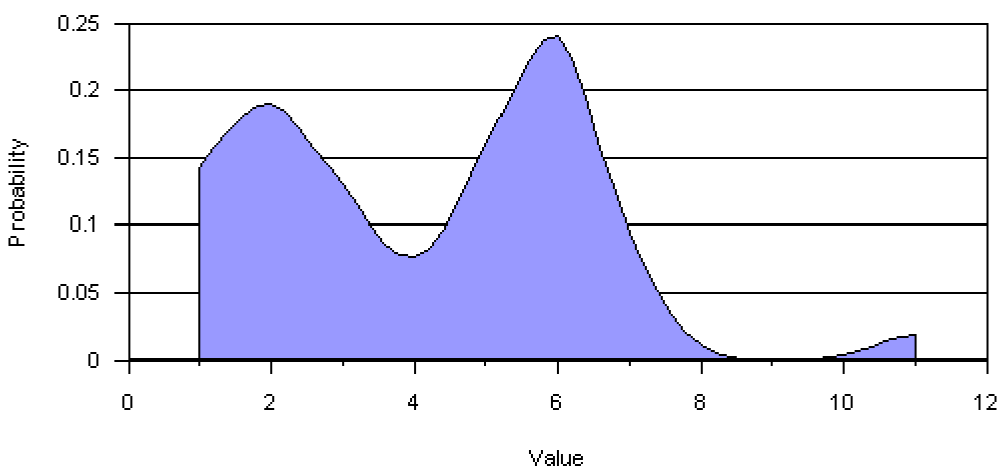


Average:	3.33
Standard Deviation:	2.25
Minimum:	1.00
Maximum:	7.00

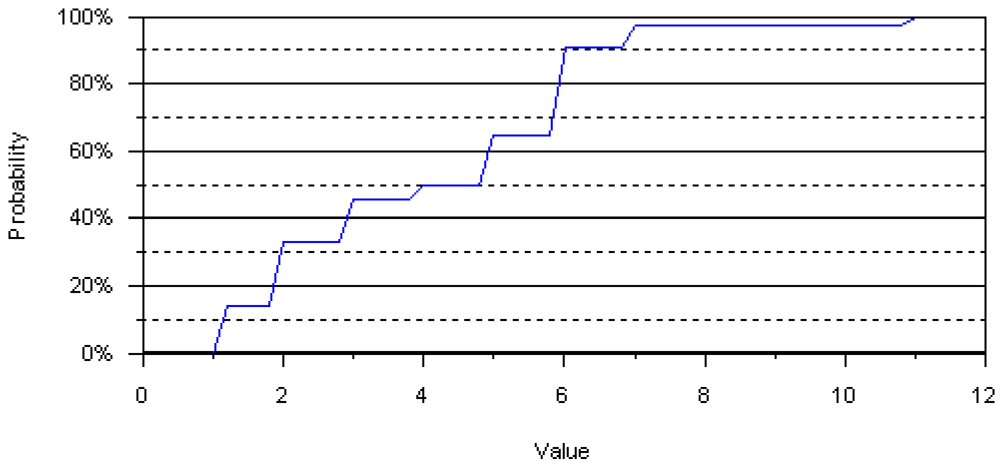
An answer to this question is not required and 368 of 407 respondents chose not to answer.

25g) ASTM-E 1386-00(2005) (Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction)

Probability Density Function



Cumulative Distribution

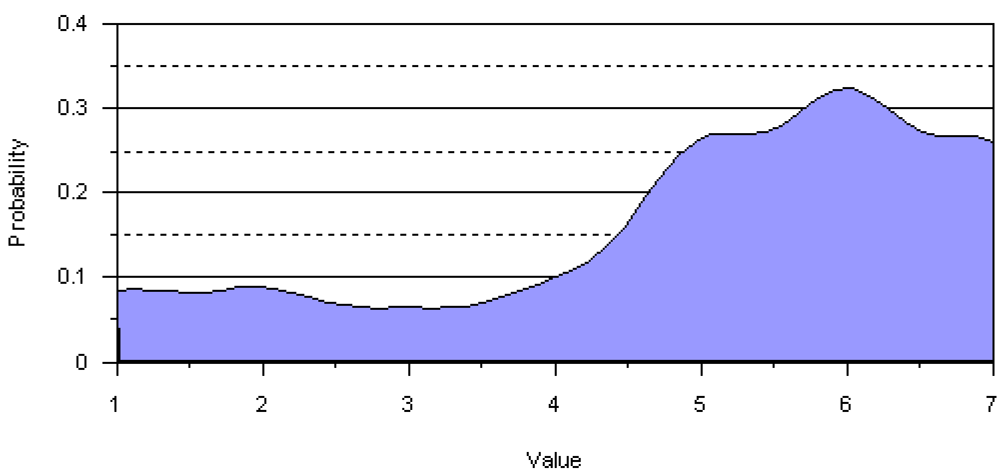


Average:	4.12
Standard Deviation:	2.30
Minimum:	1.00
Maximum:	11.00

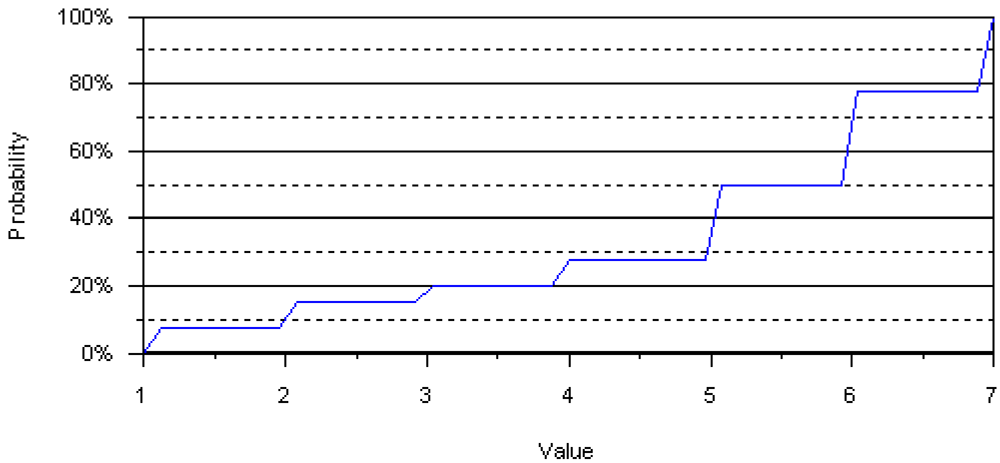
An answer to this question is not required and 365 of 407 respondents chose not to answer.

25h) ASTM-E 1492-05 (Standard Practice for Receiving, Documenting, Storing and Retrieving Evidence in a Forensic Science Laboratory)

Probability Density Function



Cumulative Distribution



Average: 5.03

Standard Deviation: 1.85

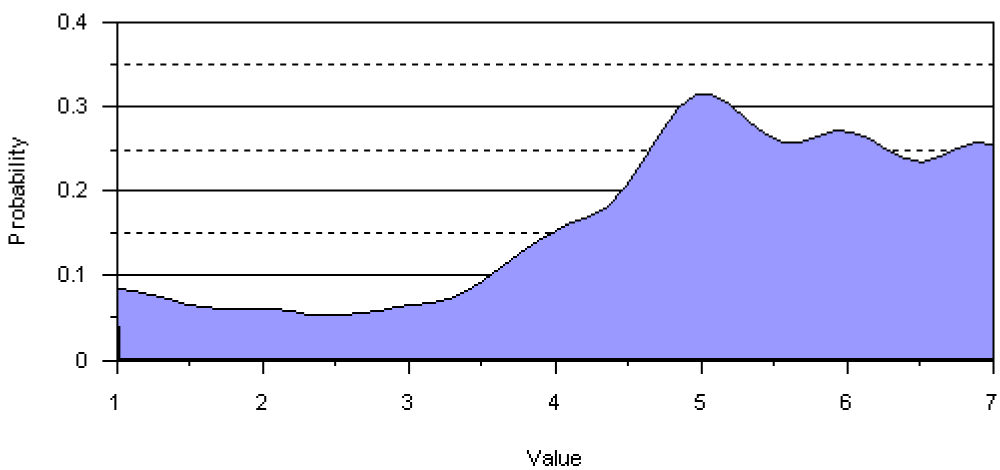
Minimum: 1.00

Maximum: 7.00

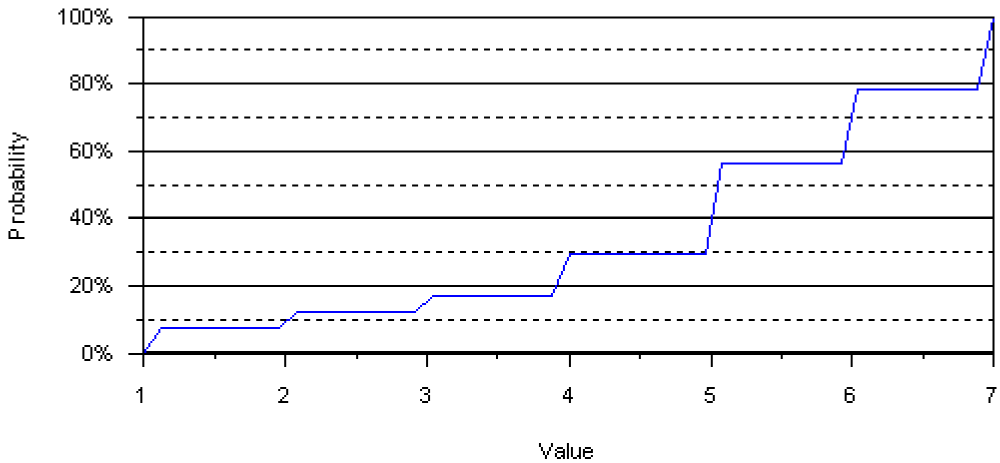
An answer to this question is not required and 367 of 407 respondents chose not to answer.

25i) ASTM-E 1459-92(2005) (Physical Evidence Labeling and Related Documentation)

Probability Density Function



Cumulative Distribution



Average:	5.00
Standard Deviation:	1.76
Minimum:	1.00
Maximum:	7.00

An answer to this question is not required and 366 of 407 respondents chose not to answer.

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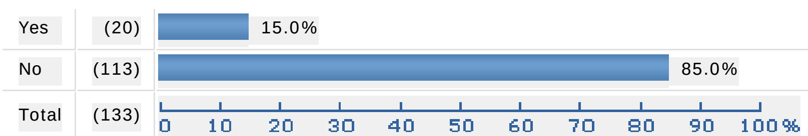
26) Are you aware of new equipment or techniques on the market or in development that could be potentially of use in fire debris analysis? These may be in the extraction, analysis, instrumentation, or interpretation of fire debris and ignitable liquids. Please indicate the type of potential improvement such as: reduction of analysis time, elimination of background, specificity of identification, etc...?



An answer to this question is not required and 274 of 407 respondents chose not to answer.

26a) Description and/or Contact

- Galaxie Software
- I would like to develop a GC/MS/MS method on Saturn 2000 If anyone has info
  I worked a NASA for a five years and we recovered used TENAX Solid Sorbant Materials , collected with SAS and then cryo focused GC/MS I do not have the preconcentrator or instrumentation but I do believe we could have excellent recovery, maybe try different combos of sorbents

- Jeff Foust; tower112@verizon.net
- GC-GC, coelution software
- Flash GC/saves time
- Currently developing a database of pyrolysis products
- 1. GC X GC/MS - Coast Guard
  2. FT-Ion Cyclotron MS - Alan Marshal @ Florida State
  3. Stable Isotope Ratio MS - John Jasper
  4. DART with JEOL
- Rapid idaho tech.
- Statical methods for automated searches of a database. Contact Dr. Michael Sigman of the National Center for Forensic Science.
- All of our samples are sent out to State/Federal labs for analysis
- not new - but dflex apparatus when put into can during evidence collection seem to mitigate effects of length between collection and examination on samples
- Not brand new but we are using ALS (Alternative Light)
- reduction of analysis time-custom column
- Lt. Joe Powell
- fast GC, GC-IRMS
- Time of Flight GC-MS

An answer to this question is not required and 391 of 407 respondents chose not to answer.

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27) What are the short-term needs in analytical methods for fire debris analysis?

- Faster turn-around time, more personnel, better software
- More pyrolysis matrix practice!
- more rapid turn around times from the laboratories doing the analysis
- Better information on background interferences
- Higher Resolution
- Comparison improvement in selectivity
- updated software, GC comsumables
- Better method for recovery of light oxygenates in every sample (i.e. without special prep, separate extraction, etc,)
- Access to standards
- Replacing CS2 as a solvent
  Alternate extraction media other than the ACS
- More training opportunities
- HAving State LAbs process Faster COOK COUNTY IL
- Faster analysis
- N/A for our investigation team
- Fire debris control samples and fire debris other than ignitable liquids
- Financial
- None
- GREATER PERSONNEL

- N/A
- Reduction in analysis time.
- Our team dooesn't deal in these matters.
- Not a lab guy, can't tell you other than the ISP lab is awful and never gets a positive sample.
- better communication between technicians and investigators
- Field GC
- update standards and pyrolysis database
- GC/MS in all labs
- simple/reliable/testifible on scene real time hit on accelerents-either polar or non-polar.
- N/A

An answer to this question is not required and 379 of 407 respondents chose not to answer.

---

28) What are the long-term needs in analytical methods for fire debris analysis?

- fingerprinting of ignitable liquids, expecially in regards to relating the liquid found at the scene to the liquid found in t he fire debris.
- Database of pyrolysis products and pyrolysis/ILR mix
  More sensitive and discriminating sorbant develop.
- same a #27, often results are received too late to be of much help to an investigation.
- A comprehensive library of ignitable liquids with TIC and EIC of compounds
- See #27
- Library Searches on TIC
- Better containers
- TRACEABLE STANDARDS
- Pyrolysis database
  Classes offered for interpretation of pyrolysis products
  Classes offered for advance organic chemistry for fire debris analysts
- pyrolysis standards, extensive training of recovery of materail, access to new technology
- More info about petroleum products in background materials (quantities, types, etc.)
- Sharing of data nationwide
- Consistency of reports and better interaction between laboratory analysts and fire investigators
- Indiviualization of IL found on two sources - matching.
  Pyrolisis Product Standards.
  Applying FAST GC
  Items in #
- Shorter run times, extraction times
- effects of ignitable liquids on the human body
- On site initial testing - example a small kit
- unknown
- Influence of heat and fire on materials
- Financial
- Better adherence to ASTM standards
- IN DEPTH SCIENTIFIC METHOD

- We would like to see production of DFLEX resume.
- N/A
- Consistency and increased specificity in data interpretation. Reduce effects from interfering products.
- N/A
- see above
- reduced costs associated with modern instrumentation
- update instrumentations
- New/better adsorption media, solventless elutions
- nationally recognized varifiable results from documented on scene equipment, used by on scene investigators
- new equipment

An answer to this question is not required and 375 of 407 respondents chose not to answer.

---

v) **Part E. Fire Debris Data Interpretation (Check an answer only on those questions which apply to you)**

---

29) How often do you use an in-house ignitable liquid reference collection in case work?

never	(43)	37.7%
sometimes	(21)	18.4%
often	(21)	18.4%
every case	(29)	25.4%
Total	(114)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 293 of 407 respondents chose not to answer.

---

30) How often have you used the on-line Ignitable Liquid Reference Collection (ILRC) in case work? (See http://ncfs.ucf.edu/databases.html for more information about this database)

never	(66)	59.5%
sometimes	(32)	28.8%
often	(11)	9.9%
every case	(2)	1.8%
Total	(111)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 296 of 407 respondents chose not to answer.

31) How does your laboratory routinely identify an ignitable liquid in fire debris (check one):

Pattern recognition by FID pattern alone	(3)	4.2%
Pattern recognition by TIC pattern alone	(2)	2.8%
Pattern recognition by mass chromatography (extracted ion chromatogram or extracted ion profile)	(52)	73.2%
target analysis	(0)	0.0%
Identification of individual components	(5)	7.0%
Other: (specify)	(9)	12.7%
Total	(71)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 336 of 407 respondents chose not to answer.

31a) If you checked "Other" above please specify how your laboratory would identify an ignitable liquid:

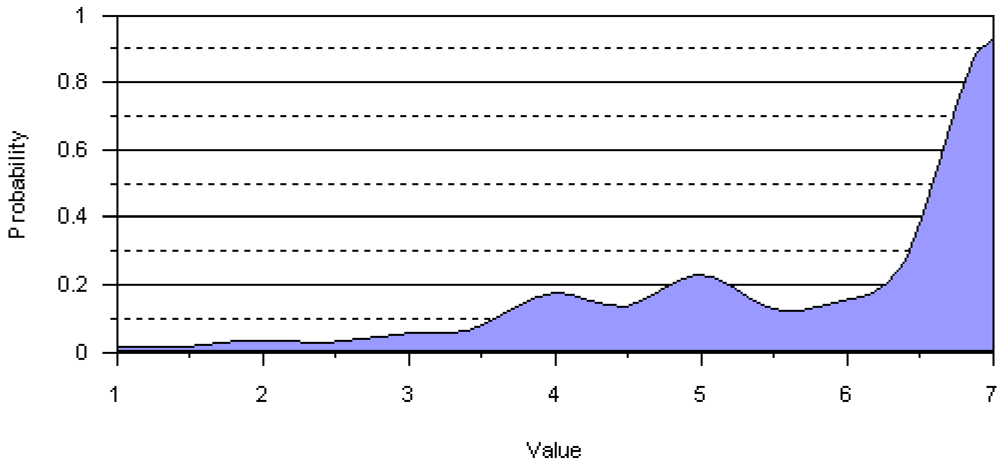
- all of the above
- Combination of TIC, EIC and component identification
- TIC also
- Combo of pattern recognition by TIC, EIC and identification of target compounds.
- Acombination of all of them: pattern from the TIC, and individual componenets within the pattern
- N/A
- outsourced
- N/A
- Tic Pattern, extracted ion pattern, and identification of individual components

An answer to this question is not required and 398 of 407 respondents chose not to answer.

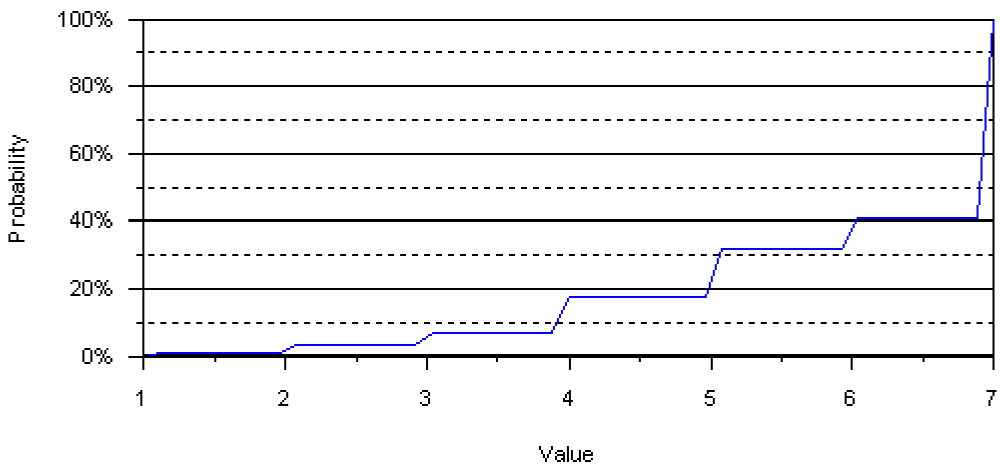
32) Rate the importance of the following courses as part of the education of fire debris analysts. (1-7 where: 1 = Not Important, 4 = Moderate, 7 = Extremely)

32a) General chemistry

Probability Density Function



Cumulative Distribution

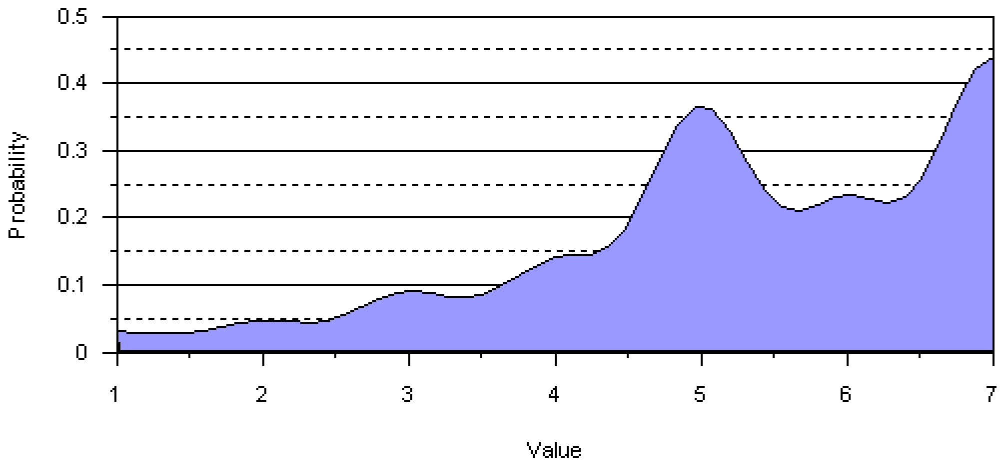


Average:	5.99
Standard Deviation:	1.46
Minimum:	1.00
Maximum:	7.00

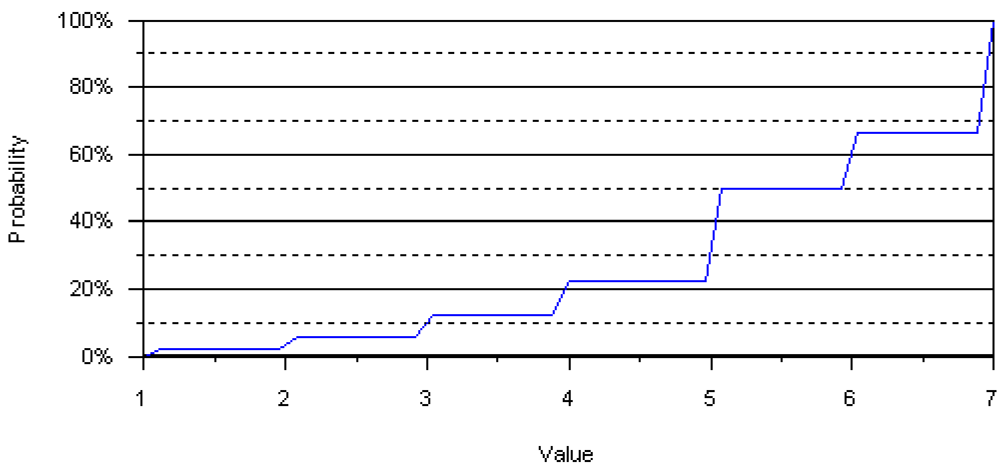
An answer to this question is not required and 316 of 407 respondents chose not to answer.

32b) Advanced organic chemistry

Probability Density Function



Cumulative Distribution

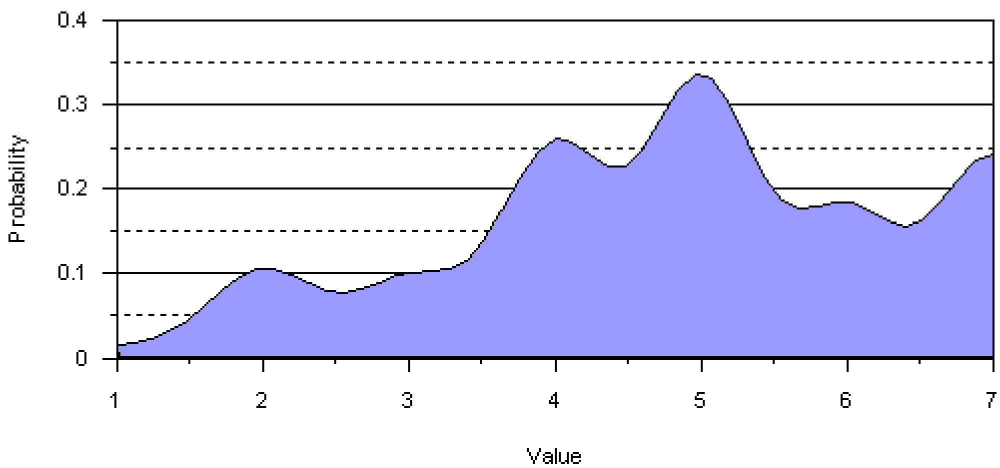


Average:	5.41
Standard Deviation:	1.54
Minimum:	1.00
Maximum:	7.00

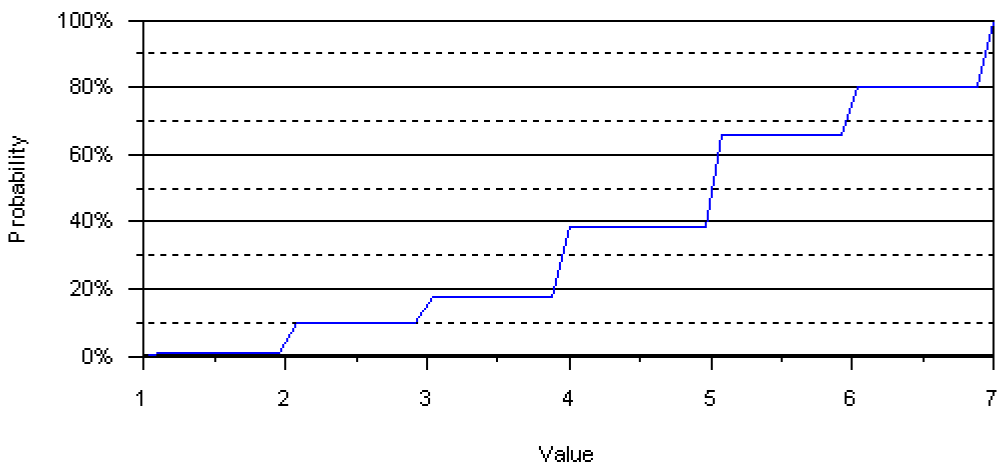
An answer to this question is not required and 317 of 407 respondents chose not to answer.

32c) Inorganic chemistry

Probability Density Function



Cumulative Distribution

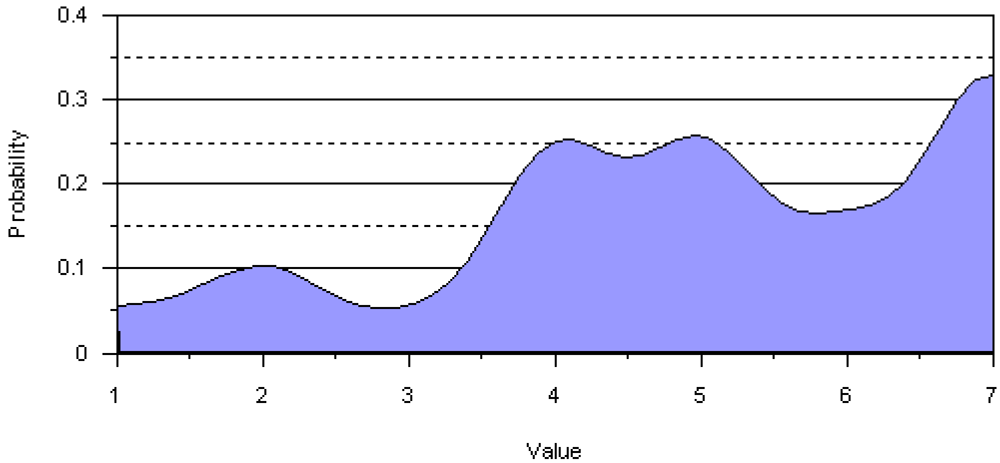


Average:	4.87
Standard Deviation:	1.56
Minimum:	1.00
Maximum:	7.00

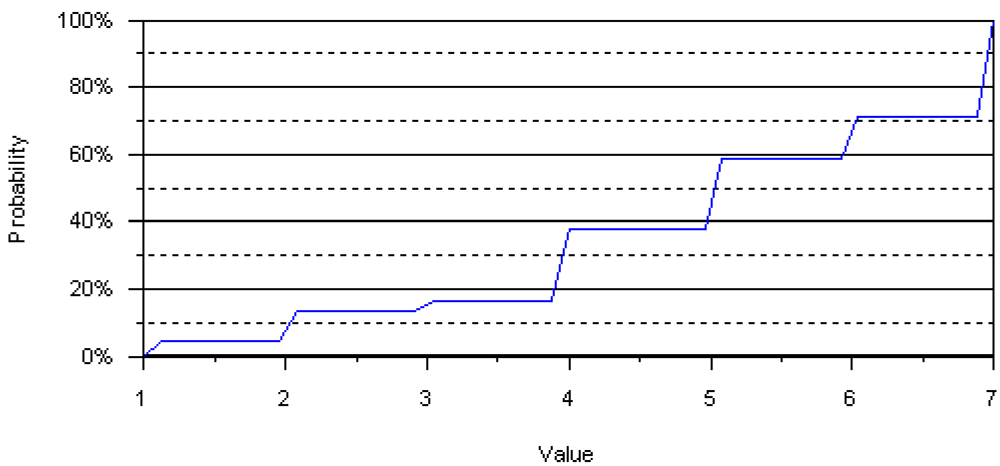
An answer to this question is not required and 316 of 407 respondents chose not to answer.

32d) Introductory physics

Probability Density Function



Cumulative Distribution

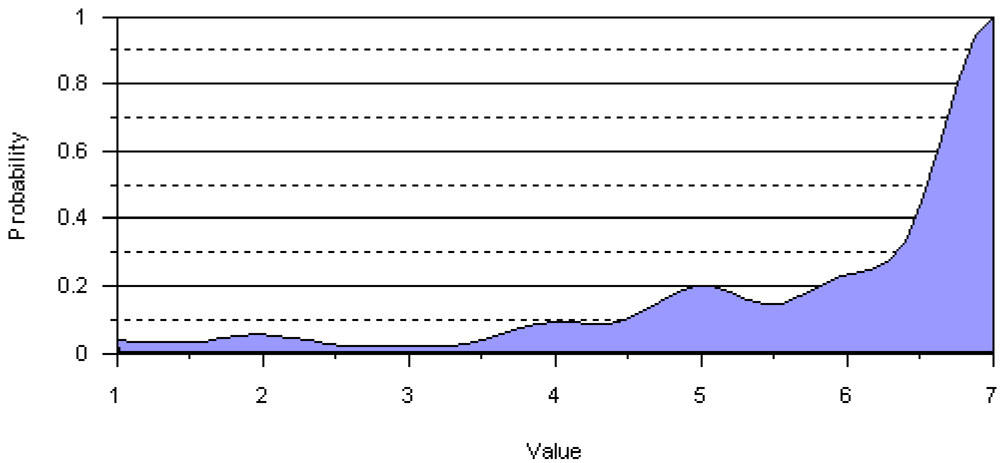


Average:	4.98
Standard Deviation:	1.78
Minimum:	1.00
Maximum:	7.00

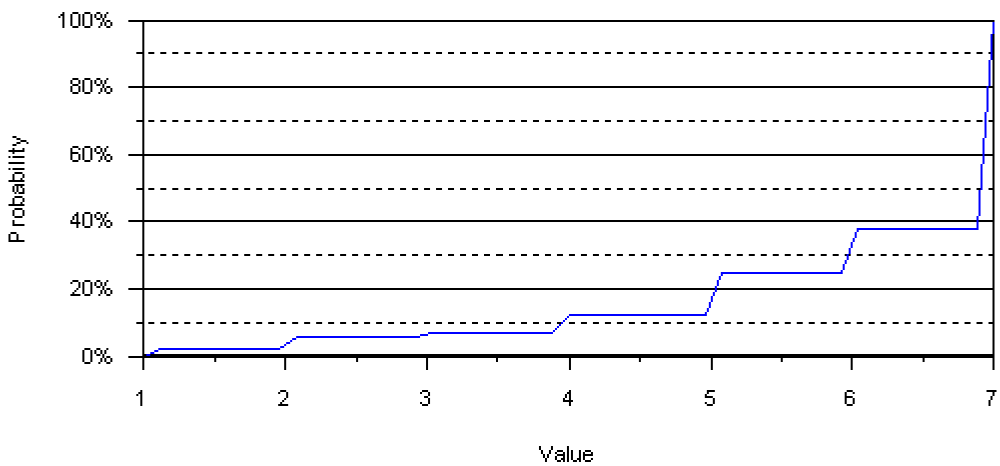
An answer to this question is not required and 317 of 407 respondents chose not to answer.

32e) Instrumental analysis

Probability Density Function



Cumulative Distribution

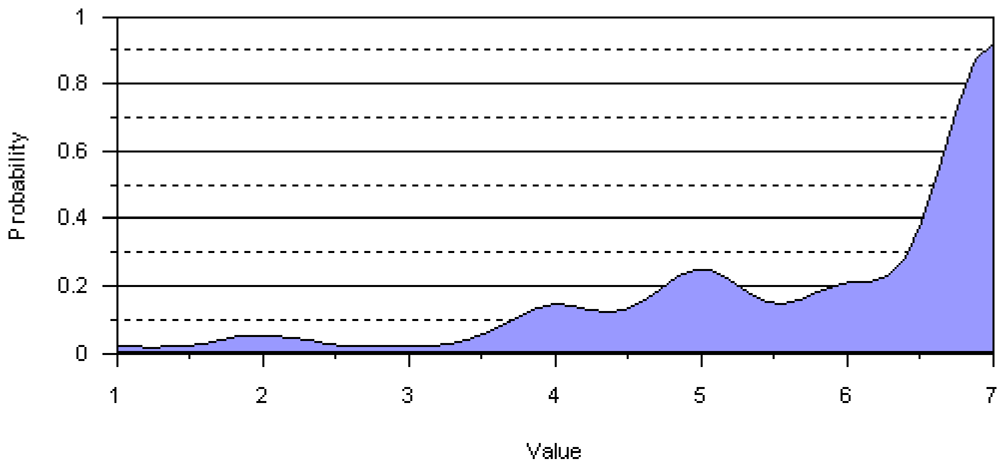


Average:	6.11
Standard Deviation:	1.47
Minimum:	1.00
Maximum:	7.00

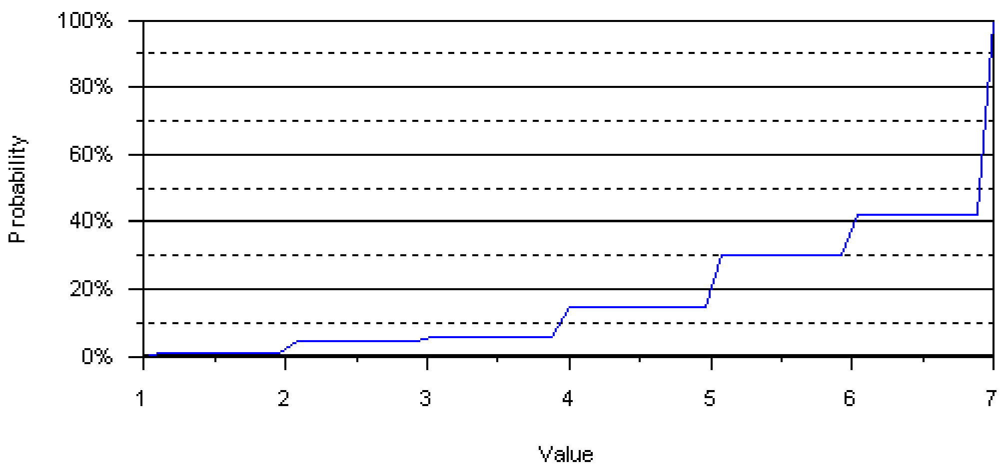
An answer to this question is not required and 317 of 407 respondents chose not to answer.

32f) Organic chemistry

Probability Density Function



Cumulative Distribution

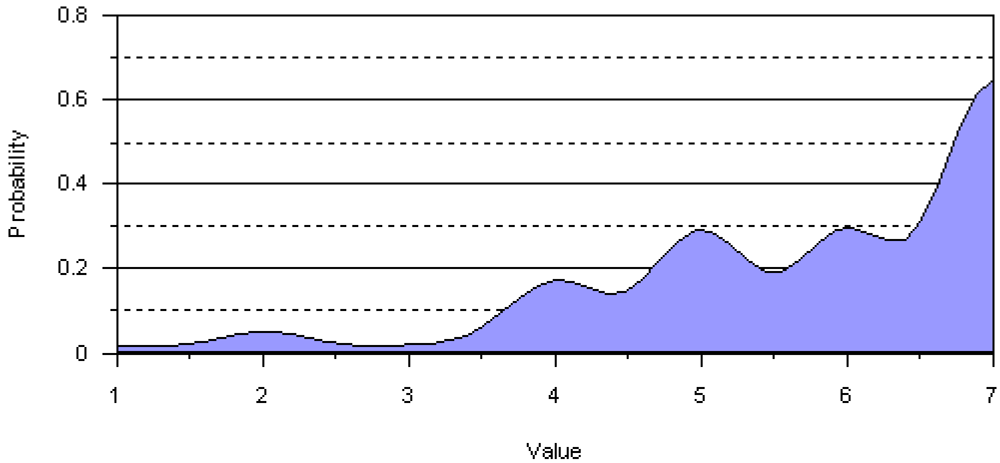


Average:	6.02
Standard Deviation:	1.42
Minimum:	1.00
Maximum:	7.00

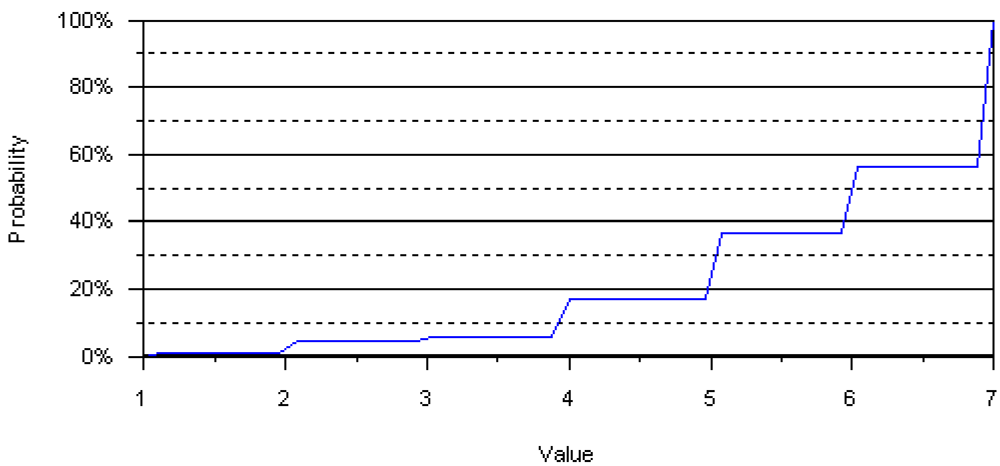
An answer to this question is not required and 317 of 407 respondents chose not to answer.

32g) Analytical chemistry

Probability Density Function



Cumulative Distribution

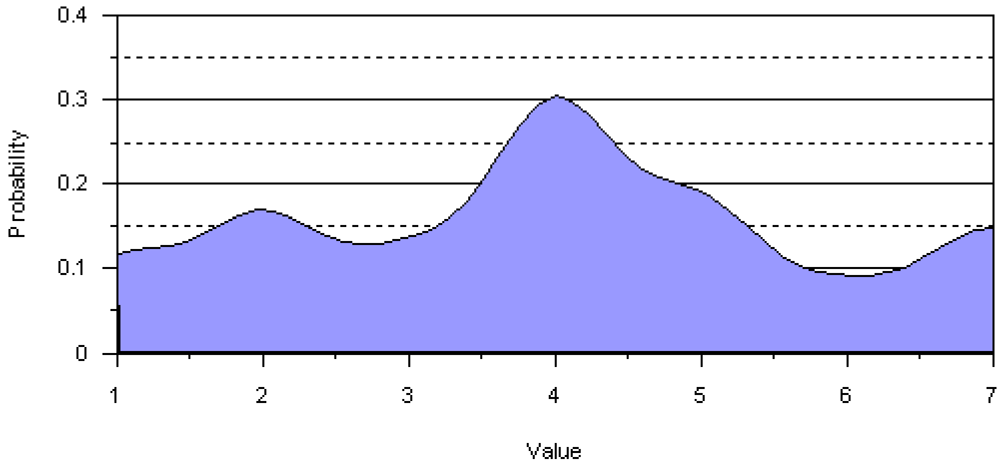


Average:	5.78
Standard Deviation:	1.42
Minimum:	1.00
Maximum:	7.00

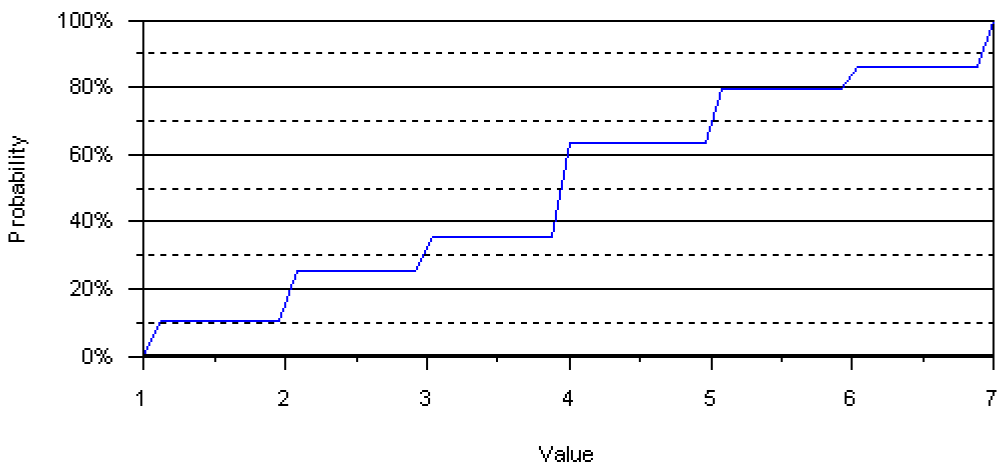
An answer to this question is not required and 320 of 407 respondents chose not to answer.

32h) Advanced physics

Probability Density Function



Cumulative Distribution

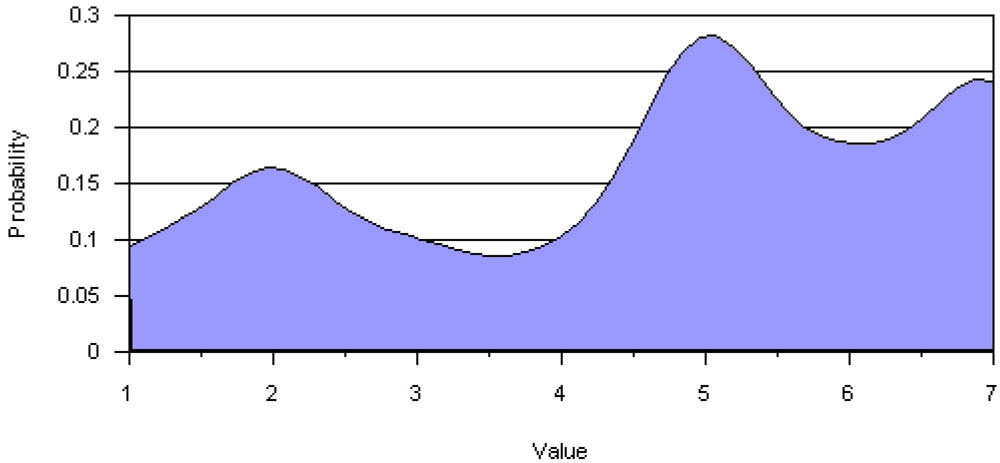


Average:	4.00
Standard Deviation:	1.83
Minimum:	1.00
Maximum:	7.00

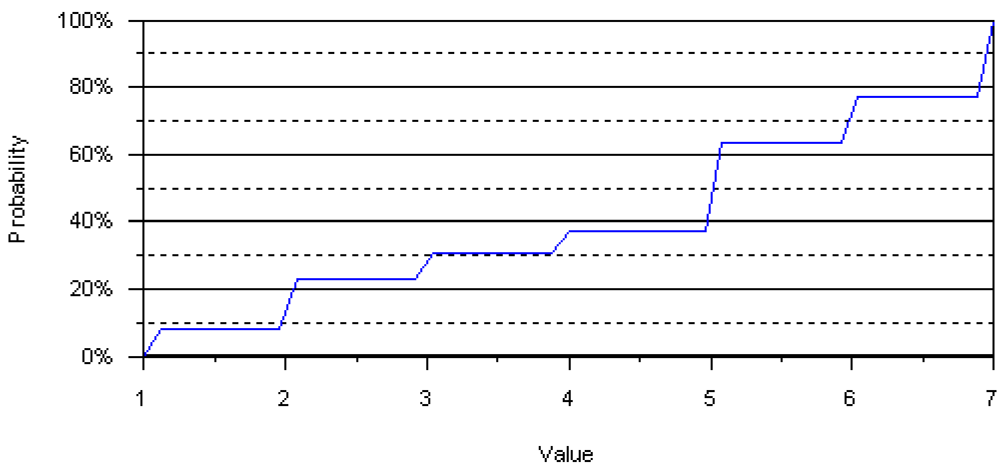
An answer to this question is not required and 320 of 407 respondents chose not to answer.

32i) Physical chemistry

Probability Density Function



Cumulative Distribution

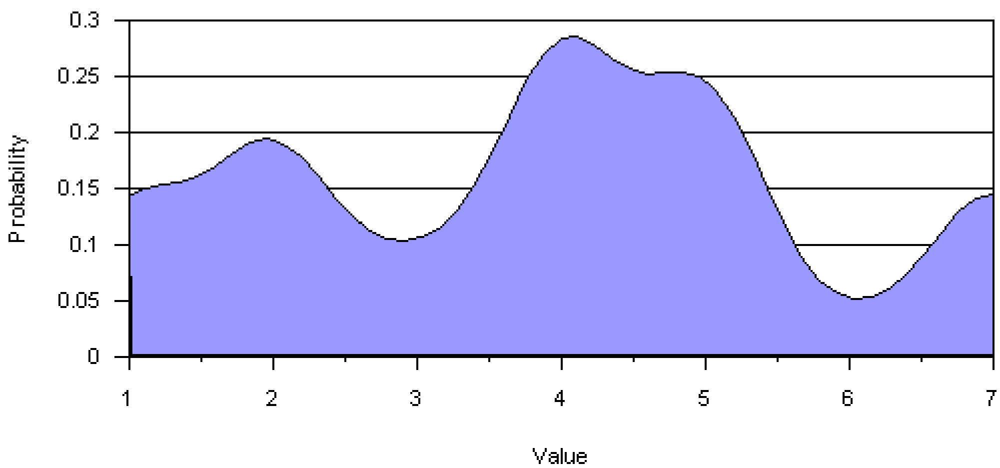


Average:	4.60
Standard Deviation:	1.98
Minimum:	1.00
Maximum:	7.00

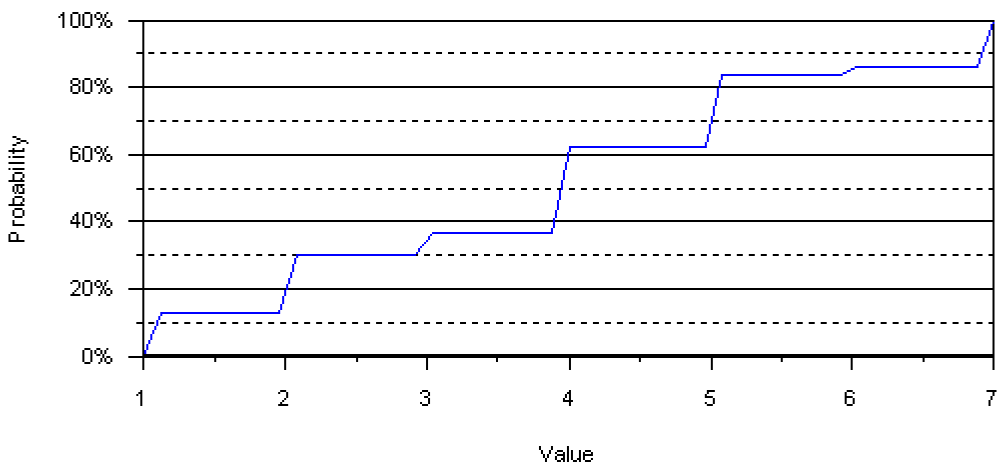
An answer to this question is not required and 319 of 407 respondents chose not to answer.

32j) Advanced physics

Probability Density Function



Cumulative Distribution

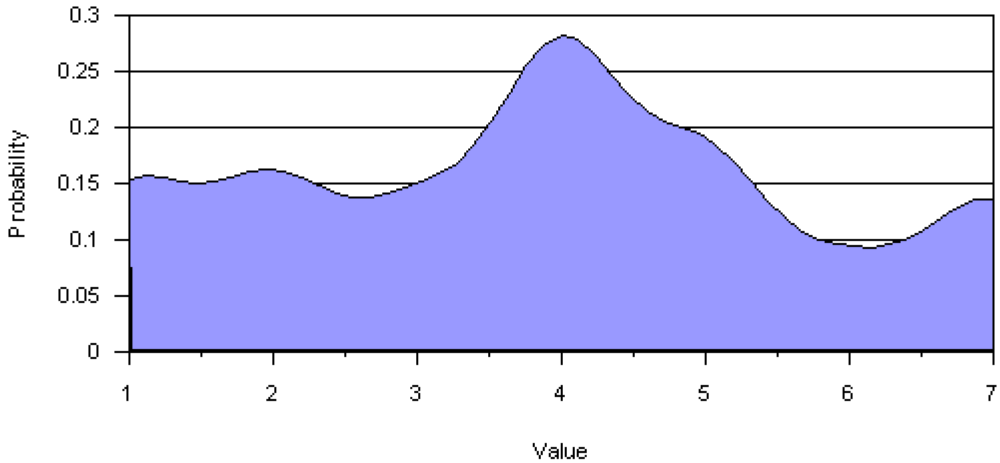


Average:	3.89
Standard Deviation:	1.86
Minimum:	1.00
Maximum:	7.00

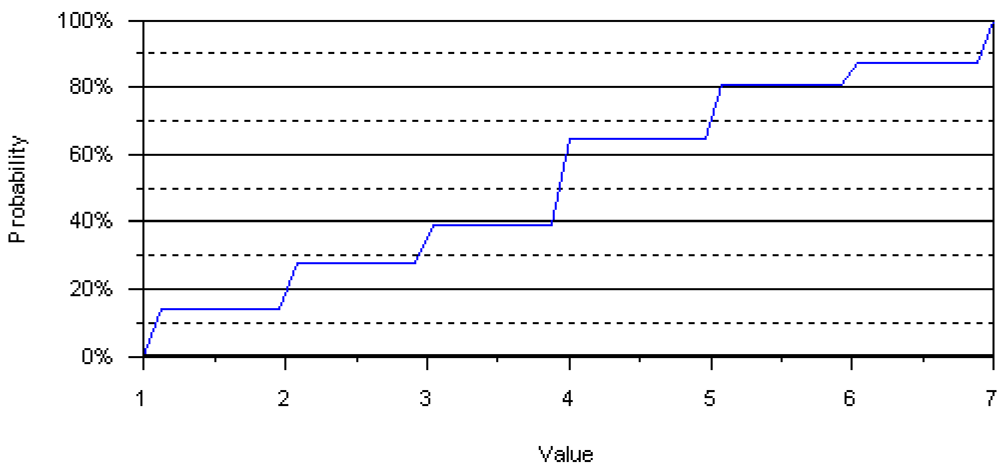
An answer to this question is not required and 320 of 407 respondents chose not to answer.

32k) Advanced mathematics

Probability Density Function



Cumulative Distribution



Average:	3.87
Standard Deviation:	1.87
Minimum:	1.00
Maximum:	7.00

An answer to this question is not required and 320 of 407 respondents chose not to answer.

32l) Other:

- 7
- 7
- 5
- 7

An answer to this question is not required and 403 of 407 respondents chose not to answer.

32m) (if other please indicate course names here):

- One needs either a degree in chemistry or sufficient chemistry, physics and math . I personally went back to school after already having a B>A> and took sciene and egineering courses-eventually received an MS-mainly though in house continuous learning on the job is a must!!
- Spectroscopy / Structural Elucidation
- Combustion gas analysis
- Digital Imaging
- logic

An answer to this question is not required and 402 of 407 respondents chose not to answer.

---

vi) **Part F. Explosives Analysis Case Work (Check an answer only on those questions which apply to you)**

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vii) Please indicate which, if any, of the following explosives analytical laboratory procedures your agency performed (items 34 through 41) and the number of times they were performed items 42 through 49) in 2006:

Analytical Procedure (Yes/No)

---

33) Intact Low Explosives

Yes	(35)	44.9%
No	(43)	55.1%
Total	(78)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 329 of 407 respondents chose not to answer.

---

34) Intact High Explosives

Yes	(20)	26.0%
No	(57)	74.0%
Total	(77)	

An answer to this question is not required and 330 of 407 respondents chose not to answer.

35) Intact IED's

Yes	(27)	35.1%
No	(50)	64.9%
Total	(77)	

An answer to this question is not required and 330 of 407 respondents chose not to answer.

36) Post-Blast Low Explosives

Yes	(43)	56.6%
No	(33)	43.4%
Total	(76)	

An answer to this question is not required and 331 of 407 respondents chose not to answer.

37) Post Blast High Explosives

Yes	(16)	21.3%
No	(59)	78.7%
Total	(75)	

An answer to this question is not required and 332 of 407 respondents chose not to answer.

38) Post Blast IED's

Yes	(31)	42.5%
No	(42)	57.5%
Total	(73)	

An answer to this question is not required and 334 of 407 respondents chose not to answer.

39) Intact Incendiary Device

Yes	(37)	48.1%
No	(40)	51.9%
Total	(77)	

An answer to this question is not required and 330 of 407 respondents chose not to answer.

40) Post-Reaction incendiary

Yes	(36)	47.4%
No	(40)	52.6%
Total	(76)	

An answer to this question is not required and 331 of 407 respondents chose not to answer.

41) Intact Low Explosives

0	(24)	36.9%
1-50	(34)	52.3%
51-100	(6)	9.2%

101-150	(0)	0.0%
151-200	(0)	0.0%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(1)	1.5%
Total	(65)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 342 of 407 respondents chose not to answer.

---

42) Intact High Explosives

0	(40)	65.6%
1-50	(20)	32.8%
51-100	(1)	1.6%
101-150	(0)	0.0%
151-200	(0)	0.0%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(0)	0.0%
Total	(61)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 346 of 407 respondents chose not to answer.

---

43) Intact IED's

0	(37)	56.9%
1-50	(26)	40.0%
51-100	(1)	1.5%
101-150	(1)	1.5%
151-200	(0)	0.0%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(0)	0.0%
Total	(65)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 342 of 407 respondents chose not to answer.

44) Post-Blast Low

0	(26)	40.0%
1-50	(36)	55.4%
51-100	(2)	3.1%
101-150	(0)	0.0%
151-200	(1)	1.5%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(0)	0.0%
Total	(65)	

An answer to this question is not required and 342 of 407 respondents chose not to answer.

45) Post Blast High

0	(44)	72.1%
1-50	(16)	26.2%
51-100	(0)	0.0%
101-150	(0)	0.0%
151-200	(0)	0.0%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(1)	1.6%
Total	(61)	

An answer to this question is not required and 346 of 407 respondents chose not to answer.

46) Post Blast IED's

0	(35)	54.7%
1-50	(26)	40.6%
51-100	(2)	3.1%
101-150	(0)	0.0%
151-200	(1)	1.6%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(0)	0.0%
Total	(64)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 343 of 407 respondents chose not to answer.

47) Intact Incendiary Device

0	(31)	49.2%
1-50	(31)	49.2%
51-100	(1)	1.6%
101-150	(0)	0.0%
151-200	(0)	0.0%
201-250	(0)	0.0%
251-300	(0)	0.0%
>300	(0)	0.0%
Total	(63)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 344 of 407 respondents chose not to answer.

48) Post-Reaction incendiary

0	(30)	46.9%
1-50	(29)	45.3%
51-100	(2)	3.1%
101-150	(1)	1.6%
151-200	(1)	1.6%
201-250	(0)	0.0%
251-300	(1)	1.6%

>300	(0)	0.0%
Total	(64)	0 10 20 30 40 50 60 70 80 90 100%

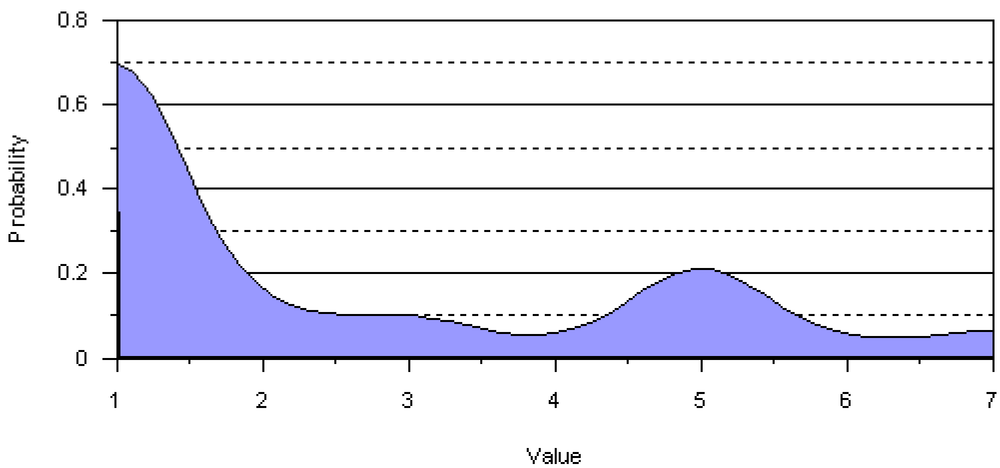
An answer to this question is not required and 343 of 407 respondents chose not to answer.

viii) **Part G. Explosives Analytical Methods (Check an answer only on those questions which apply to you)**

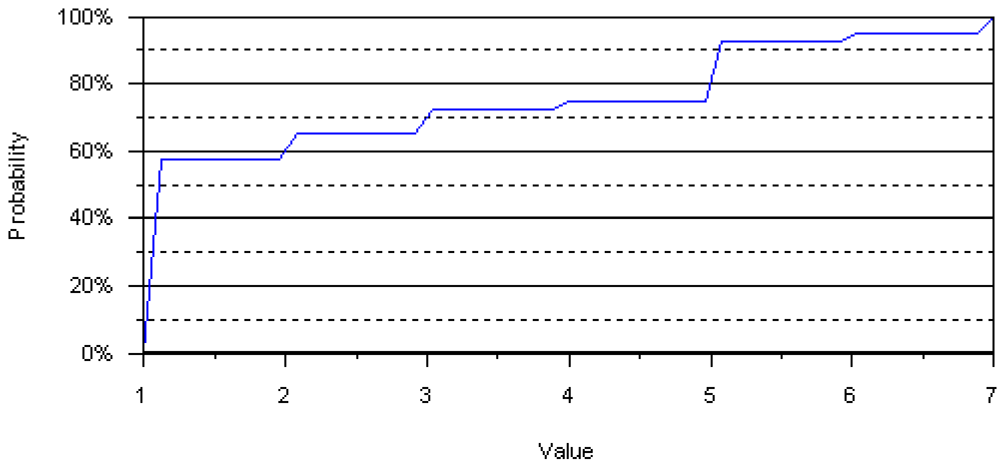
49) In explosives analyses, how often do you use each of the following analytical techniques? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

49a) Microchemical analysis using PLM

Probability Density Function



Cumulative Distribution

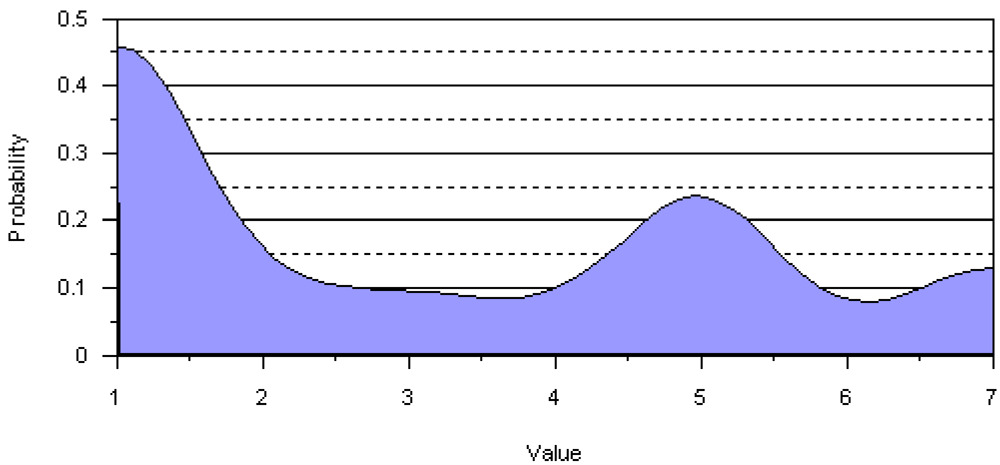


Average:	2.42
Standard Deviation:	1.97
Minimum:	1.00
Maximum:	7.00

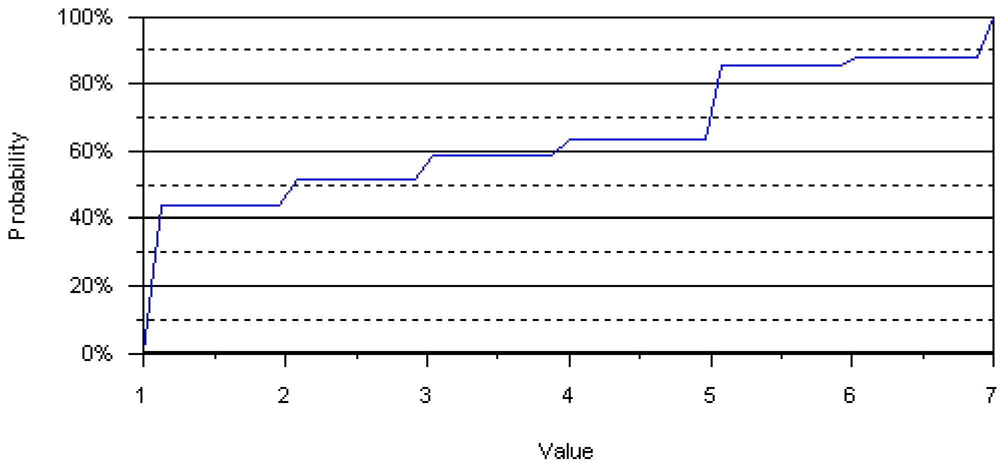
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49b) Spot tests

Probability Density Function



Cumulative Distribution

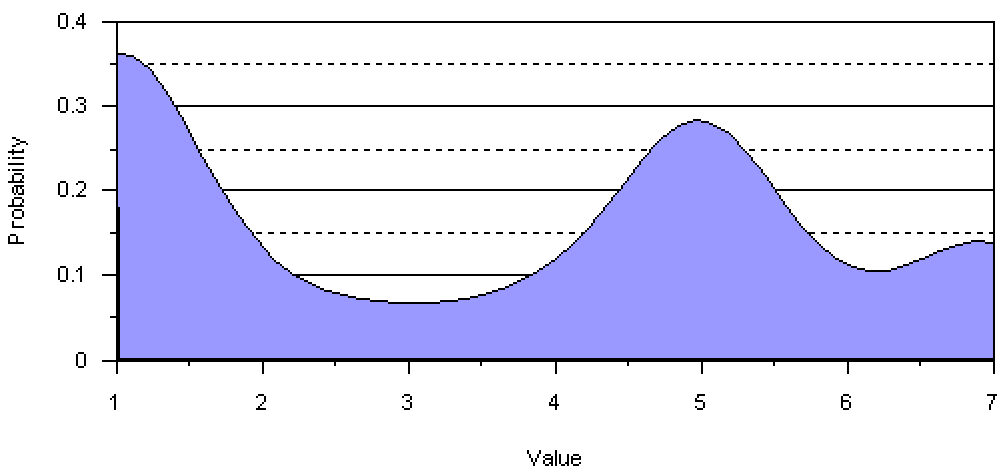


Average:	3.10
Standard Deviation:	2.25
Minimum:	1.00
Maximum:	7.00

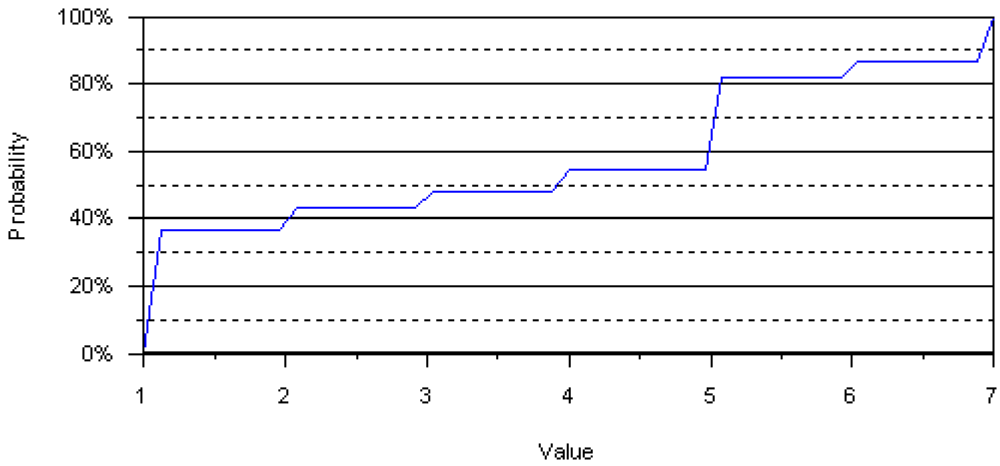
An answer to this question is not required and 366 of 407 respondents chose not to answer.

49c) Ignition analysis

Probability Density Function



Cumulative Distribution



Average: 3.50

Standard Deviation: 2.27

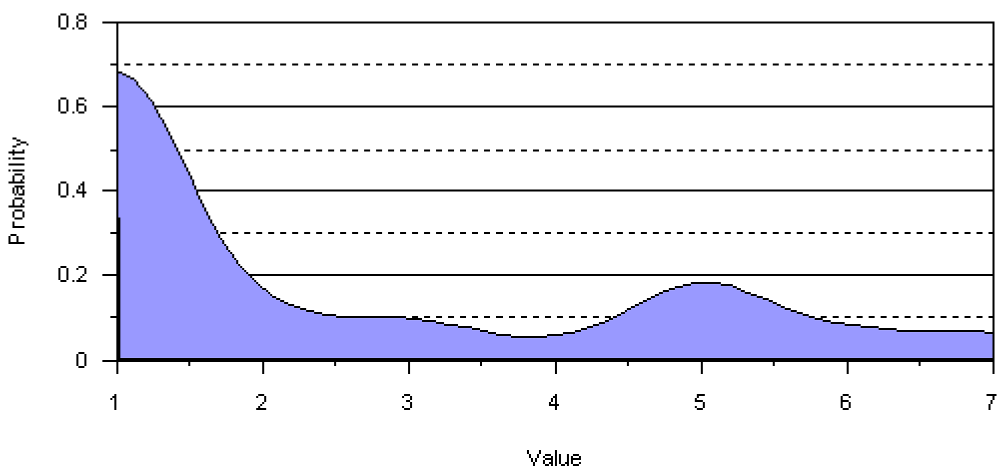
Minimum: 1.00

Maximum: 7.00

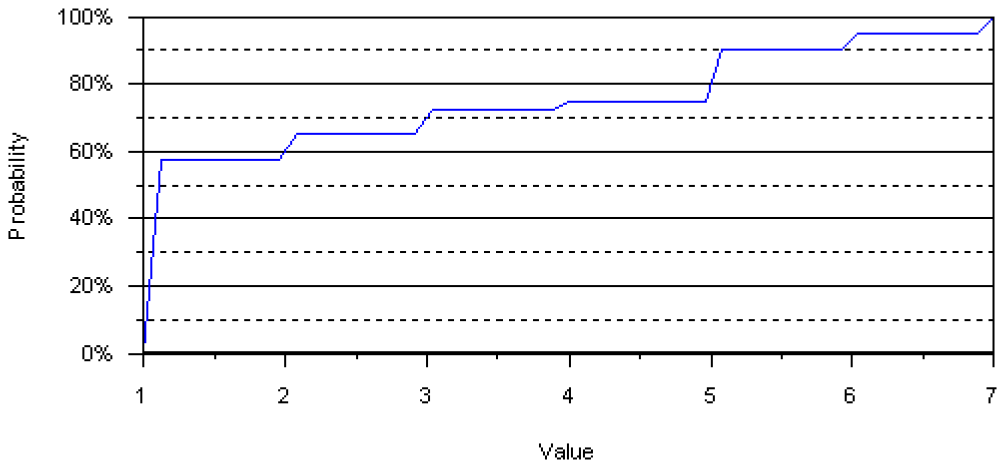
An answer to this question is not required and 363 of 407 respondents chose not to answer.

49d) Microchemical analysis using stereomicroscopy

Probability Density Function



Cumulative Distribution



Average: 2.45

Standard Deviation: 2.01

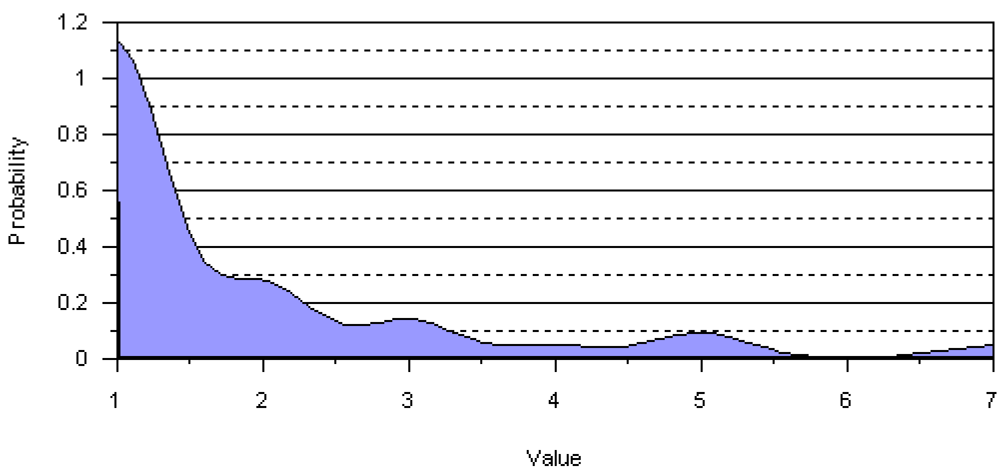
Minimum: 1.00

Maximum: 7.00

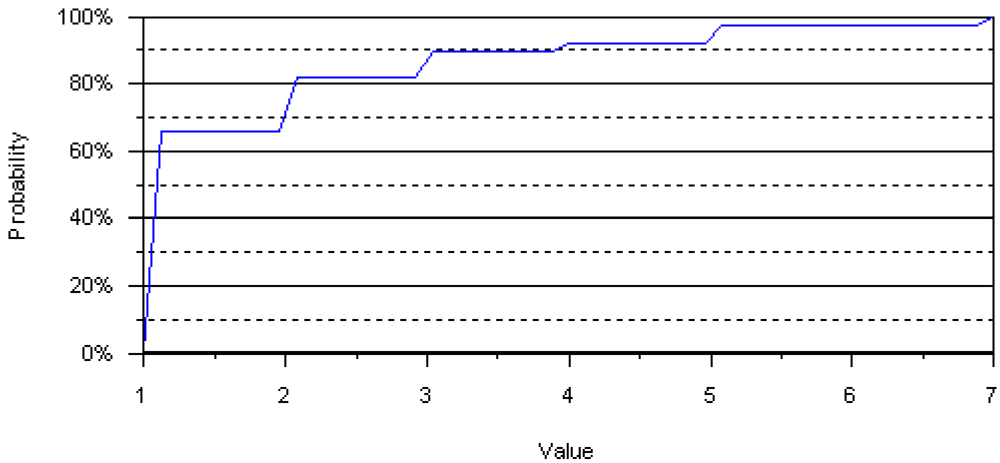
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49e) TLC

Probability Density Function



Cumulative Distribution



Average: 1.76

Standard Deviation: 1.40

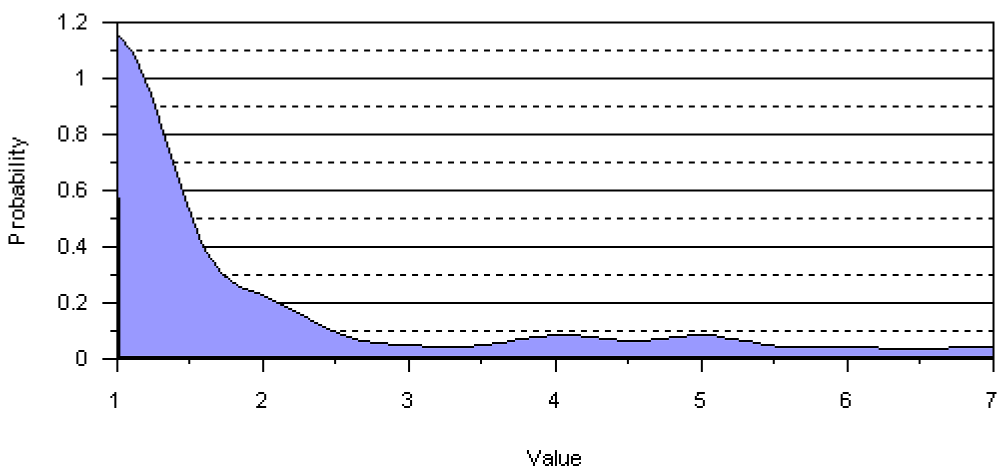
Minimum: 1.00

Maximum: 7.00

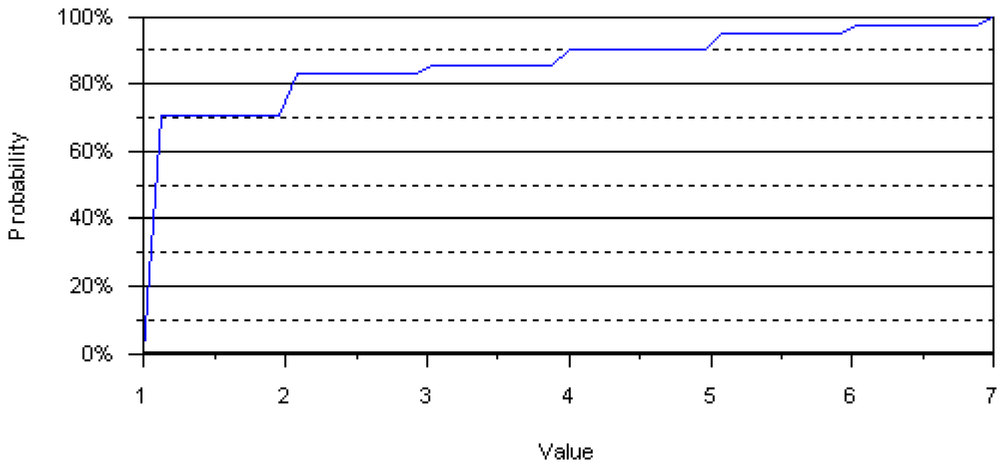
An answer to this question is not required and 369 of 407 respondents chose not to answer.

49f) Field explosives screening

Probability Density Function



Cumulative Distribution



Average: 1.78

Standard Deviation: 1.54

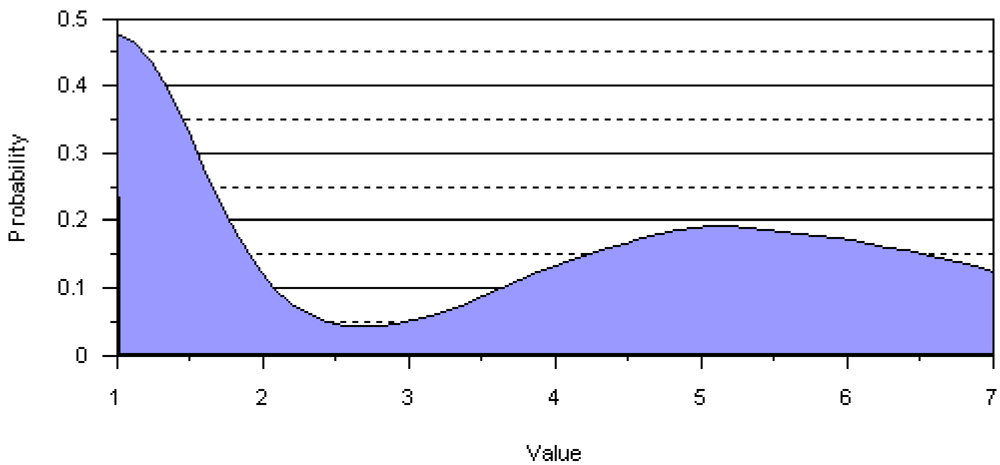
Minimum: 1.00

Maximum: 7.00

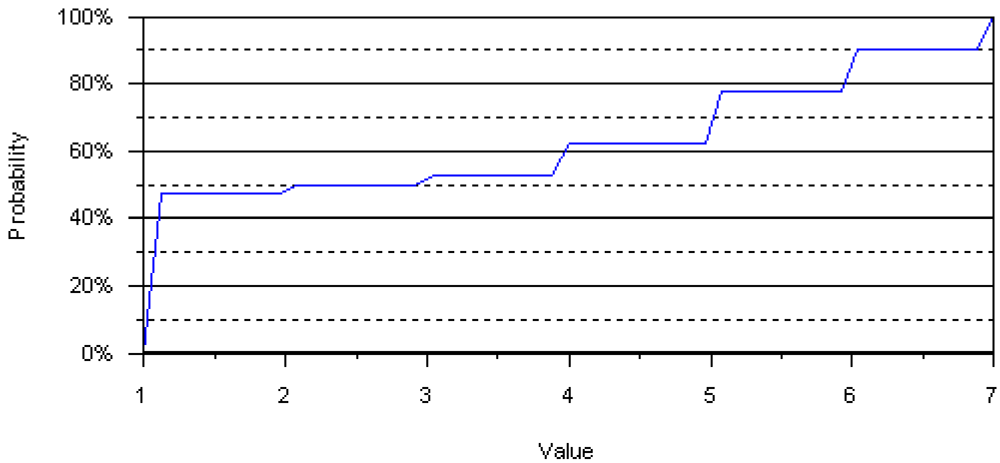
An answer to this question is not required and 366 of 407 respondents chose not to answer.

49g) IR

Probability Density Function



Cumulative Distribution



Average: 3.20

Standard Deviation: 2.33

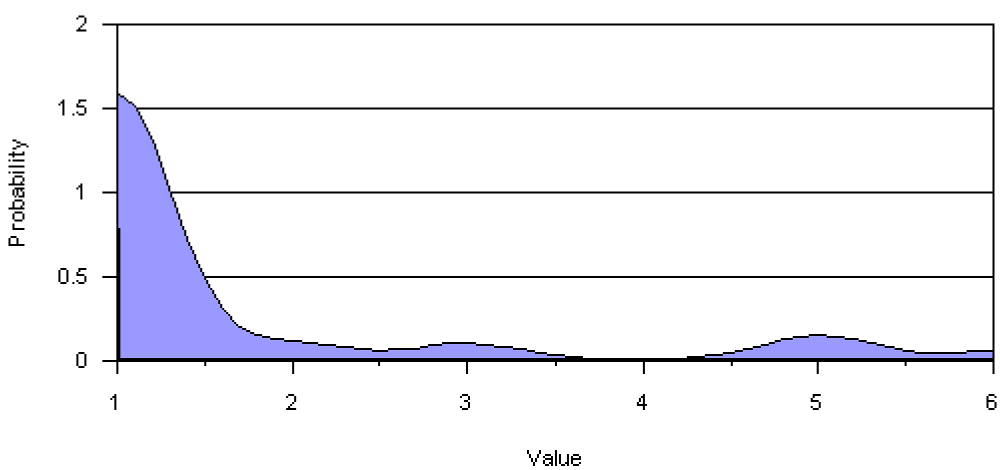
Minimum: 1.00

Maximum: 7.00

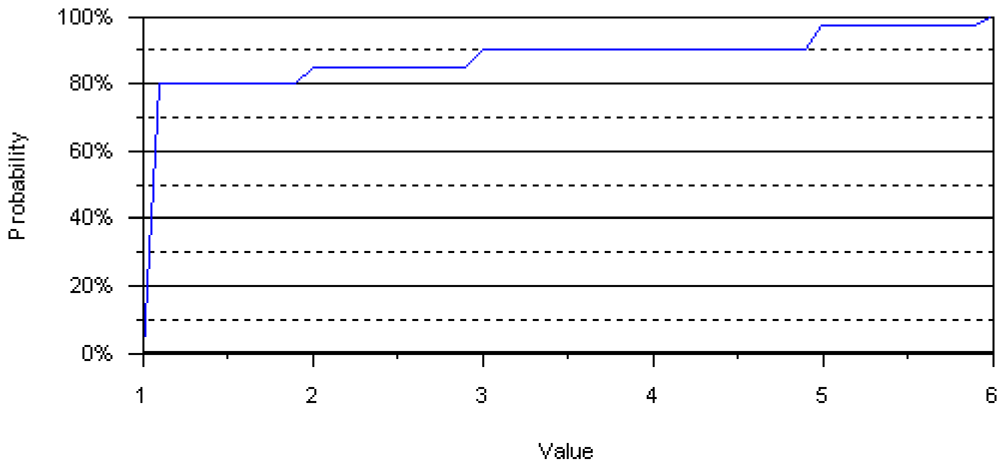
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49h) Raman spectroscopy

Probability Density Function



Cumulative Distribution

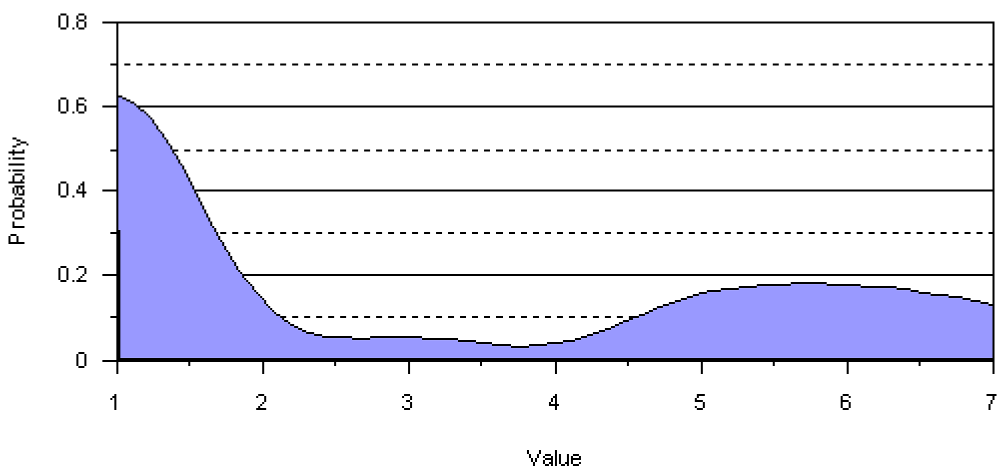


Average:	1.57
Standard Deviation:	1.34
Minimum:	1.00
Maximum:	6.00

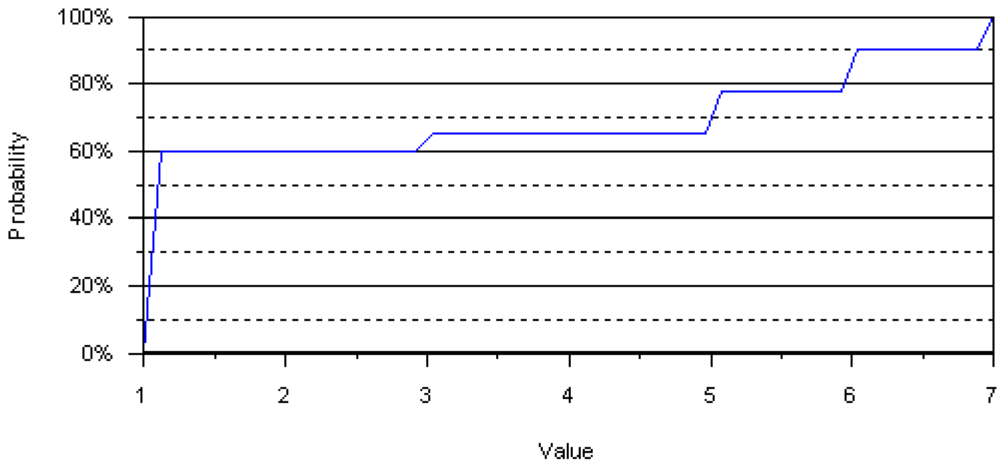
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49i) SEM-EDX

Probability Density Function



Cumulative Distribution

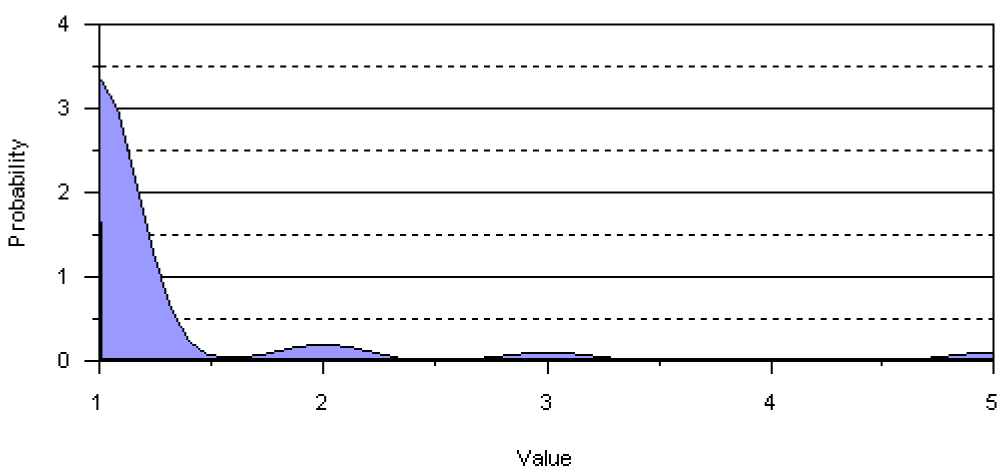


Average:	2.83
Standard Deviation:	2.40
Minimum:	1.00
Maximum:	7.00

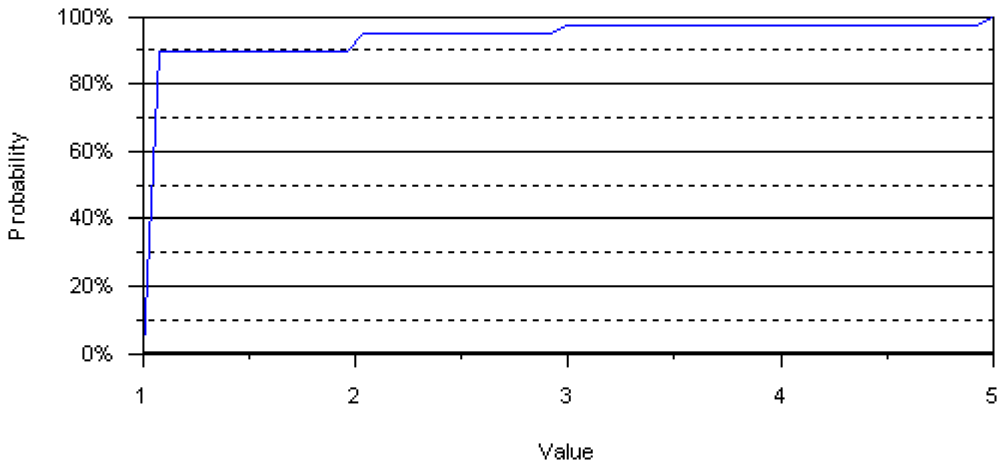
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49j) ICP

Probability Density Function



Cumulative Distribution



Average: 1.21

Standard Deviation: 0.73

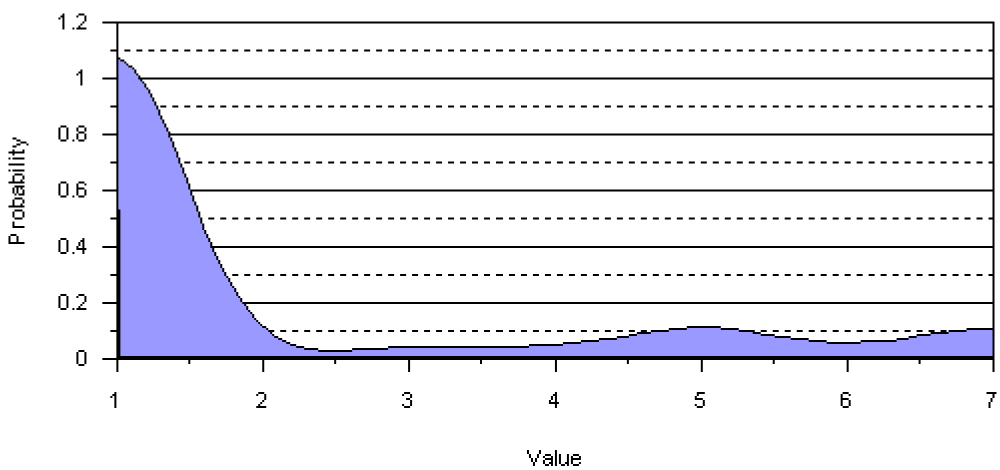
Minimum: 1.00

Maximum: 5.00

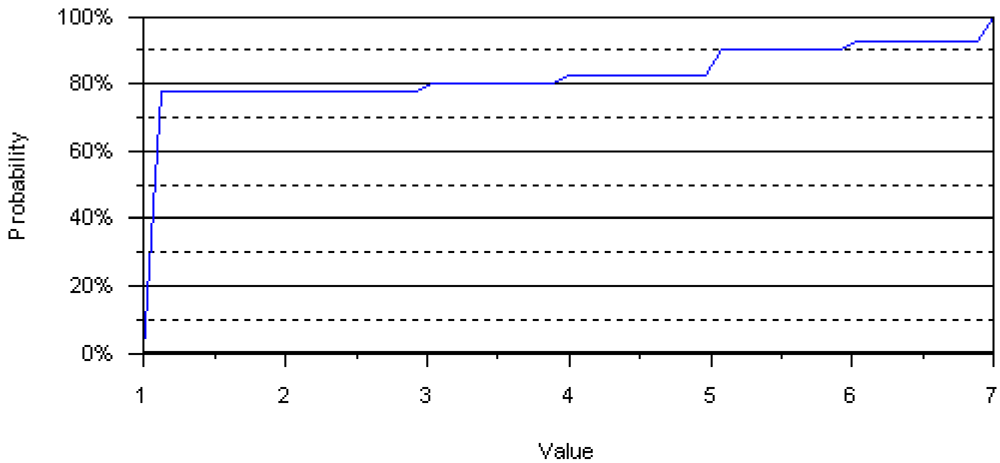
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49k) XRF

Probability Density Function



Cumulative Distribution



Average: 2.00

Standard Deviation: 1.99

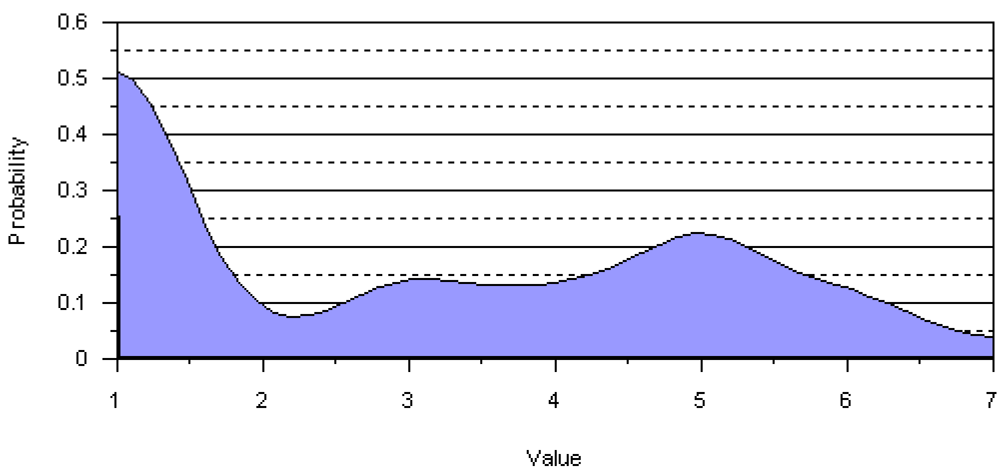
Minimum: 1.00

Maximum: 7.00

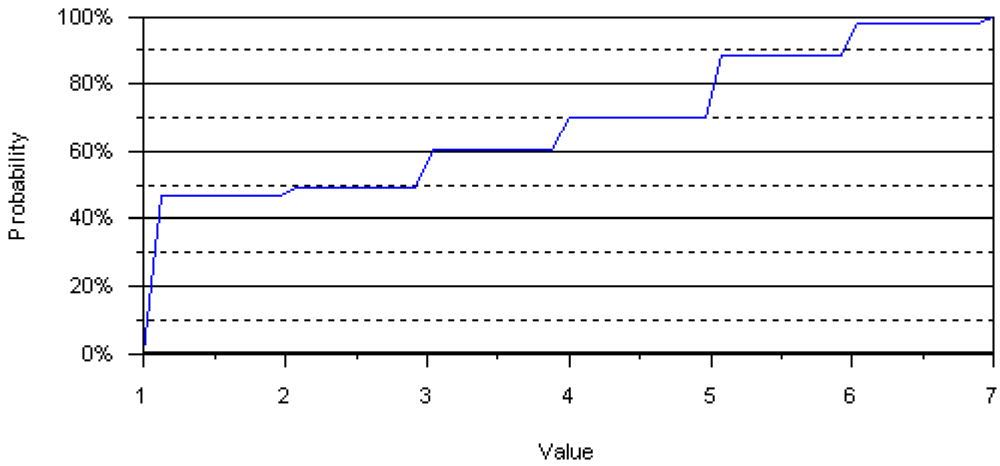
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49l) GC/MS

Probability Density Function



Cumulative Distribution



Average: 2.88

Standard Deviation: 2.00

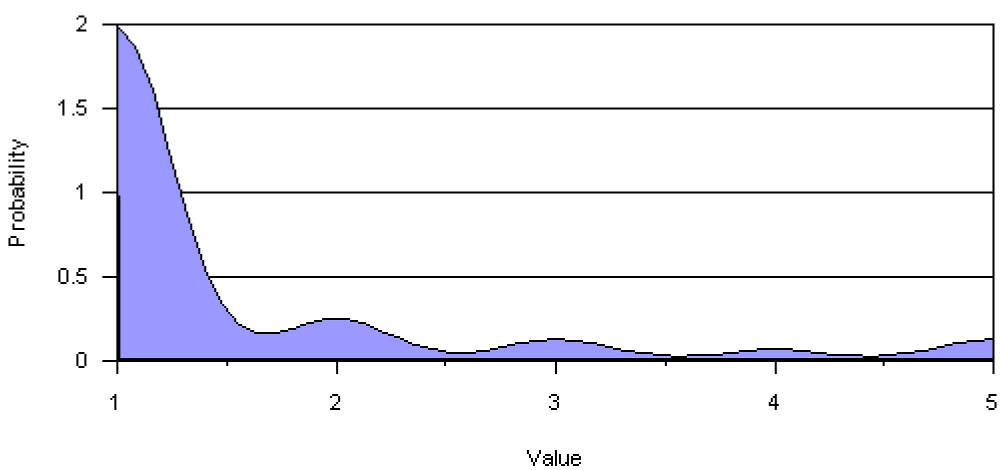
Minimum: 1.00

Maximum: 7.00

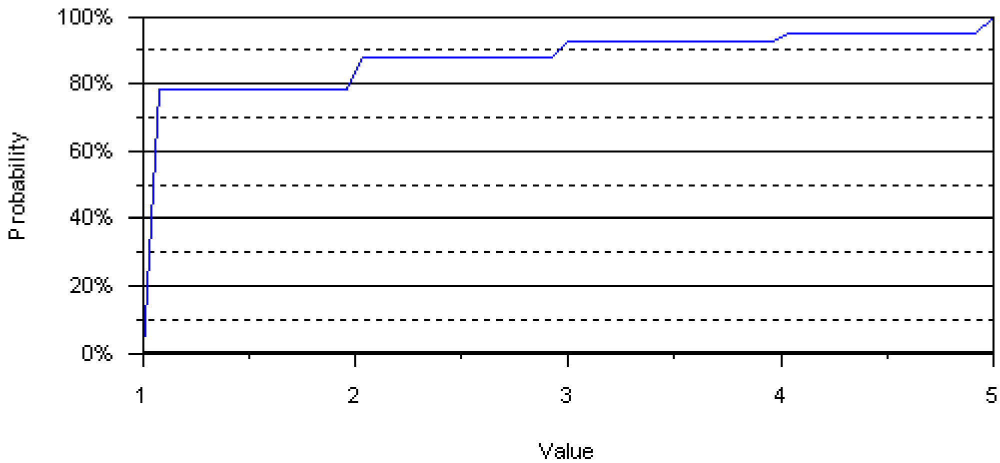
An answer to this question is not required and 364 of 407 respondents chose not to answer.

49m)GC/FID

Probability Density Function



Cumulative Distribution



Average: 1.46

Standard Deviation: 1.05

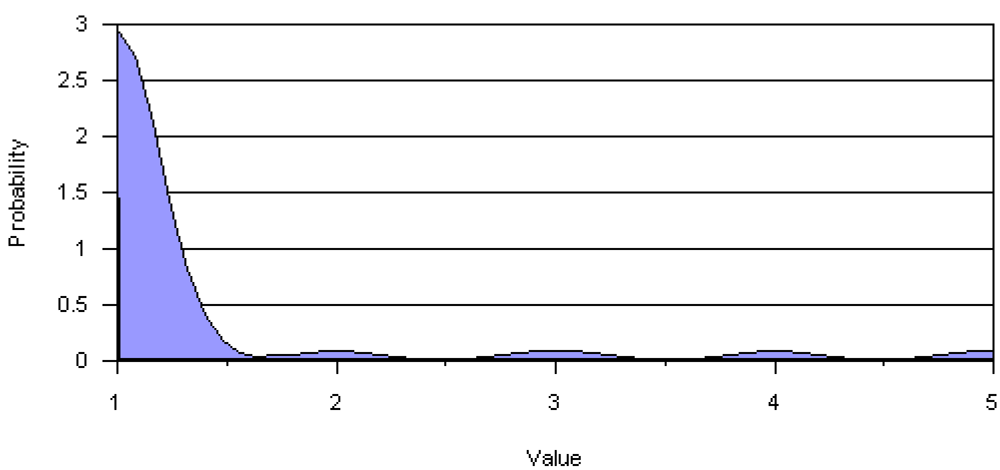
Minimum: 1.00

Maximum: 5.00

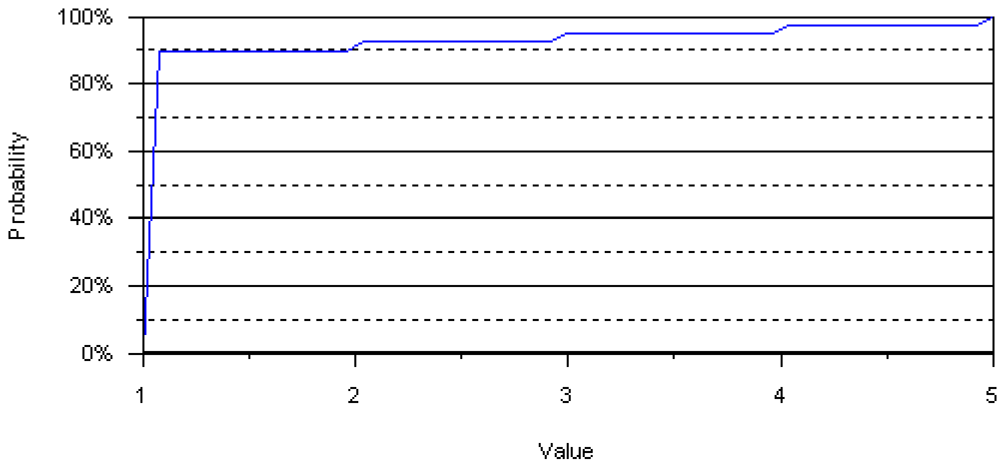
An answer to this question is not required and 366 of 407 respondents chose not to answer.

49n) CE

Probability Density Function



Cumulative Distribution



Average: 1.26

Standard Deviation: 0.85

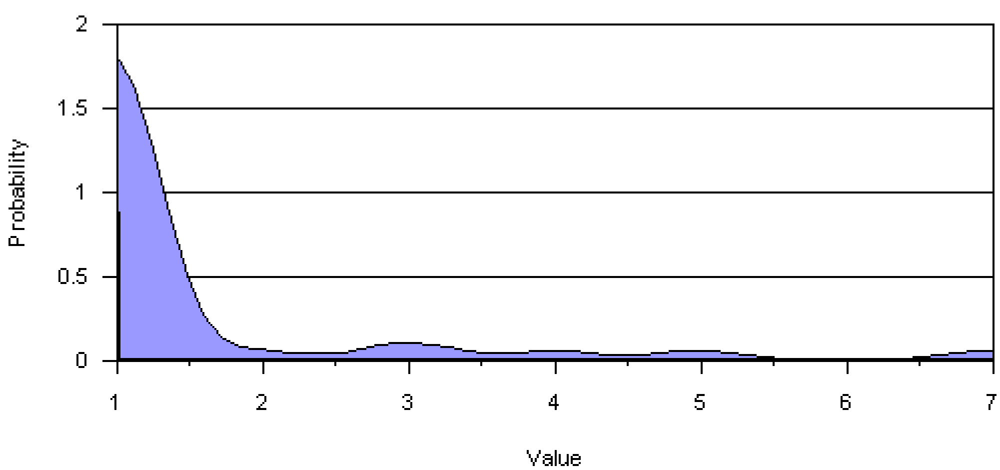
Minimum: 1.00

Maximum: 5.00

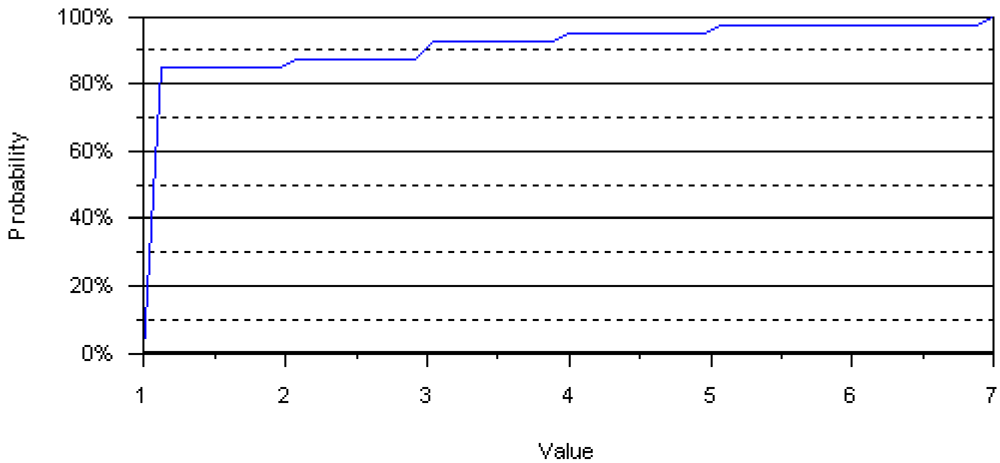
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49o) HPLC

Probability Density Function



Cumulative Distribution



Average: 1.46

Standard Deviation: 1.27

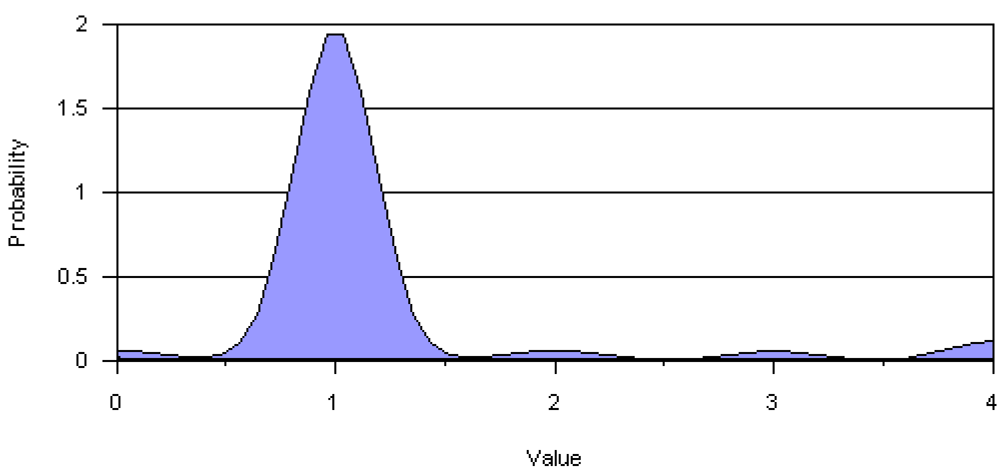
Minimum: 1.00

Maximum: 7.00

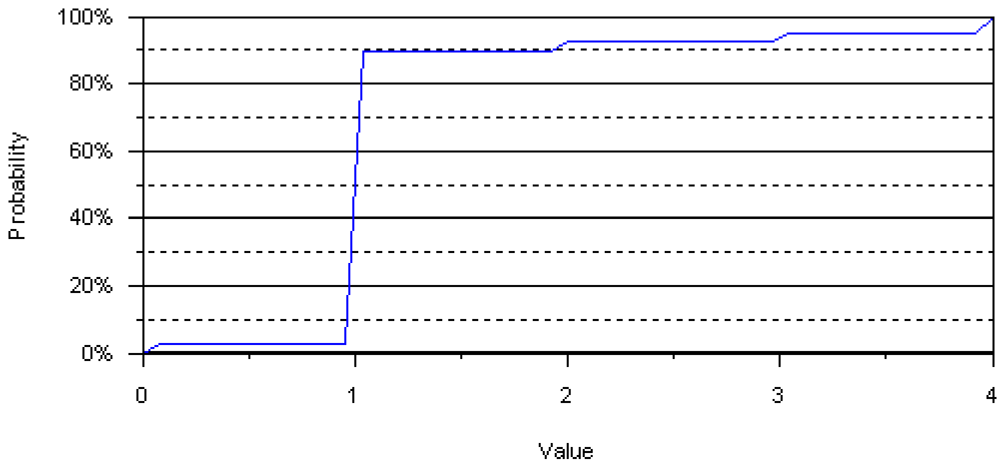
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49p) HPLC/TEA

Probability Density Function



Cumulative Distribution



Average: 1.21

Standard Deviation: 0.77

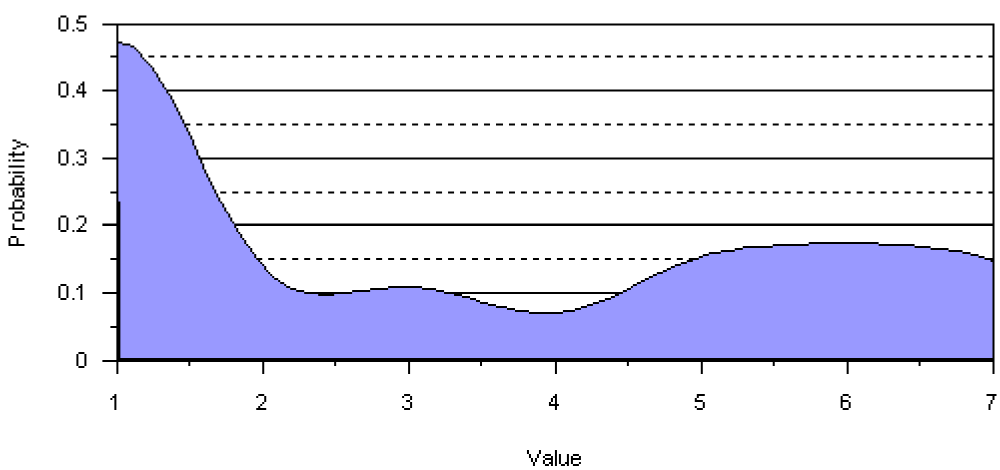
Minimum: 0.00

Maximum: 4.00

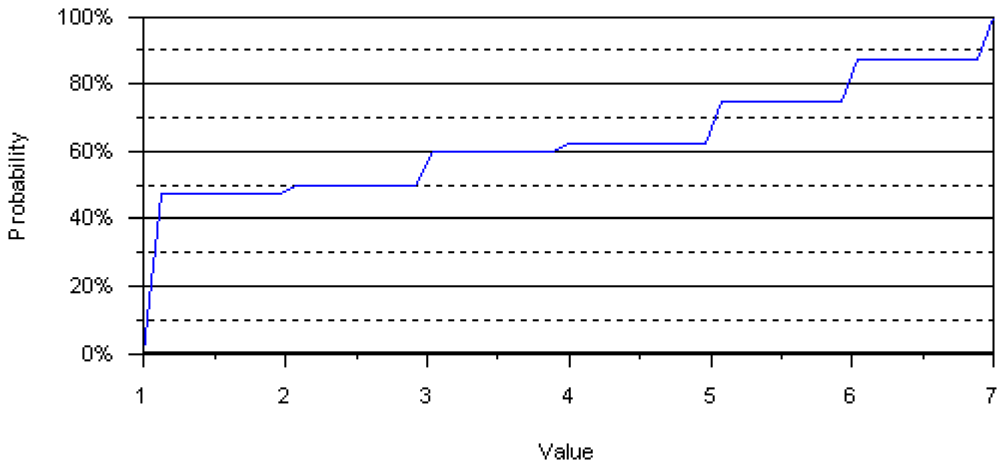
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49q) FTIR

Probability Density Function



Cumulative Distribution



Average: 3.17

Standard Deviation: 2.38

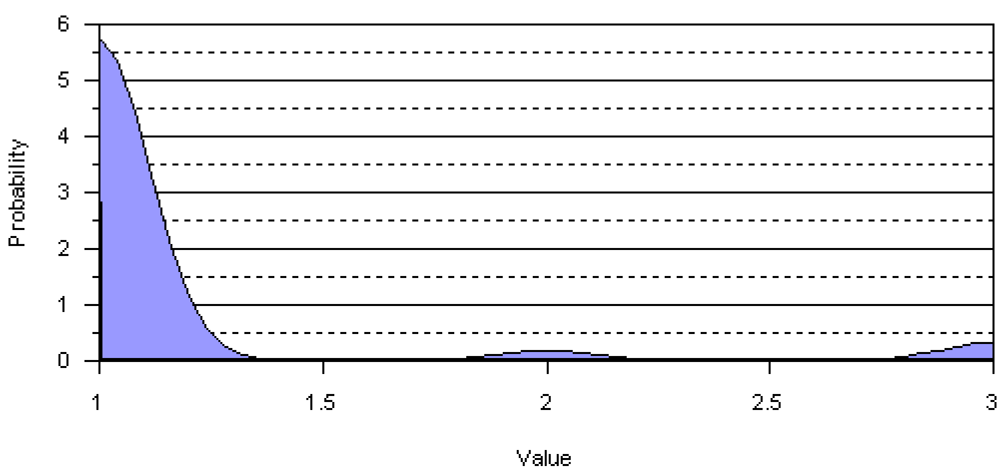
Minimum: 1.00

Maximum: 7.00

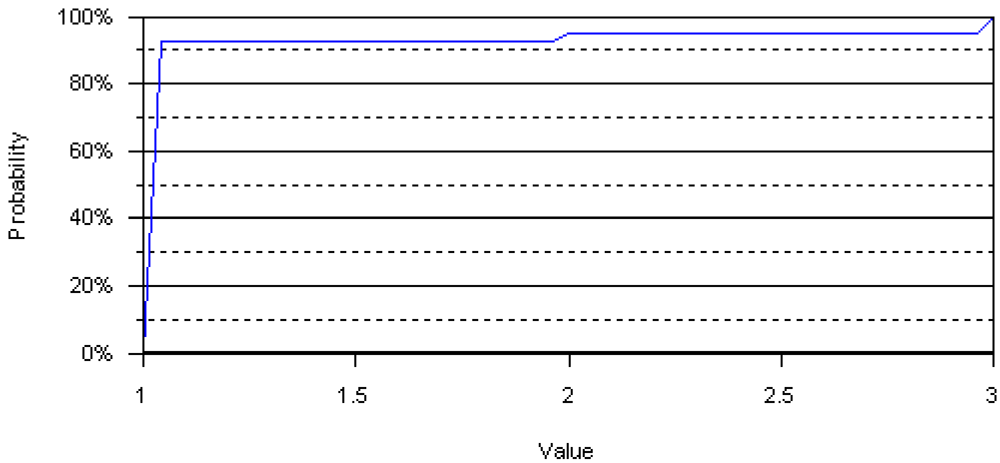
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49r) NMR

Probability Density Function



Cumulative Distribution



Average: 1.13

Standard Deviation: 0.47

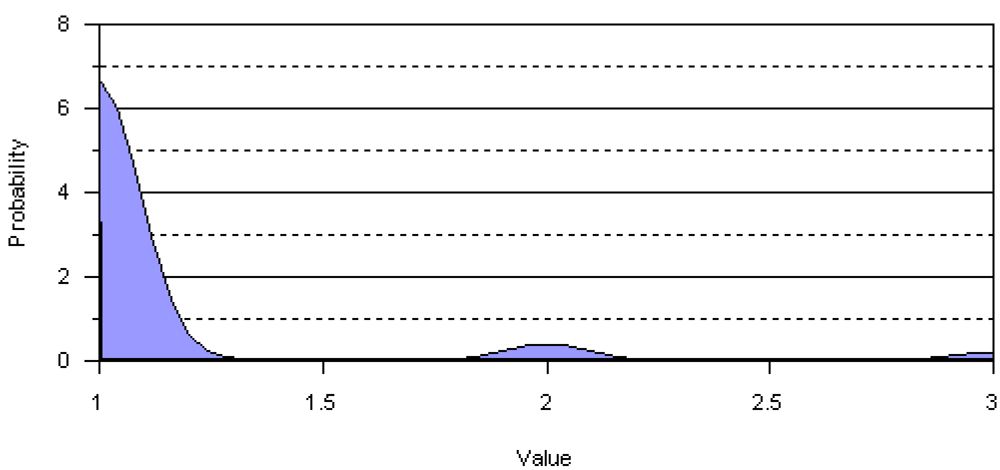
Minimum: 1.00

Maximum: 3.00

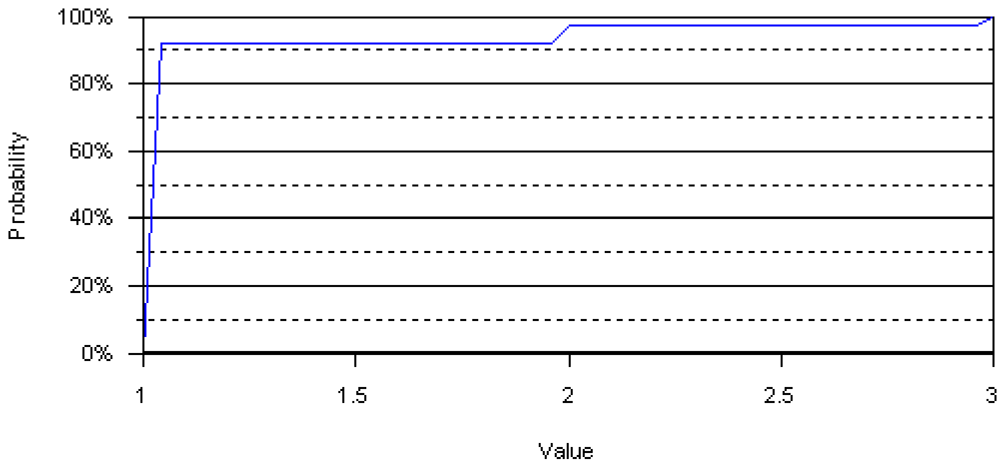
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49s) SEM-WDX

Probability Density Function



Cumulative Distribution

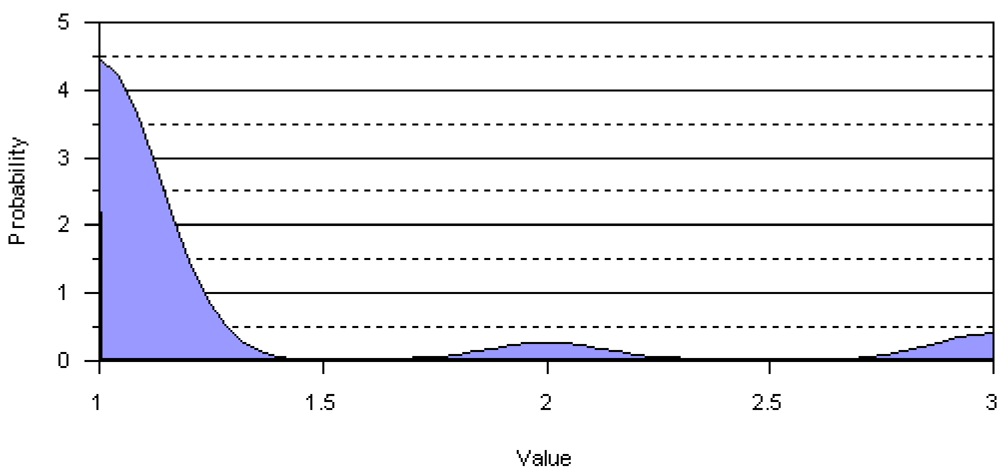


Average:	1.11
Standard Deviation:	0.39
Minimum:	1.00
Maximum:	3.00

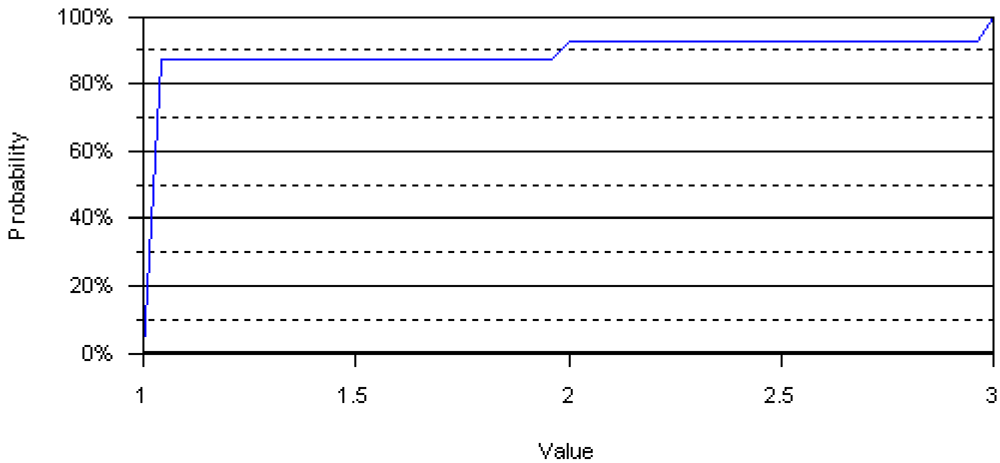
An answer to this question is not required and 369 of 407 respondents chose not to answer.

49t) IMS

Probability Density Function



Cumulative Distribution



Average: 1.21

Standard Deviation: 0.57

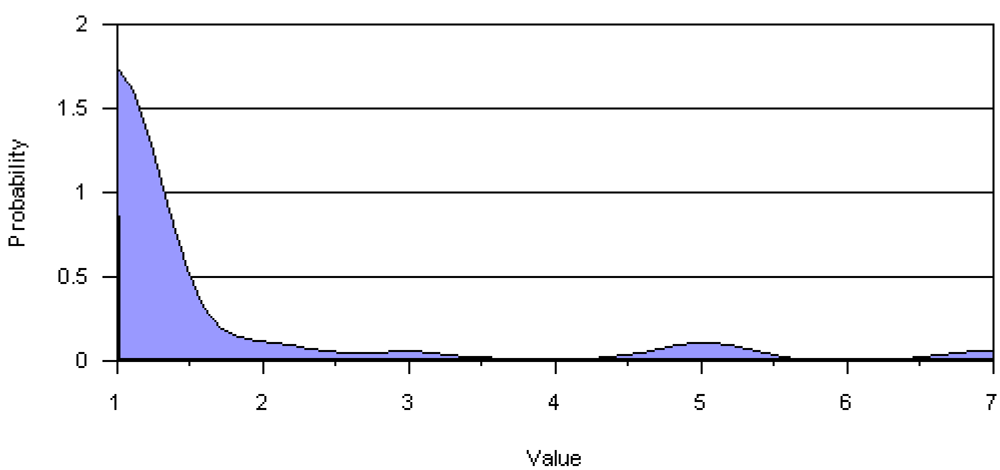
Minimum: 1.00

Maximum: 3.00

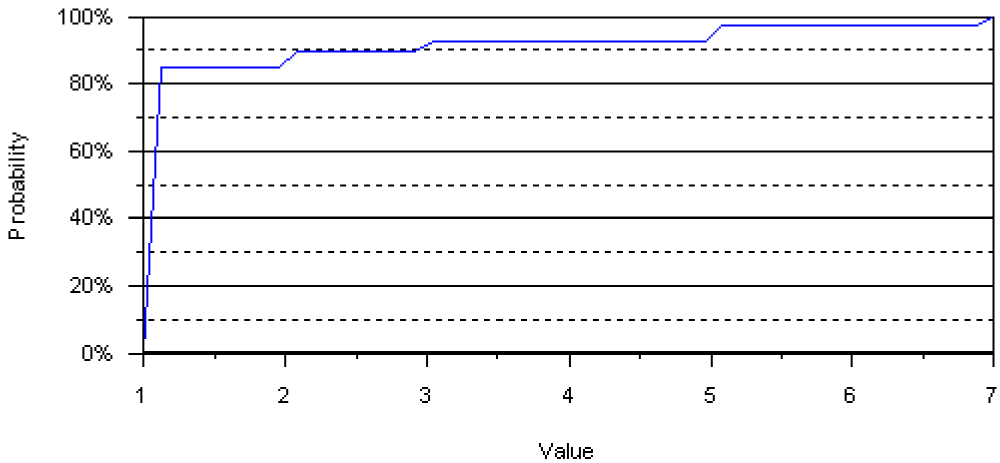
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49u) XRD

Probability Density Function



Cumulative Distribution

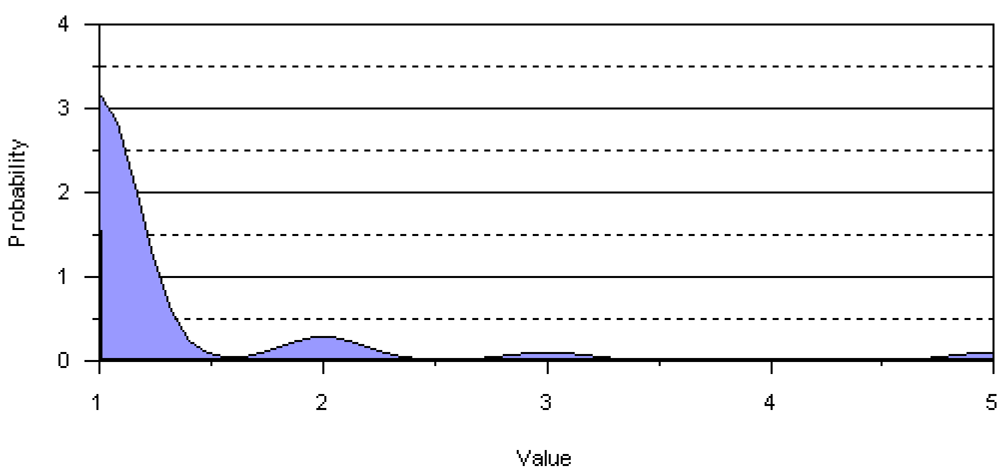


Average:	1.46
Standard Deviation:	1.31
Minimum:	1.00
Maximum:	7.00

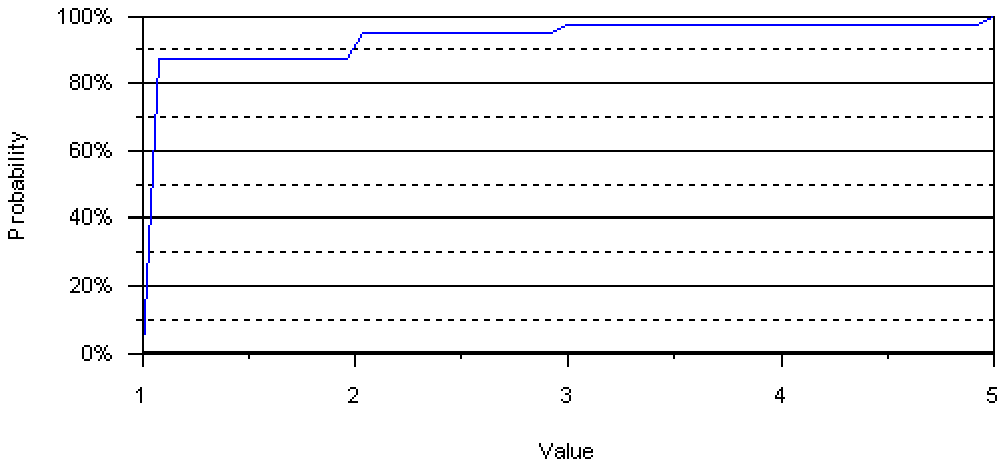
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49v) GC/TEA

Probability Density Function



Cumulative Distribution

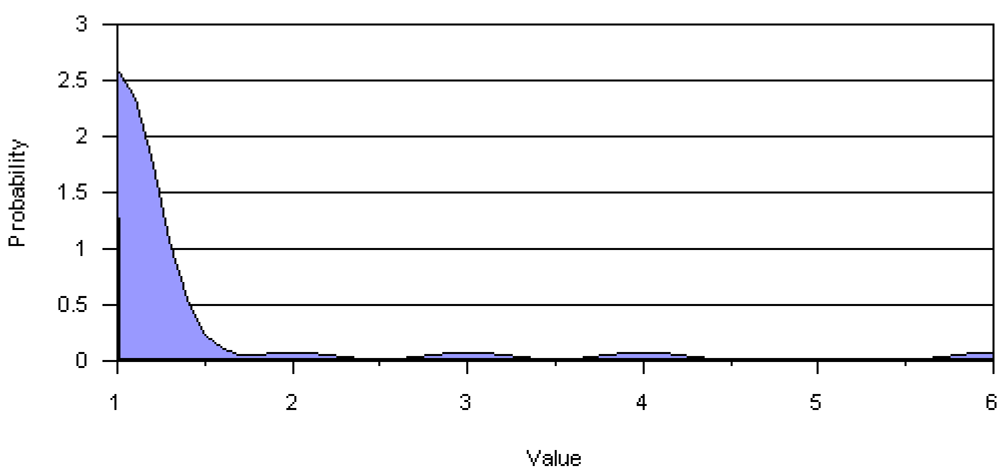


Average:	1.23
Standard Deviation:	0.74
Minimum:	1.00
Maximum:	5.00

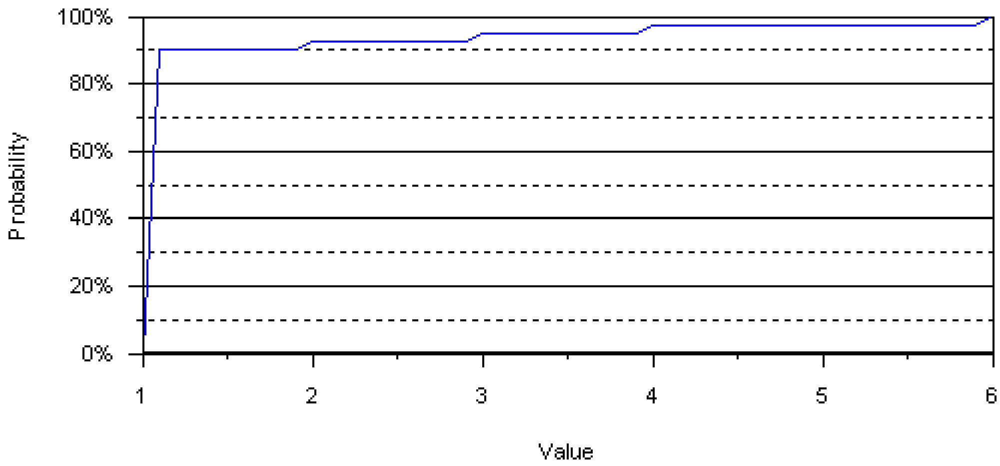
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49w) GC/ECD

Probability Density Function



Cumulative Distribution



Average: 1.27

Standard Deviation: 0.96

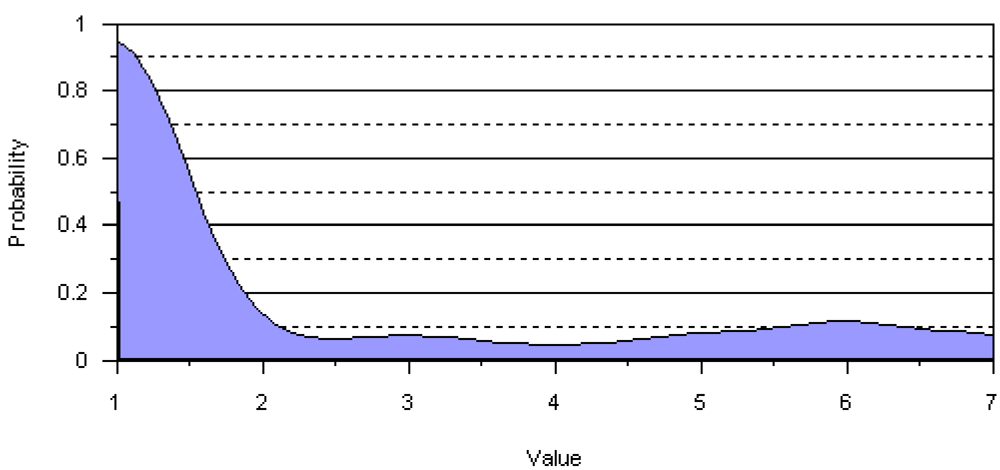
Minimum: 1.00

Maximum: 6.00

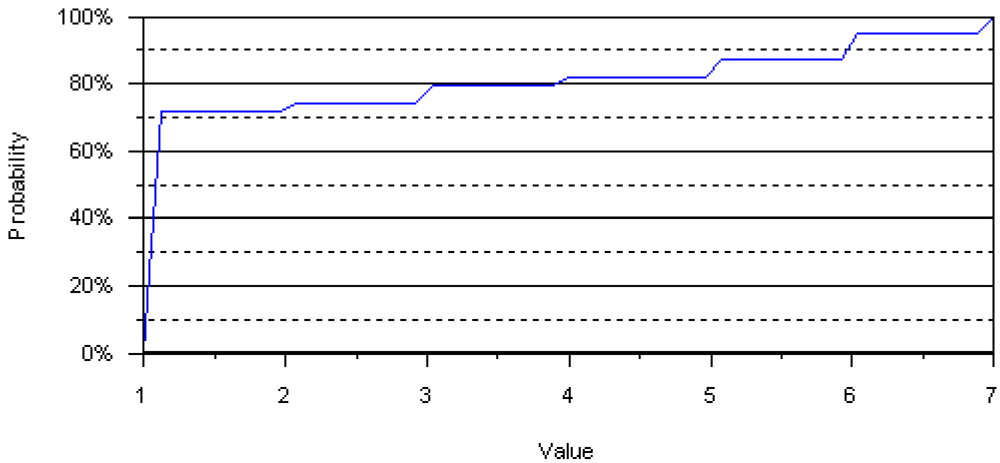
An answer to this question is not required and 367 of 407 respondents chose not to answer.

49x) IC

Probability Density Function



Cumulative Distribution

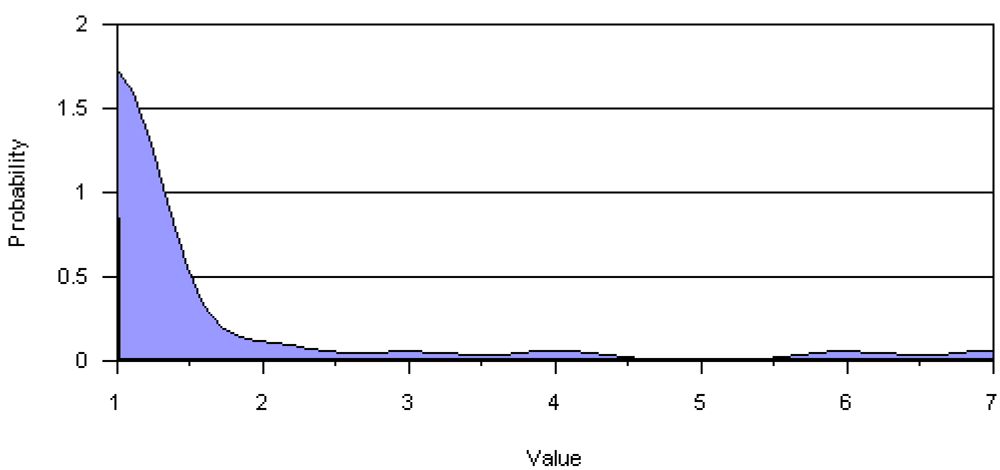


Average:	2.10
Standard Deviation:	1.98
Minimum:	1.00
Maximum:	7.00

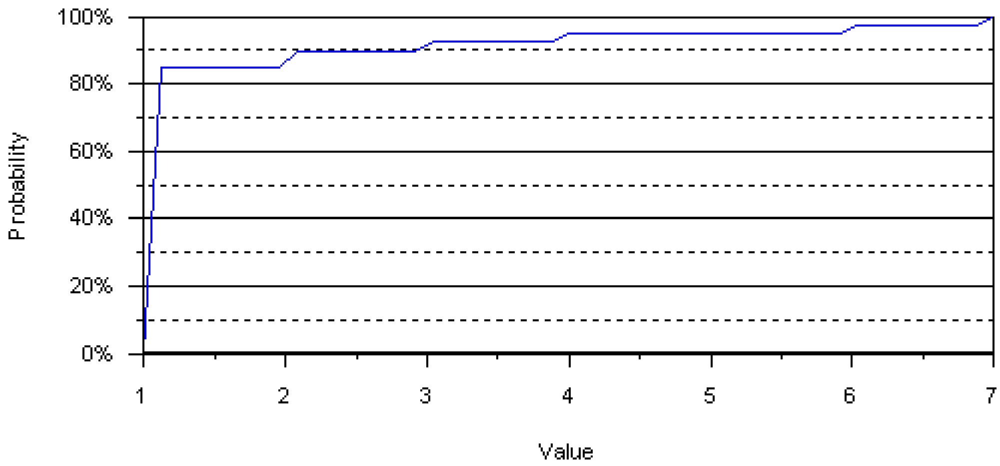
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49y) HPLC/MS

Probability Density Function



Cumulative Distribution



Average: 1.46

Standard Deviation: 1.33

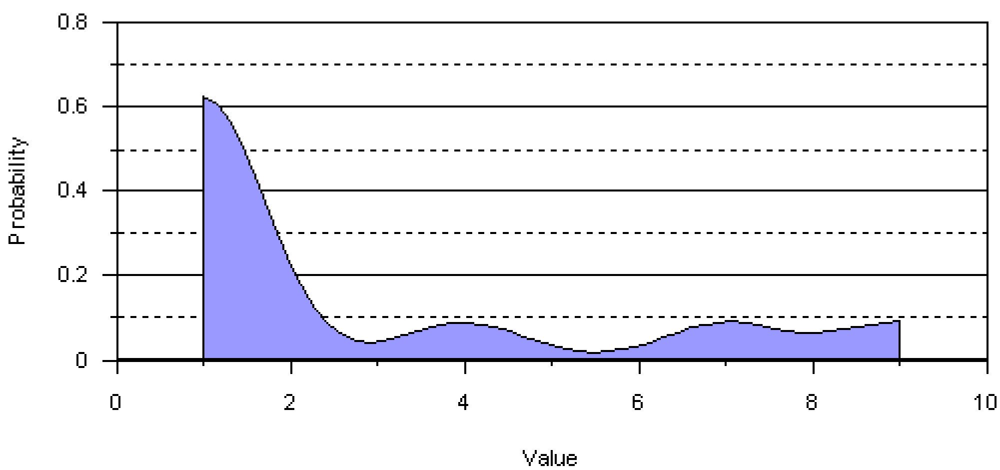
Minimum: 1.00

Maximum: 7.00

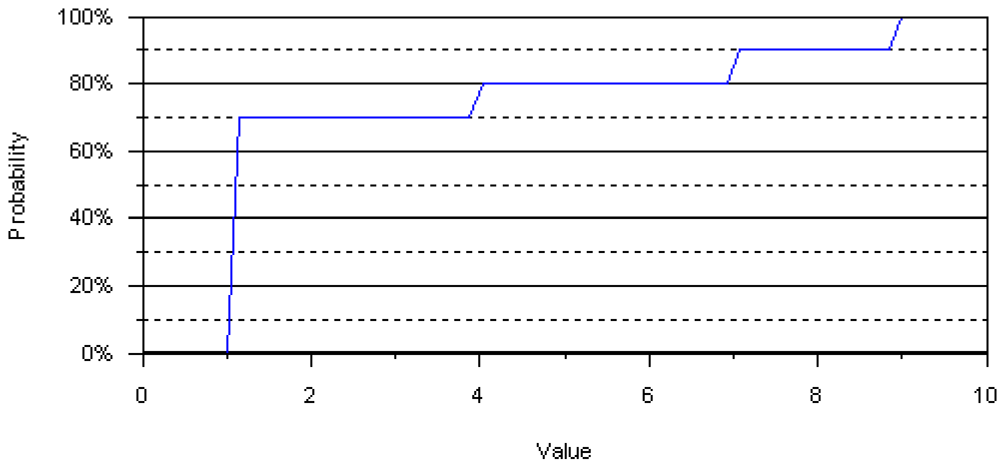
An answer to this question is not required and 368 of 407 respondents chose not to answer.

49z) Other:

Probability Density Function



Cumulative Distribution



Average:	2.70
Standard Deviation:	2.98
Minimum:	1.00
Maximum:	9.00

An answer to this question is not required and 397 of 407 respondents chose not to answer.

49aa)(please indicate):

- We do not have SOPs for explosives -all we do is possibly process, visually inspect and call ATF or FBI
- Have none available to us
- Didnt receive samples for analysis
- N/A
- 1

An answer to this question is not required and 402 of 407 respondents chose not to answer.

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50) Are you aware of new equipment or techniques on the market or in development that could be potentially of use in explosives analysis? These improvements may be in analytical instrumentation, recovery of post-explosion residue, isolation of un-reacted products, component reconstruction, etc... Please indicate the type of potential improvement such as: reduction of analysis time, elimination of background, specificity of identification, etc...?

Yes	(13)	14.0%
No	(80)	86.0%
Total	(93)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 314 of 407 respondents chose not to answer.

50a) Description and/or Contact

- IMS (I did my MS on this instrument) is not new but a drift tube GC/MS , electronic sniffer-
- Jeff Foust; tower112@verizon.net
- lc-ms
- Arkansas State Crime Laboratory
- air sampling detection devices
- not at this time
- jamesp.taylor@dc.gov
- Capillary Electrophoresis

An answer to this question is not required and 399 of 407 respondents chose not to answer.

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51) What are the short-term needs in analytical methods for explosives analysis?

- Education on what is out there -we are located in the refinery and Ship Channel area of HOuston
- There needs to be some comprehensive methods or maybe just training procedures for analysis published by swgfex. What is there is, is good but it is more of an outline than a comprehensive how-to.
- Basic/Advanced Course in Explosive Analysis and a Federal mandate ordering departments to allow their EOD teams to allow for analysis in each case.
- training in explosive chemical composition, analysis, and availability of resources.
- Training course for laboratory analysts that deals specifically with the chemistry and analysis of explosive materials (the two federal courses I've attended are geared toward investigators and put all the emphasis on post-blast scene processing)
- Explosives materials analytical data database by analytical method
- Unknown
- Financial
- Digital imaging training
- analysis of items for investigative purpose- no suspect no tests.
- GREATER ROBOTICS TECHNOLOGY
- Sample collection
- N/A
- Resources and training
- simple field explosive analytical analysis system
- Trained technicians who communicate well with investigators.
- My agency doesn't currently have the means for this.
- on scene analysis of suspect explosive compounds

- Rapid in field use

An answer to this question is not required and 388 of 407 respondents chose not to answer.

52) What are the long-term needs in analytical methods for explosives analysis?

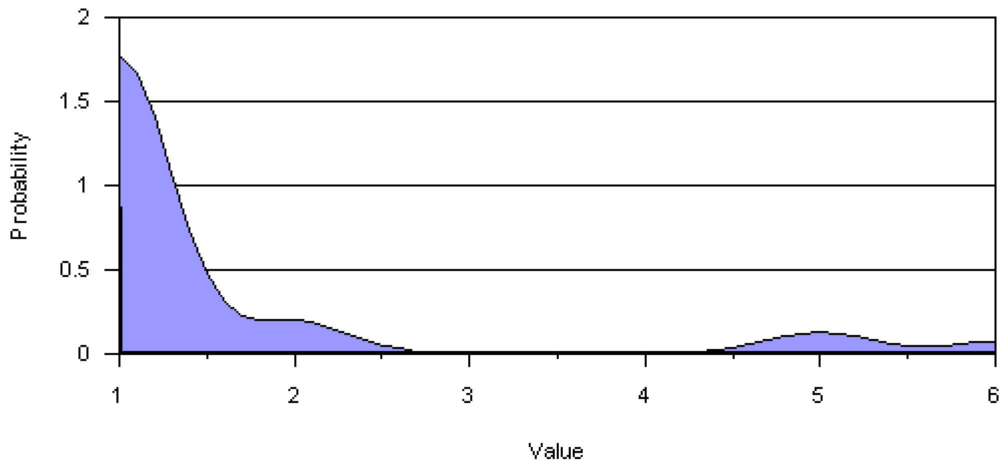
- Developing relationship or support for agency
- There needs to be more sharing of information and analytical techniques especially by the federal agencies as they have abundant resources and encounter more than the state or local laboratories.
- on-going training
- Derivitization protocols to allow alternate analytical methods.
- Unknown
- Financial
- Digital imaging training
- GREATER PREVENTION METHODS FOR FUTURE GENERATIONS
- Equipment and training
- N/A
- resources and training
- simple field explosive analytical analysis system
- Reduced costs for modern instrumentation.
- Have the capability to complete this.
- Maricopa County Crime Lab has no resources in explosive analysis
- lost cost simple analysis
- We would like to start analyzing explosives

An answer to this question is not required and 390 of 407 respondents chose not to answer.

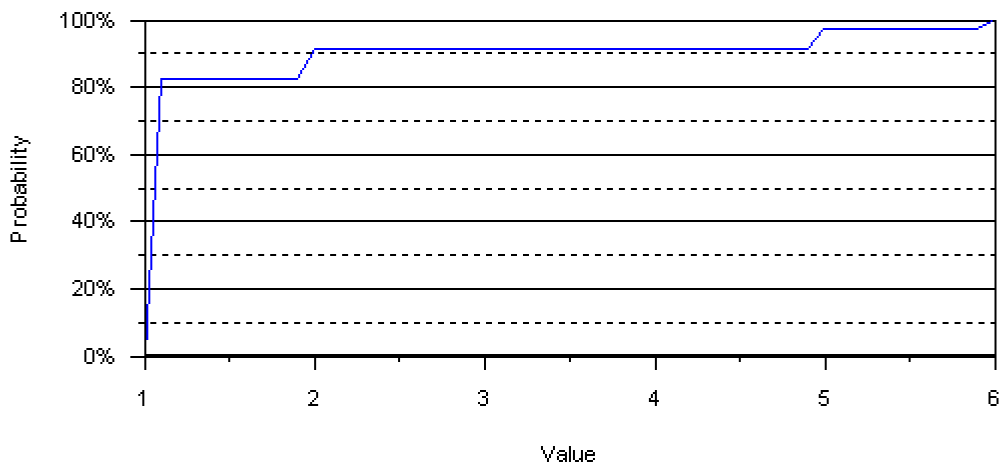
53) For explosives/explosives residue analysis, how often do you see the following QA/QC tests: (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

53a) 8095 Calibration Mix A

Probability Density Function



Cumulative Distribution

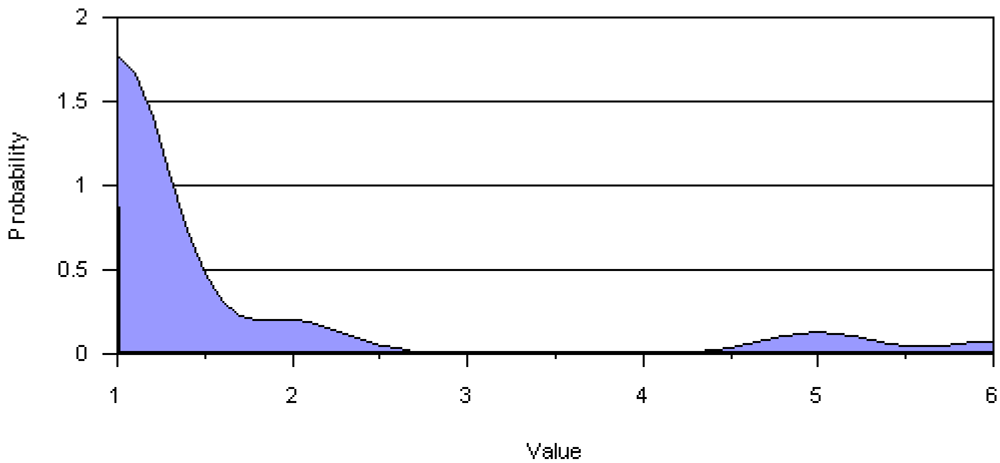


Average:	1.47
Standard Deviation:	1.26
Minimum:	1.00
Maximum:	6.00

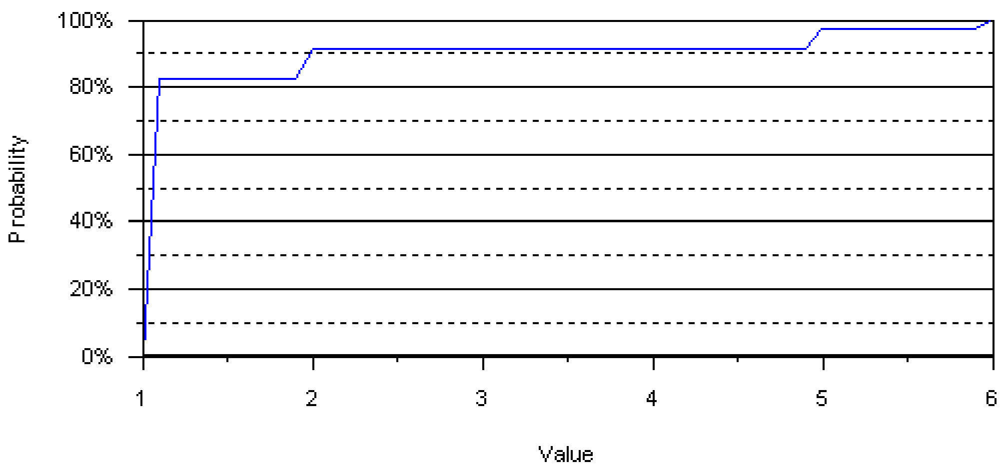
An answer to this question is not required and 373 of 407 respondents chose not to answer.

53b) 8095 Calibration Mix B

Probability Density Function



Cumulative Distribution

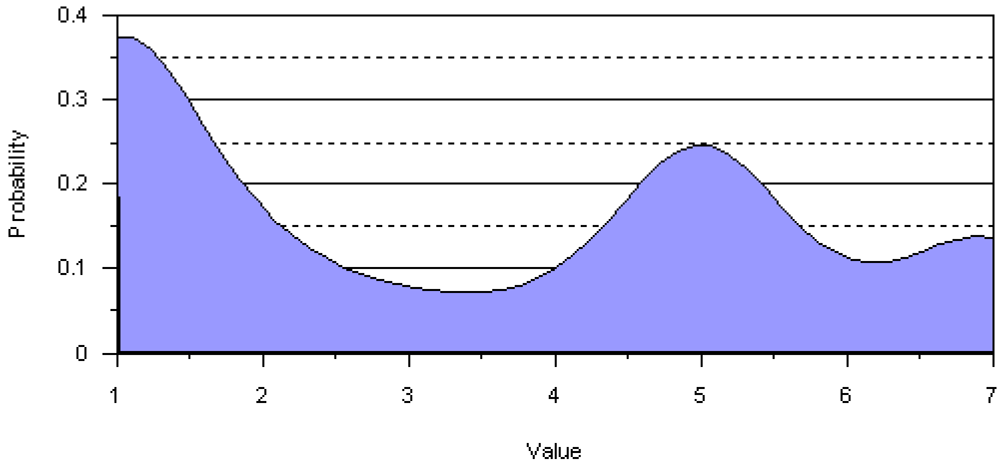


Average:	1.47
Standard Deviation:	1.26
Minimum:	1.00
Maximum:	6.00

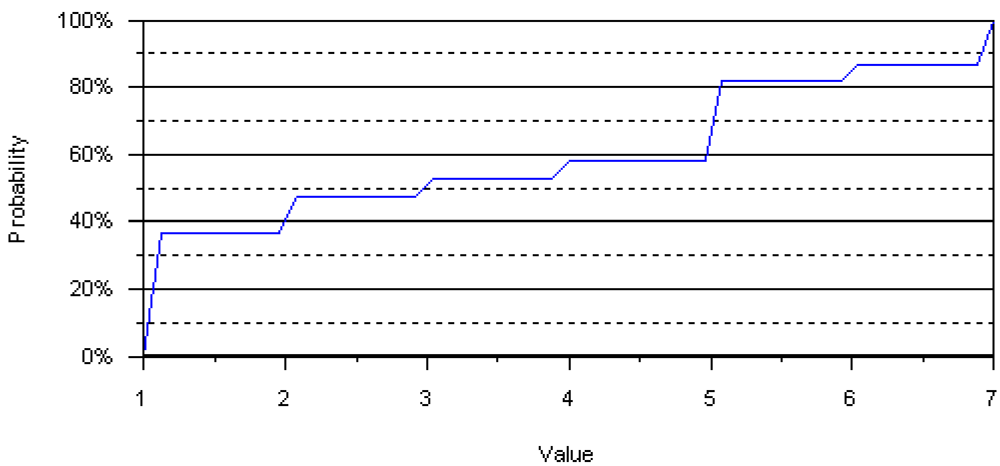
An answer to this question is not required and 373 of 407 respondents chose not to answer.

53c) Smokeless Powder (or similar) mixture

Probability Density Function



Cumulative Distribution

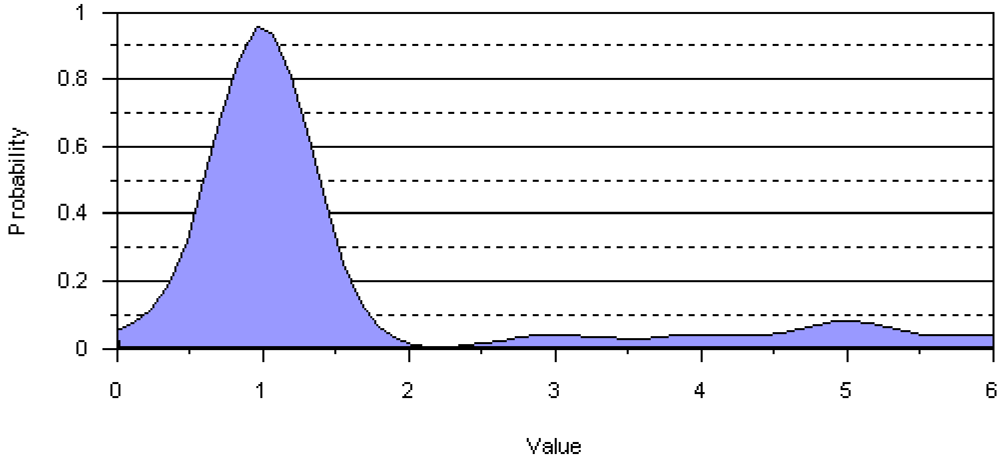


Average:	3.37
Standard Deviation:	2.27
Minimum:	1.00
Maximum:	7.00

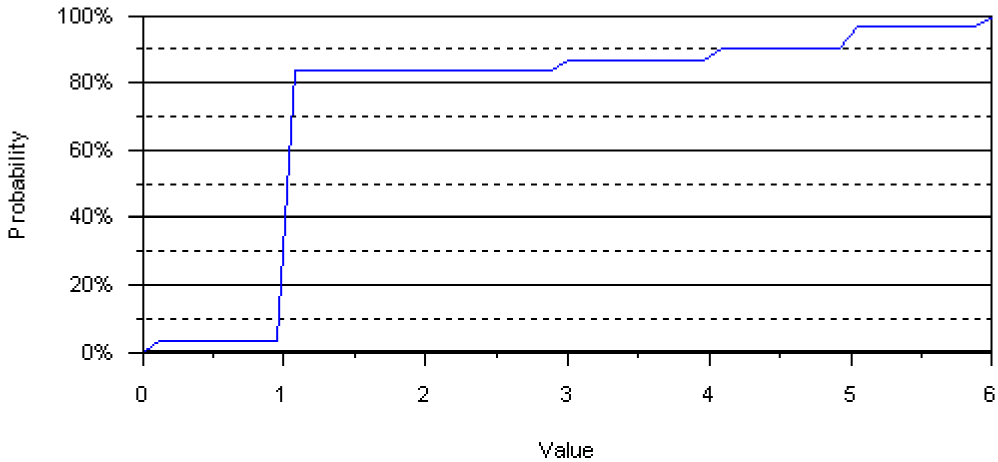
An answer to this question is not required and 369 of 407 respondents chose not to answer.

53d) Internal Standard

Probability Density Function



Cumulative Distribution



Average:	1.57
Standard Deviation:	1.45
Minimum:	0.00
Maximum:	6.00

An answer to this question is not required and 377 of 407 respondents chose not to answer.

53e) (please indicate):

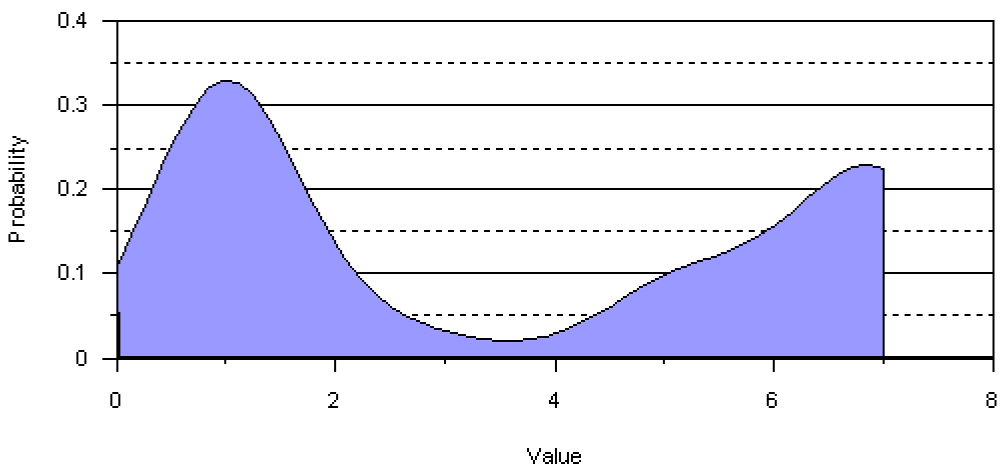
- 5 nitro 2 fluoro toluene
- 1
- 1
- 1
- 1

- IC Standards

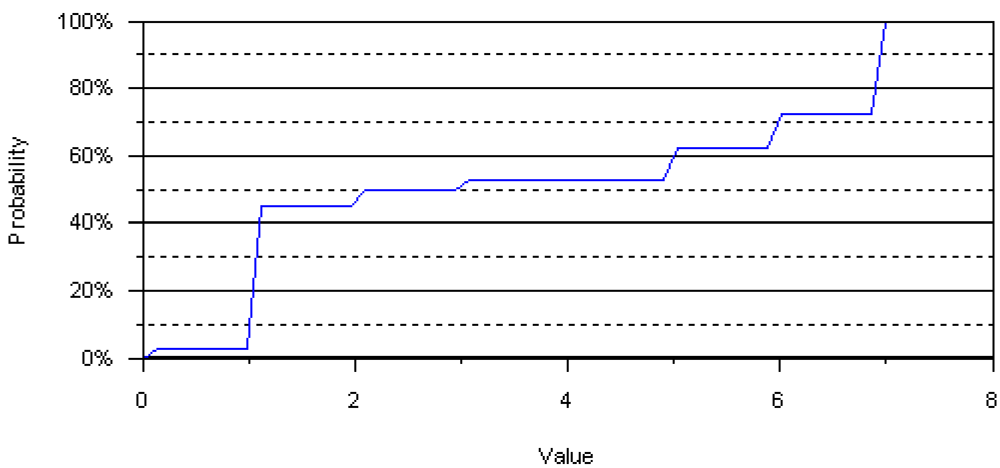
An answer to this question is not required and 401 of 407 respondents chose not to answer.

53f) Solvent Blank

Probability Density Function



Cumulative Distribution

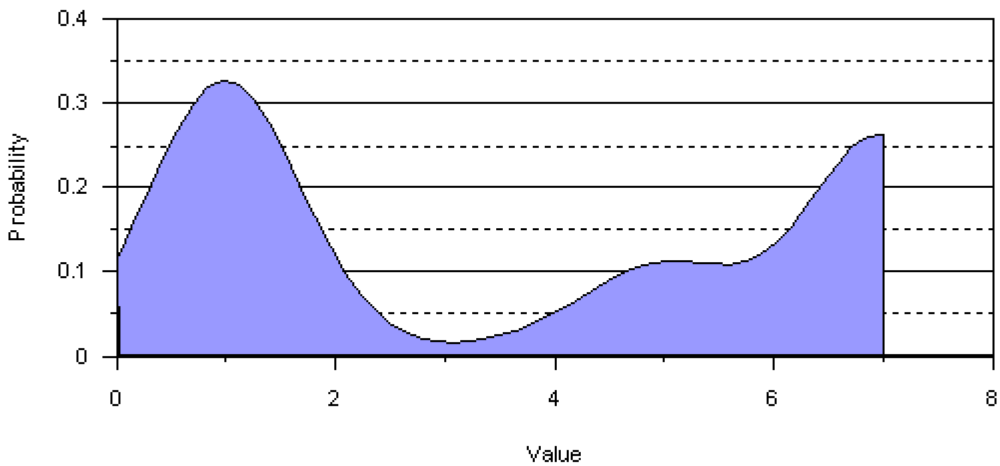


Average:	3.62
Standard Deviation:	2.73
Minimum:	0.00
Maximum:	7.00

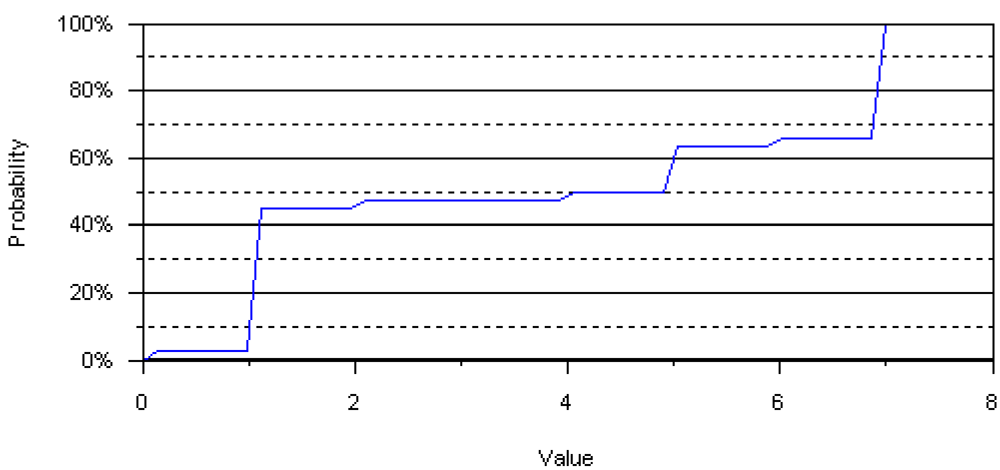
An answer to this question is not required and 367 of 407 respondents chose not to answer.

53g) Peer Review

Probability Density Function



Cumulative Distribution



Average:	3.79
Standard Deviation:	2.79
Minimum:	0.00
Maximum:	7.00

An answer to this question is not required and 369 of 407 respondents chose not to answer.

53h) Other:

- 1
- 7
- 6
- 7
- 7
- 1
- 1
- 0
- 1
- 5
- 1
- 1

An answer to this question is not required and 395 of 407 respondents chose not to answer.

53i) (please indicate):

- proficiency testing, standards of explosives run on our instruments
- known chemical compounds and mixtures
- in house standards
- "known" reference standard are run prior to any testing performed (ie color tests for anions, etc.)
- no samples were received for analysis
- N/A
- 1
- 1

An answer to this question is not required and 399 of 407 respondents chose not to answer.

---

ix) **Part H. Explosives Data Interpretation (Check an answer only on those questions which apply to you)**

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54) How often do you use an in-house explosives reference collection in case work?

never	(30)	36.6%
sometimes	(31)	37.8%

often	(12)	14.6%
every case	(9)	11.0%
Total	(82)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 325 of 407 respondents chose not to answer.

---

55) Would you use an on-line explosives data (morphological descriptions, microphotographs, IR, MS, etc...) in case work?

never	(14)	17.7%
sometimes	(30)	38.0%
often	(27)	34.2%
every case	(8)	10.1%
Total	(79)	0 10 20 30 40 50 60 70 80 90 100%

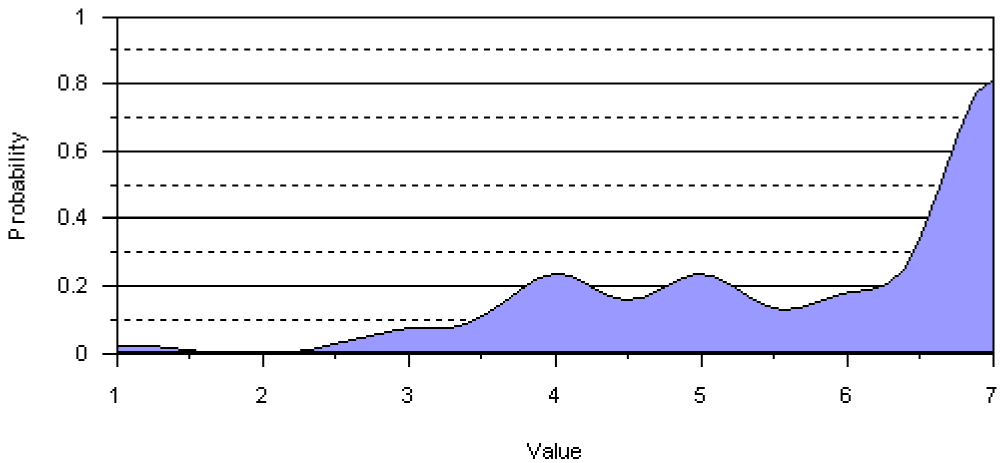
An answer to this question is not required and 328 of 407 respondents chose not to answer.

---

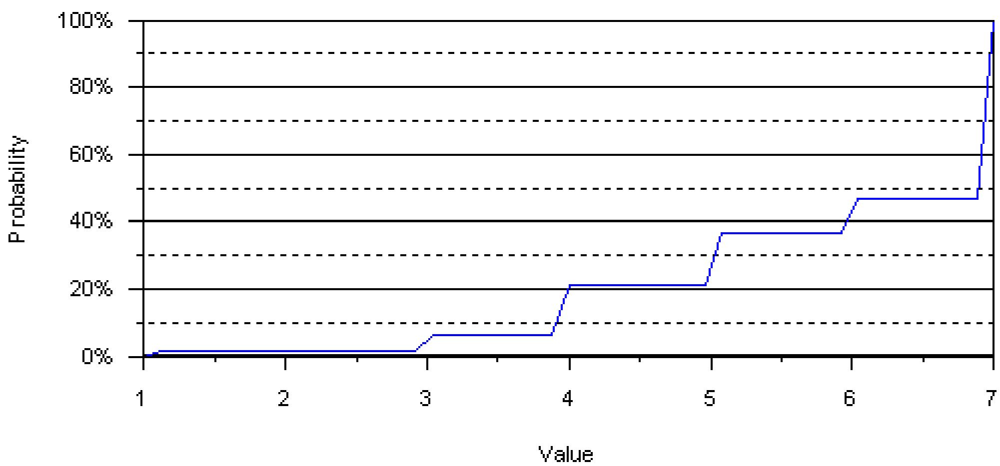
56) Rate the importance of the following courses as part of the education of explosives analysts. (1-7 where: 1 = Not Important, 4 = Moderate, 7 = Extremely)

56a) General Chemistry

Probability Density Function



Cumulative Distribution

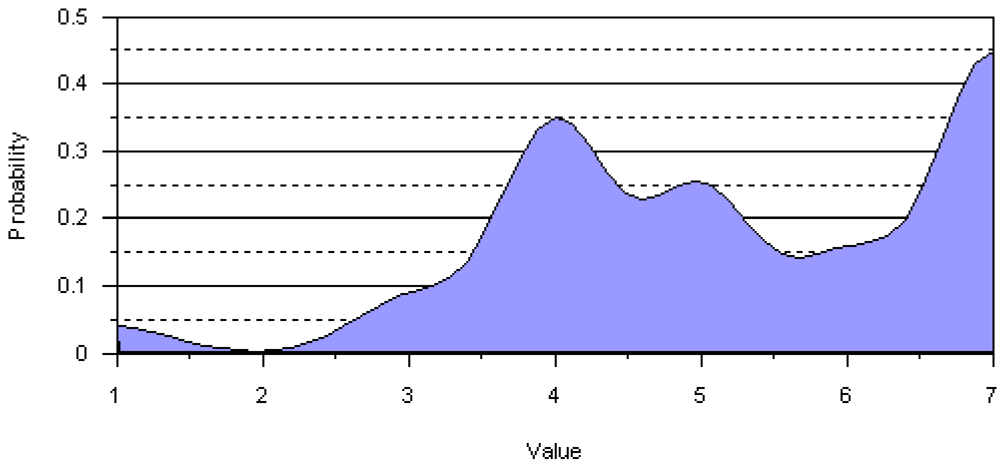


Average:	5.86
Standard Deviation:	1.45
Minimum:	1.00
Maximum:	7.00

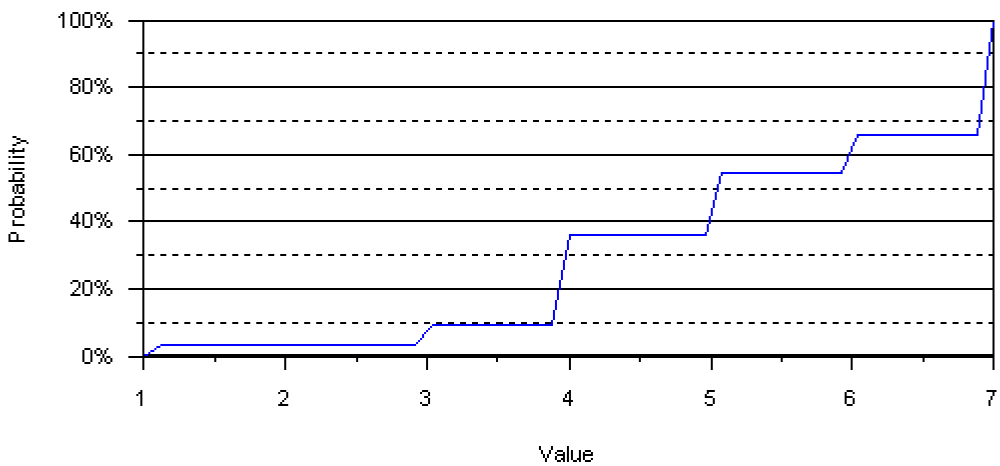
An answer to this question is not required and 341 of 407 respondents chose not to answer.

56b) Advanced organic chemistry

Probability Density Function



Cumulative Distribution

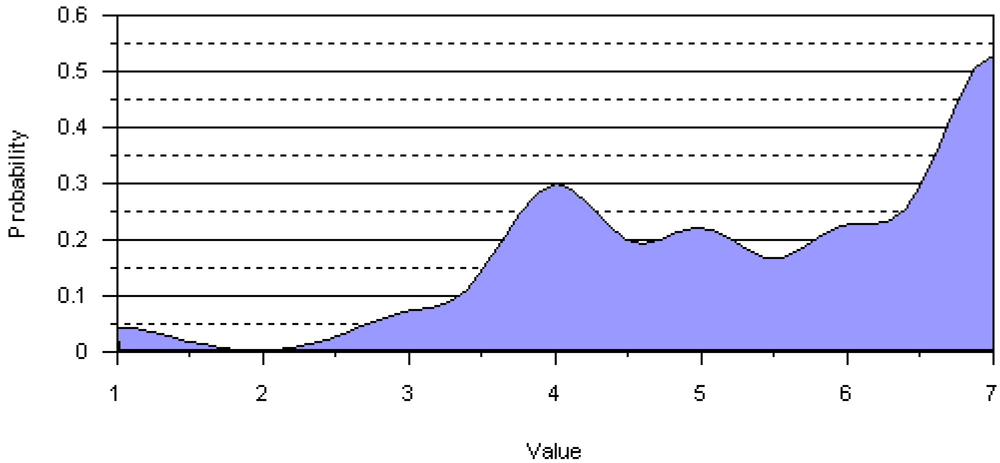


Average:	5.28
Standard Deviation:	1.57
Minimum:	1.00
Maximum:	7.00

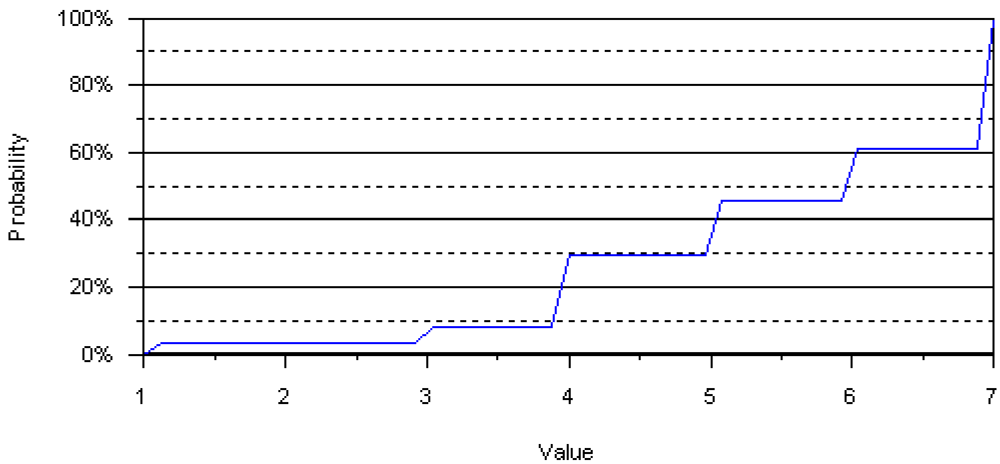
An answer to this question is not required and 343 of 407 respondents chose not to answer.

56c) Inorganic chemistry

Probability Density Function



Cumulative Distribution

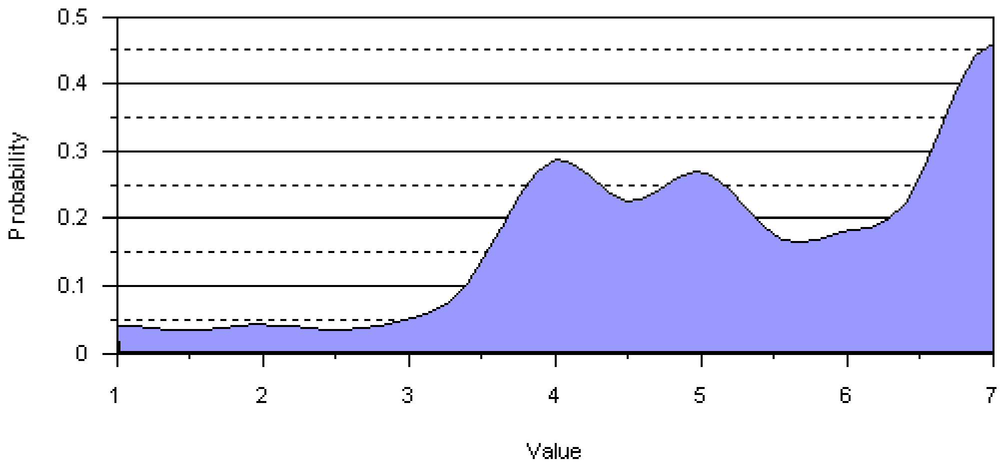


Average:	5.50
Standard Deviation:	1.55
Minimum:	1.00
Maximum:	7.00

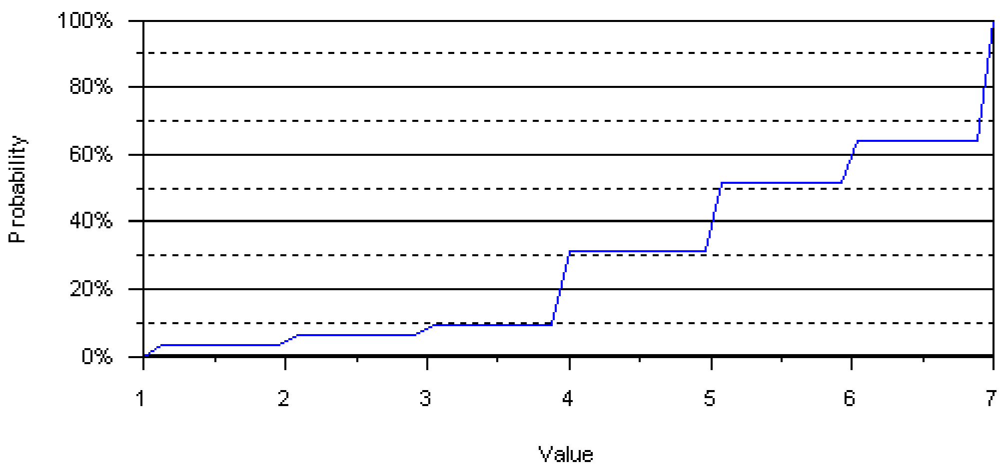
An answer to this question is not required and 343 of 407 respondents chose not to answer.

56d) Introductory physics

Probability Density Function



Cumulative Distribution

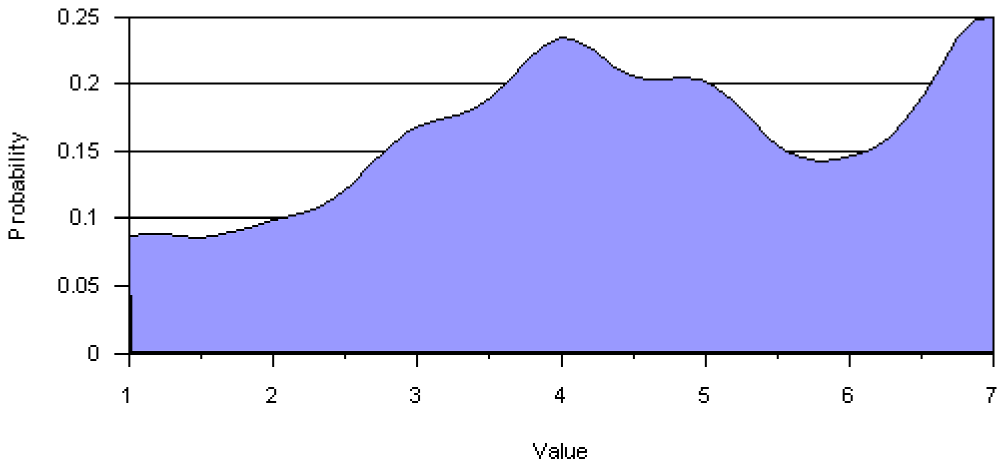


Average:	5.34
Standard Deviation:	1.62
Minimum:	1.00
Maximum:	7.00

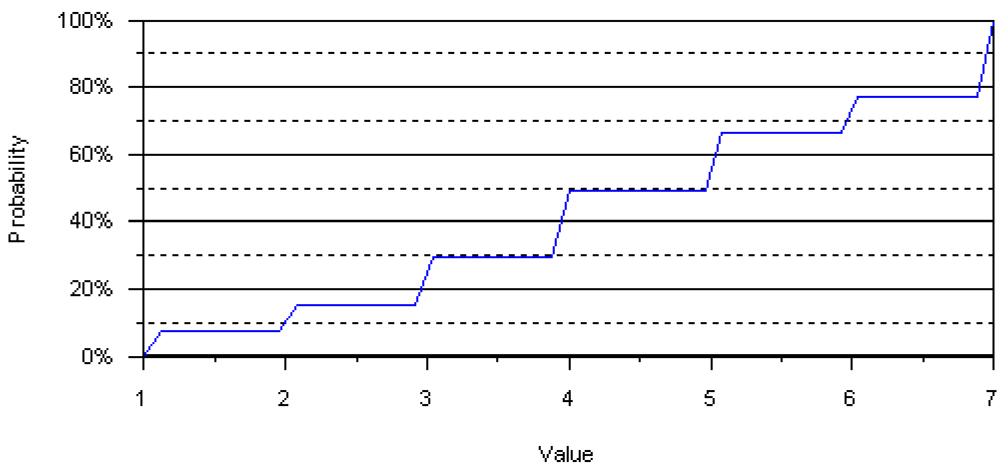
An answer to this question is not required and 343 of 407 respondents chose not to answer.

56e) Advanced physics

Probability Density Function



Cumulative Distribution

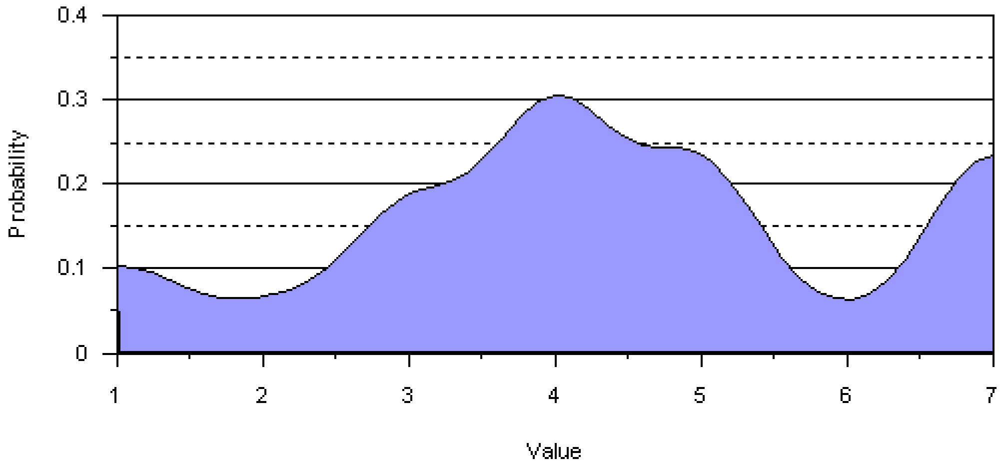


Average:	4.55
Standard Deviation:	1.89
Minimum:	1.00
Maximum:	7.00

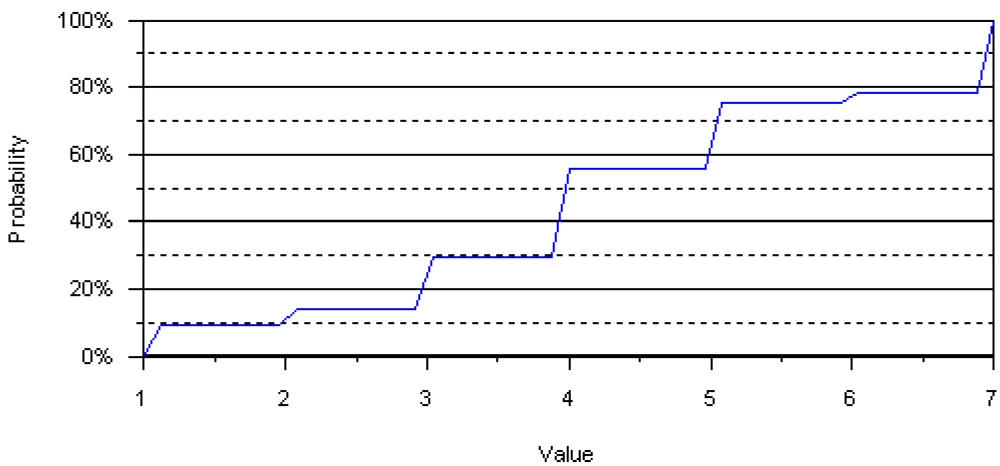
An answer to this question is not required and 342 of 407 respondents chose not to answer.

56f) Advanced mathematics

Probability Density Function



Cumulative Distribution

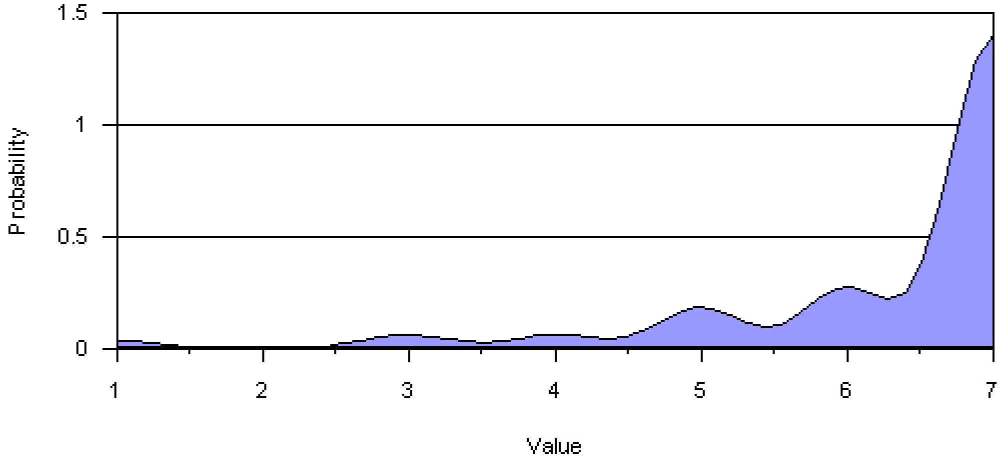


Average:	4.38
Standard Deviation:	1.83
Minimum:	1.00
Maximum:	7.00

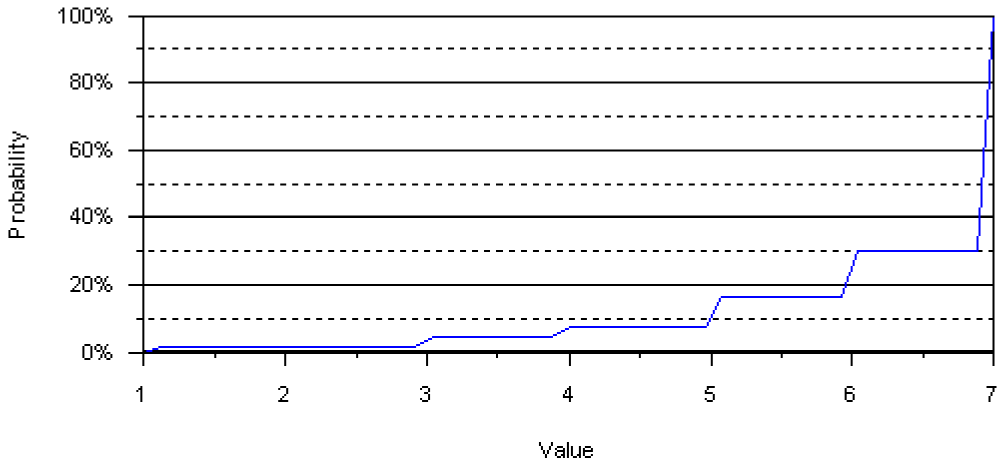
An answer to this question is not required and 342 of 407 respondents chose not to answer.

56g) Intro. to explosives

Probability Density Function



Cumulative Distribution

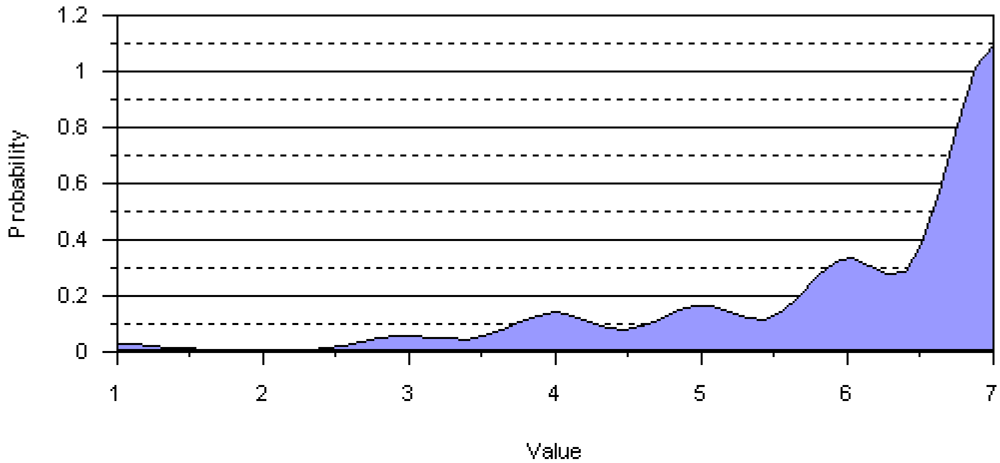


Average:	6.38
Standard Deviation:	1.20
Minimum:	1.00
Maximum:	7.00

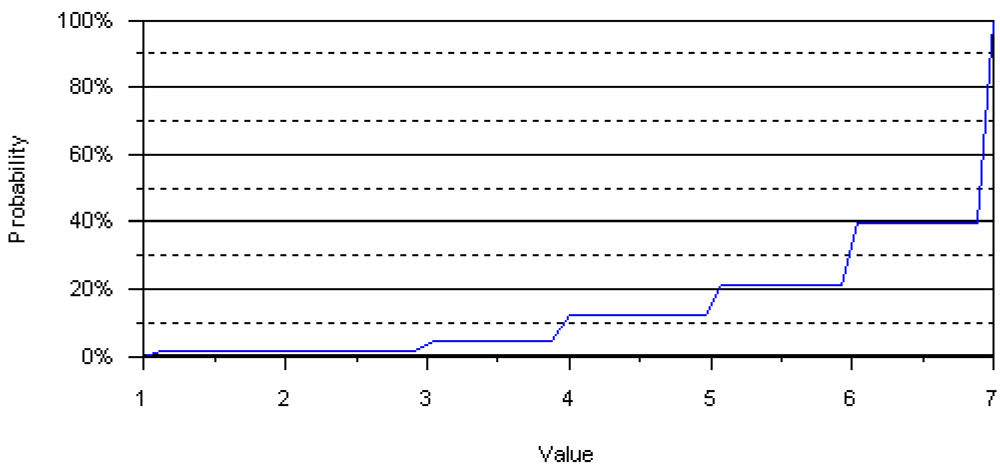
An answer to this question is not required and 341 of 407 respondents chose not to answer.

56h) Combustion explosions

Probability Density Function



Cumulative Distribution

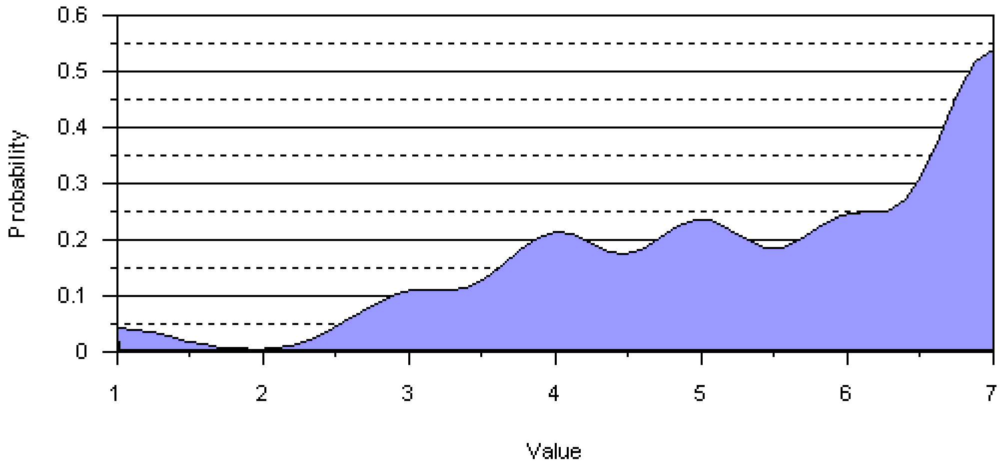


Average:	6.20
Standard Deviation:	1.28
Minimum:	1.00
Maximum:	7.00

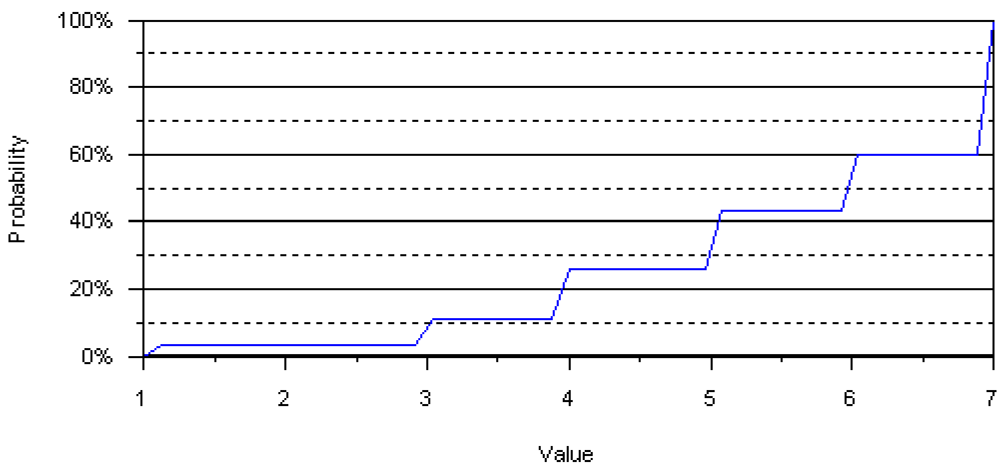
An answer to this question is not required and 341 of 407 respondents chose not to answer.

56i) Organic chemistry

Probability Density Function



Cumulative Distribution

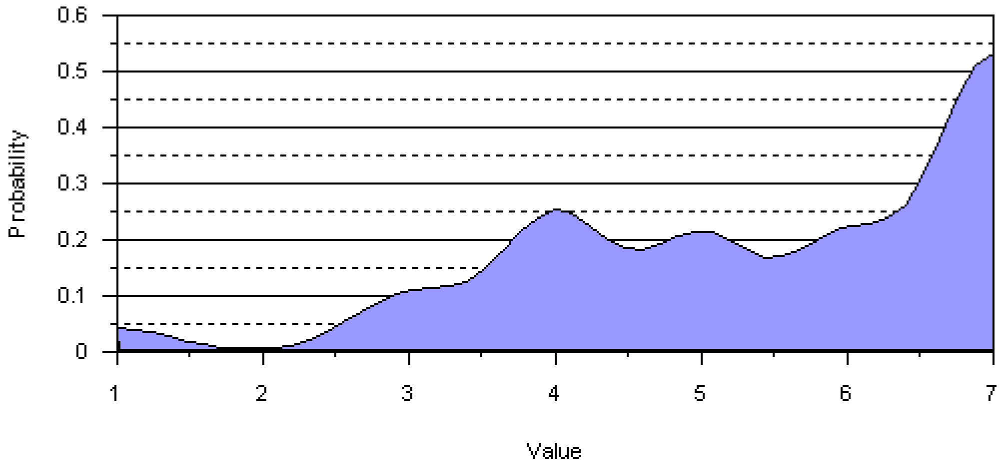


Average:	5.54
Standard Deviation:	1.57
Minimum:	1.00
Maximum:	7.00

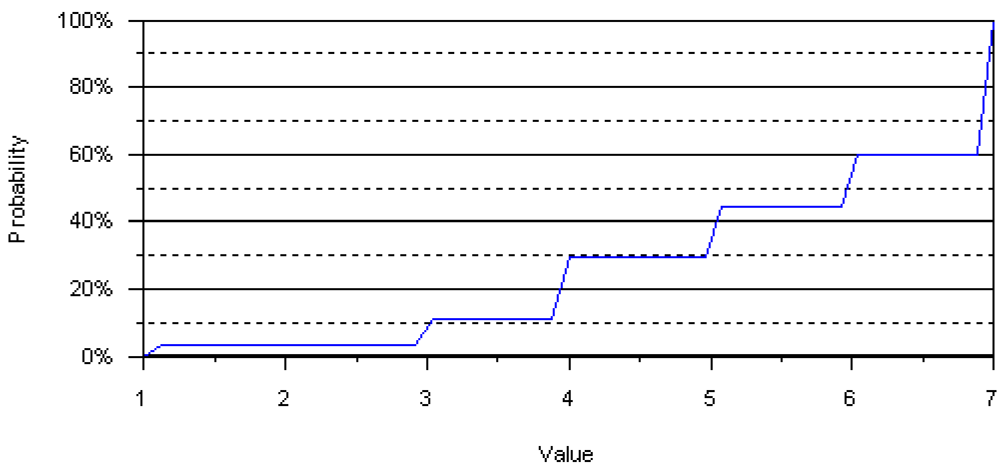
An answer to this question is not required and 342 of 407 respondents chose not to answer.

56j) Analytical chemistry

Probability Density Function



Cumulative Distribution

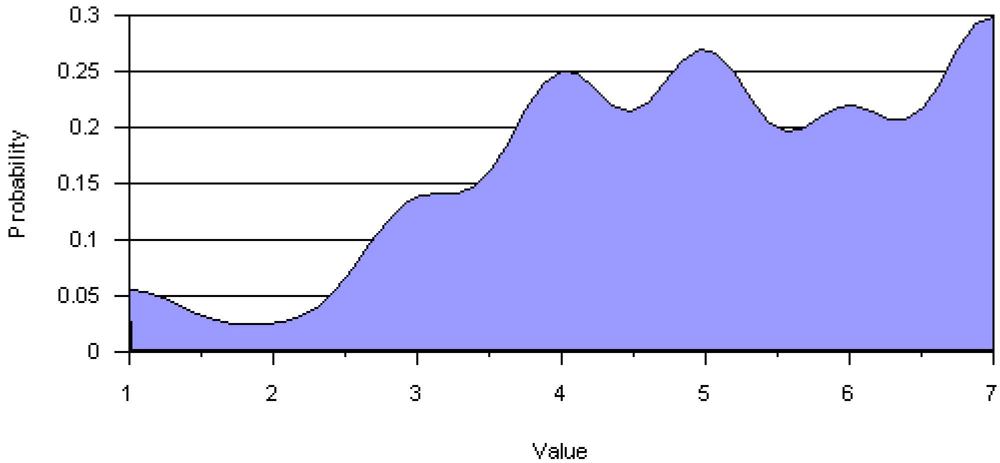


Average:	5.49
Standard Deviation:	1.59
Minimum:	1.00
Maximum:	7.00

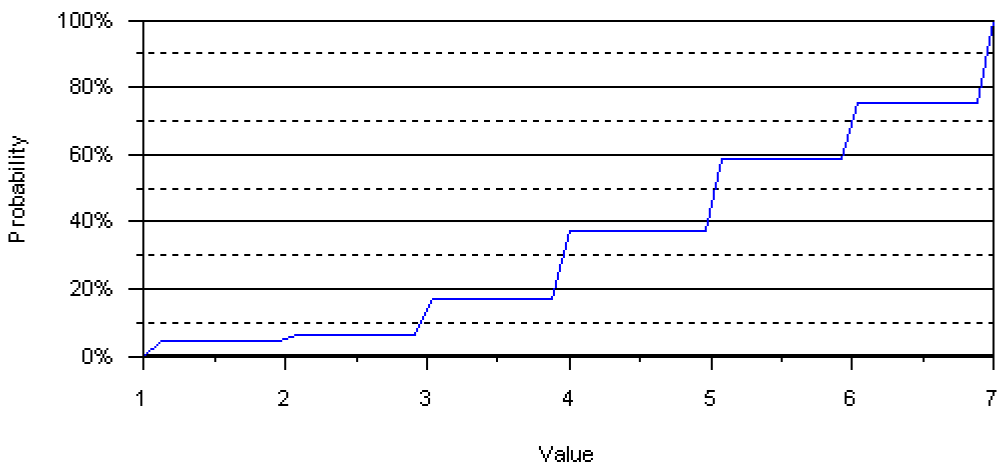
An answer to this question is not required and 342 of 407 respondents chose not to answer.

56k) Physical chemistry

Probability Density Function



Cumulative Distribution

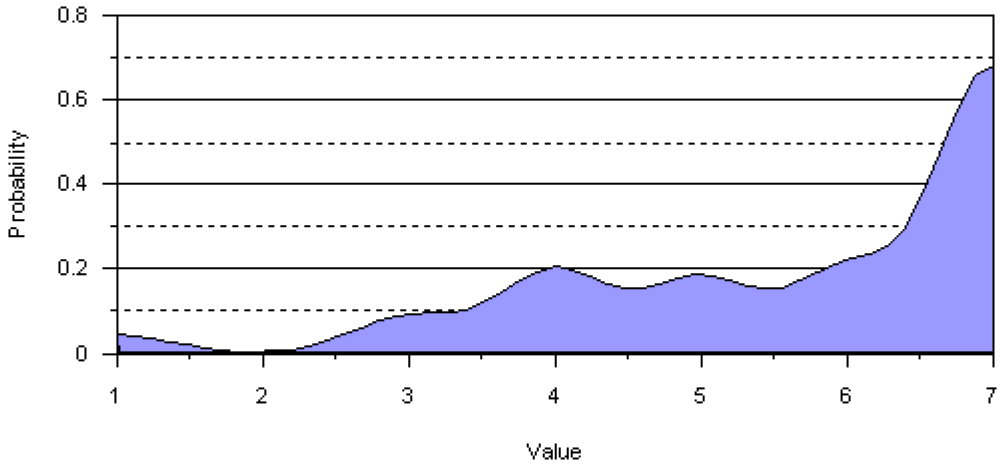


Average:	5.02
Standard Deviation:	1.64
Minimum:	1.00
Maximum:	7.00

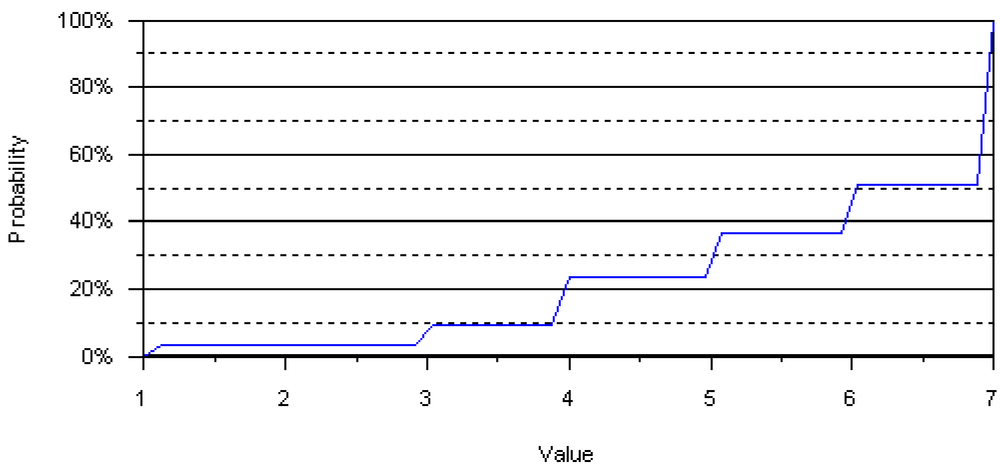
An answer to this question is not required and 342 of 407 respondents chose not to answer.

56l) Instrumental analysis

Probability Density Function



Cumulative Distribution

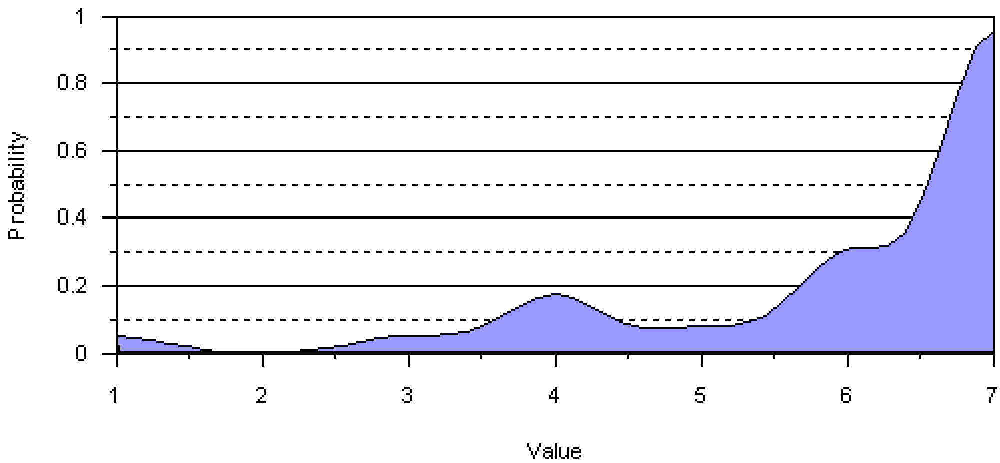


Average:	5.73
Standard Deviation:	1.59
Minimum:	1.00
Maximum:	7.00

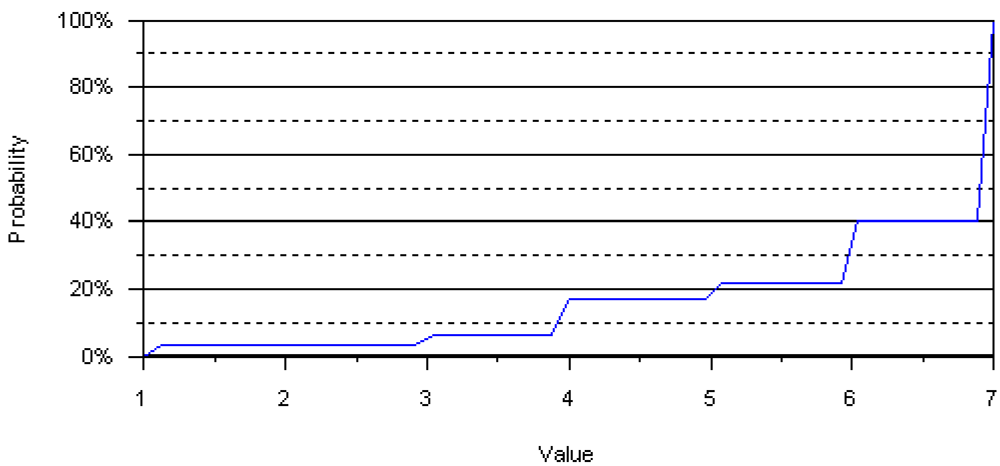
An answer to this question is not required and 344 of 407 respondents chose not to answer.

56m) Chemical analysis of explosives

Probability Density Function



Cumulative Distribution

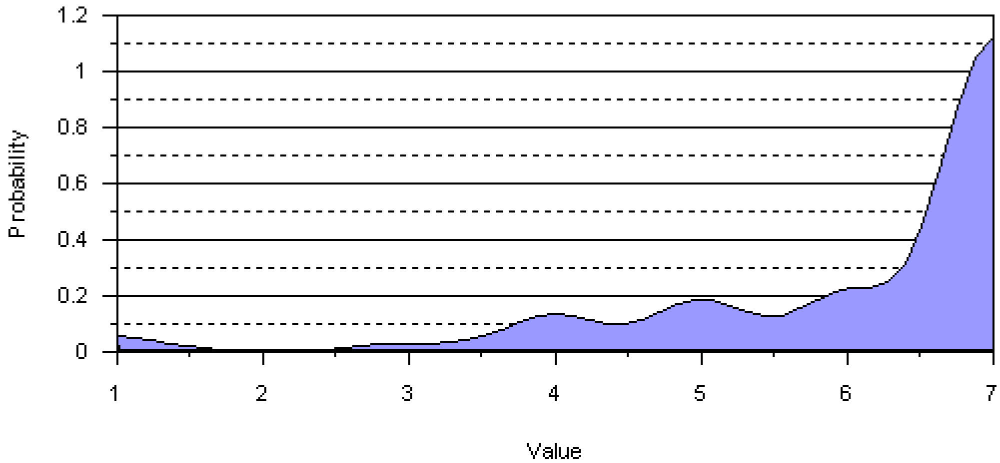


Average:	6.09
Standard Deviation:	1.47
Minimum:	1.00
Maximum:	7.00

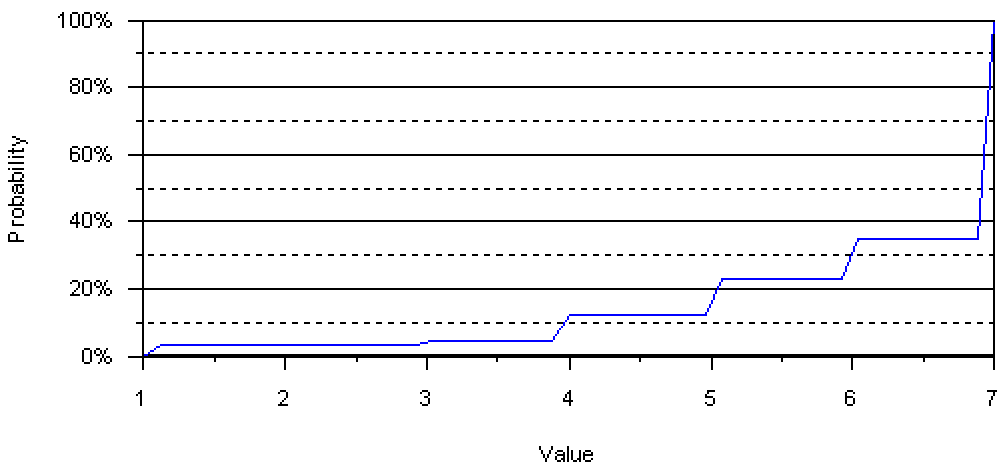
An answer to this question is not required and 342 of 407 respondents chose not to answer.

56n) The chemistry of pyrotechnics

Probability Density Function



Cumulative Distribution

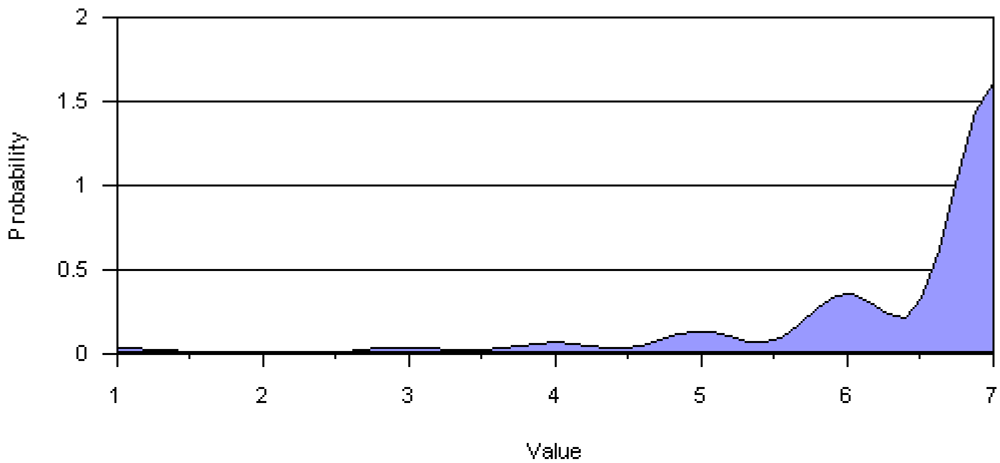


Average:	6.20
Standard Deviation:	1.39
Minimum:	1.00
Maximum:	7.00

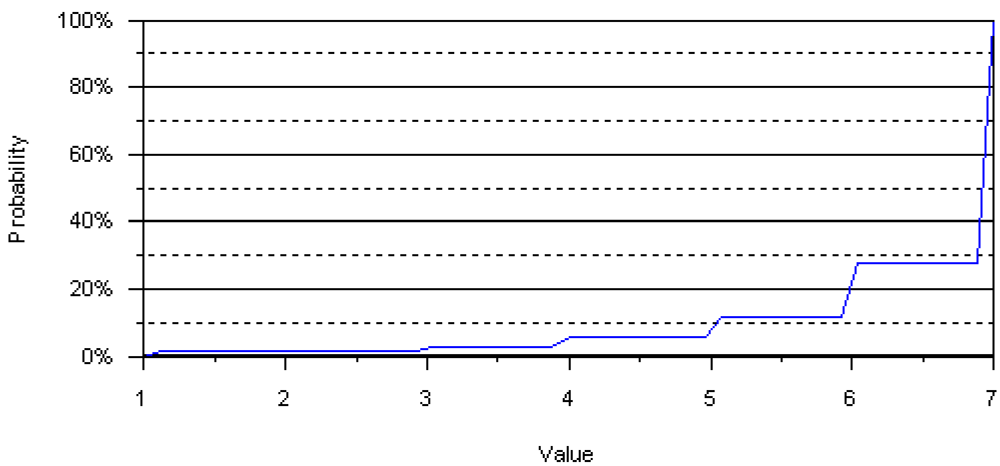
An answer to this question is not required and 341 of 407 respondents chose not to answer.

56o) Explosives analysis

Probability Density Function



Cumulative Distribution

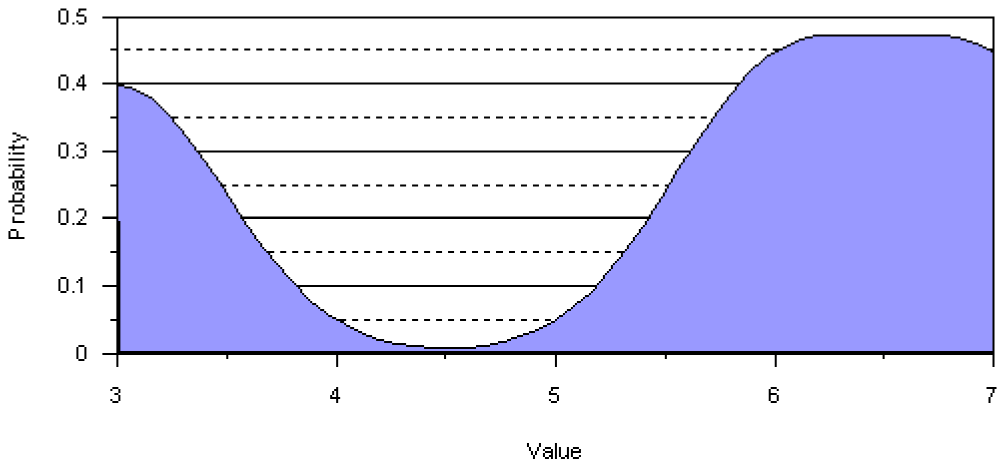


Average:	6.49
Standard Deviation:	1.09
Minimum:	1.00
Maximum:	7.00

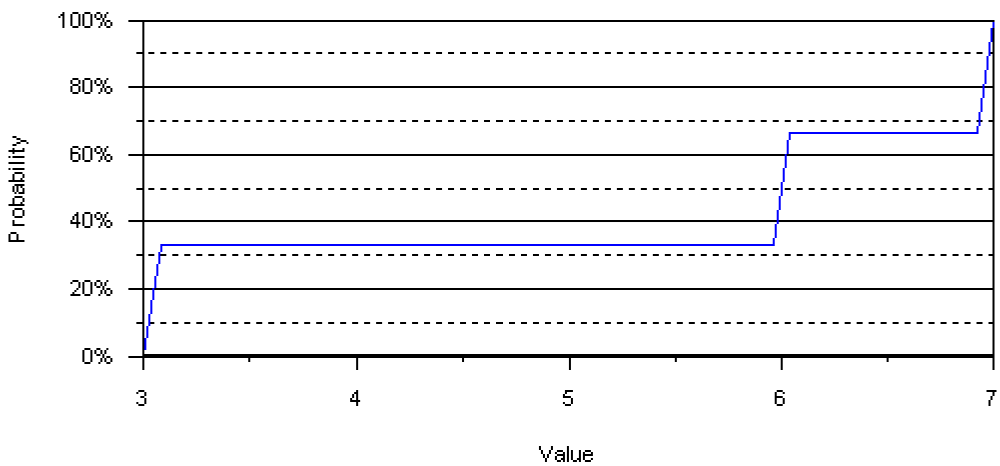
An answer to this question is not required and 339 of 407 respondents chose not to answer.

56p) Other:

Probability Density Function



Cumulative Distribution



Average:	5.33
Standard Deviation:	2.08
Minimum:	3.00
Maximum:	7.00

An answer to this question is not required and 404 of 407 respondents chose not to answer.

56q) (please indicate):

- Blast effects calculations
- Digital imaging training
- N/A
- 3

- Safety, Post and Pre-Blast

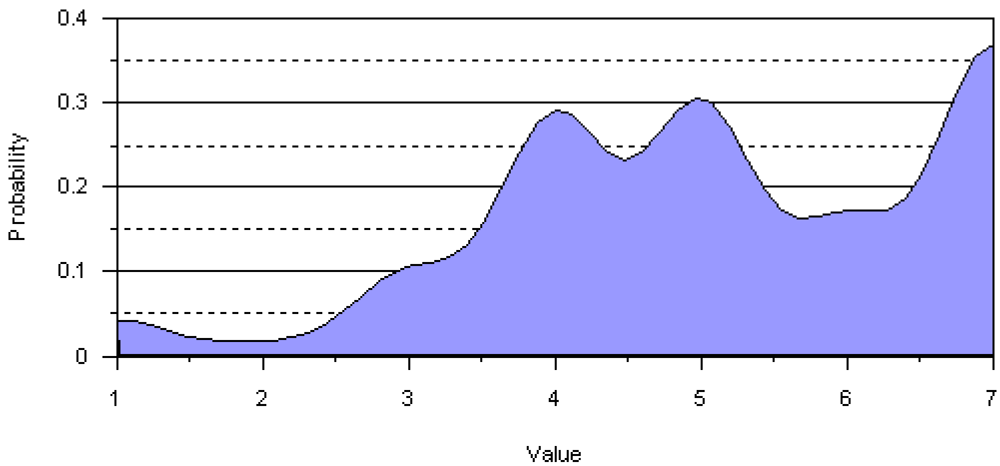
An answer to this question is not required and 402 of 407 respondents chose not to answer.

---

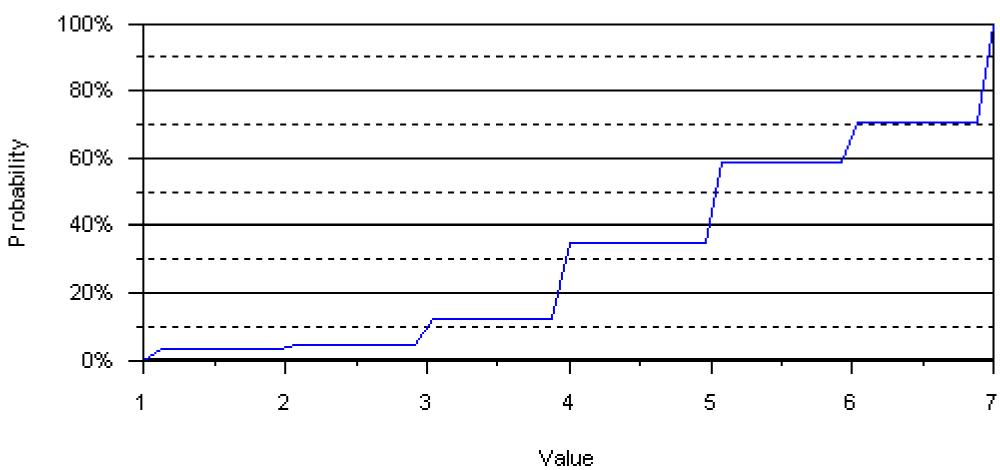
57) Rate training or course work in the following areas for explosives analysts? (1-7 where: 1 = Not Important, 4 = Moderate, 7 = Extremely)

57a) History of Explosives

Probability Density Function



Cumulative Distribution



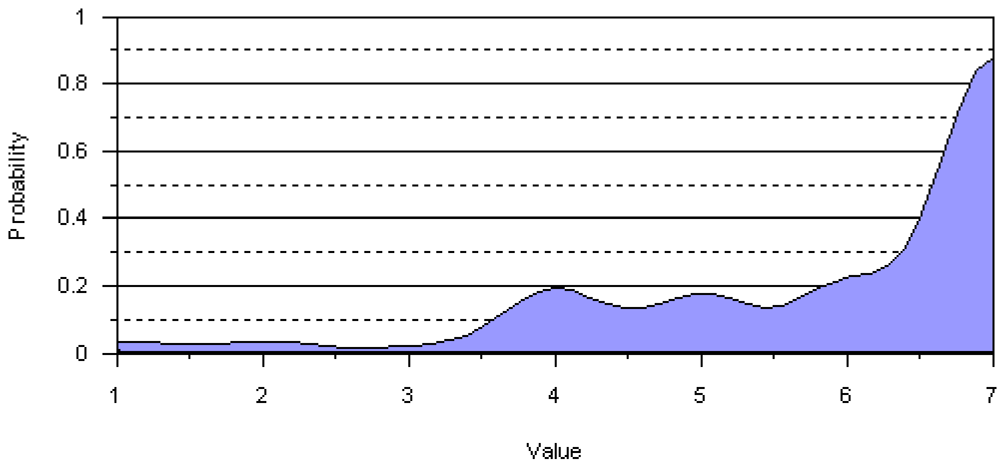
Average: 5.16

Standard Deviation:	1.57
Minimum:	1.00
Maximum:	7.00

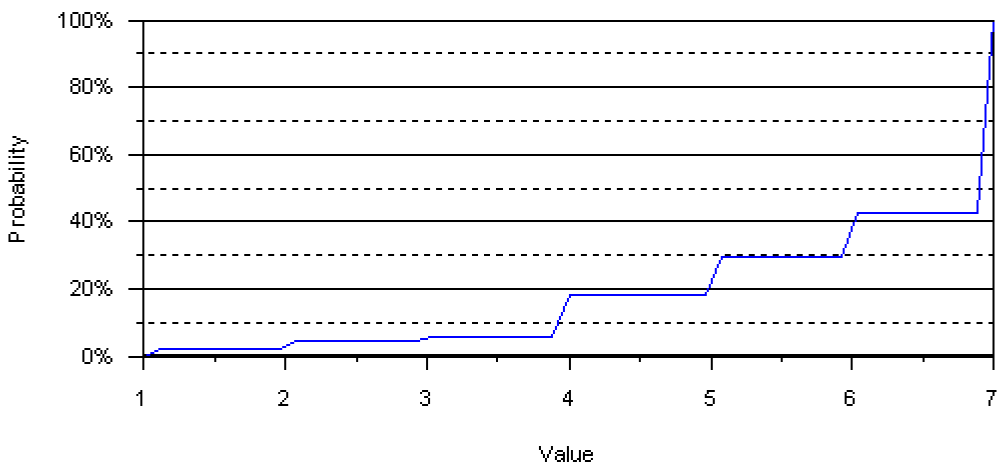
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57b) Terminology and vocabulary of explosives

Probability Density Function



Cumulative Distribution

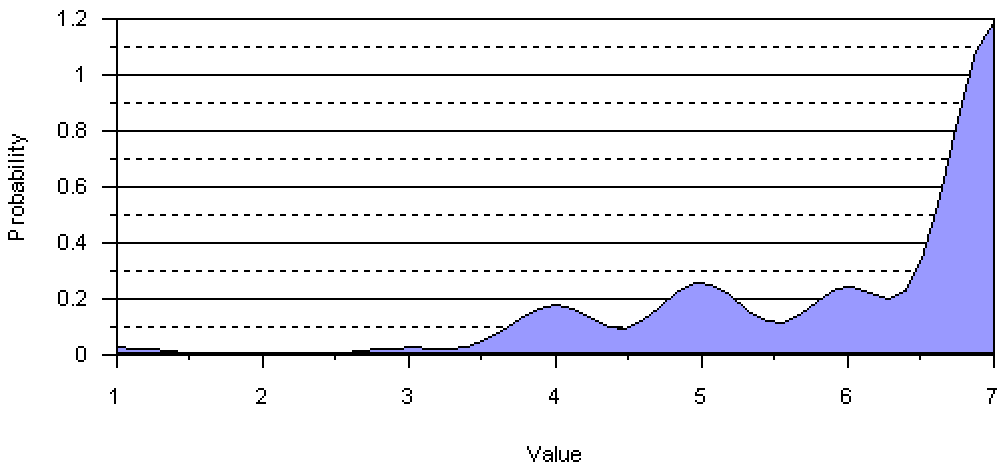


Average:	5.98
Standard Deviation:	1.49
Minimum:	1.00
Maximum:	7.00

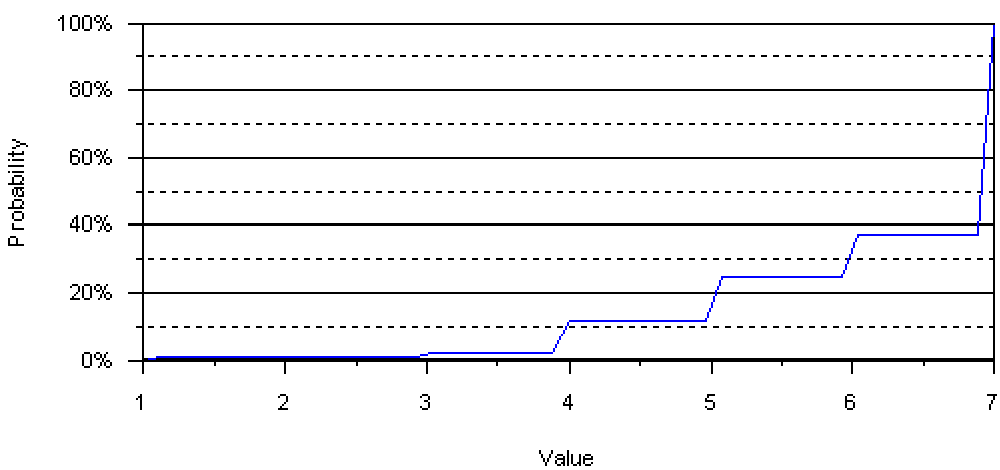
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57c) Composition of low explosive materials

Probability Density Function



Cumulative Distribution

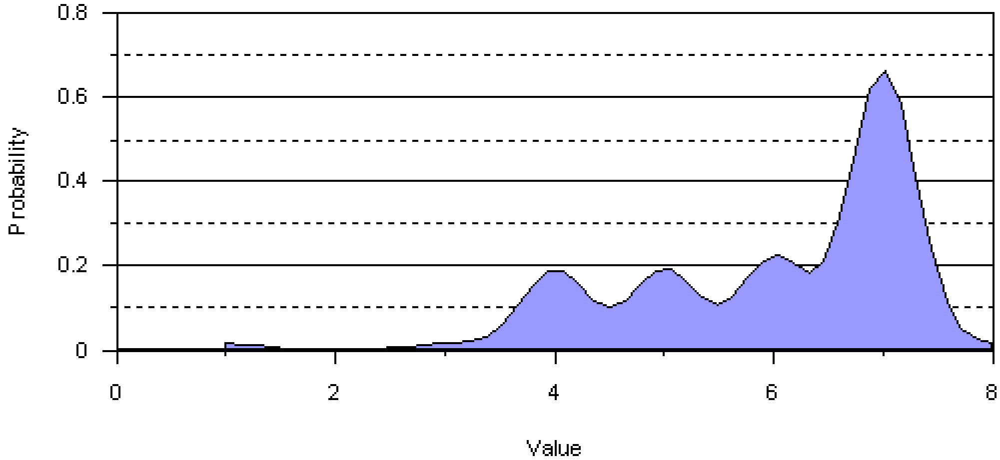


Average:	6.22
Standard Deviation:	1.22
Minimum:	1.00
Maximum:	7.00

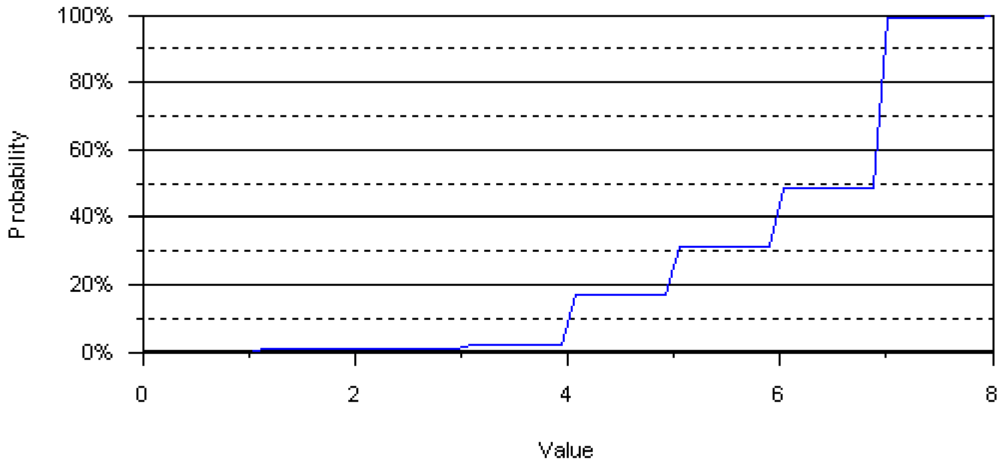
An answer to this question is not required and 319 of 407 respondents chose not to answer.

57d) Construction of commercial pyrotechnic devices

Probability Density Function



Cumulative Distribution

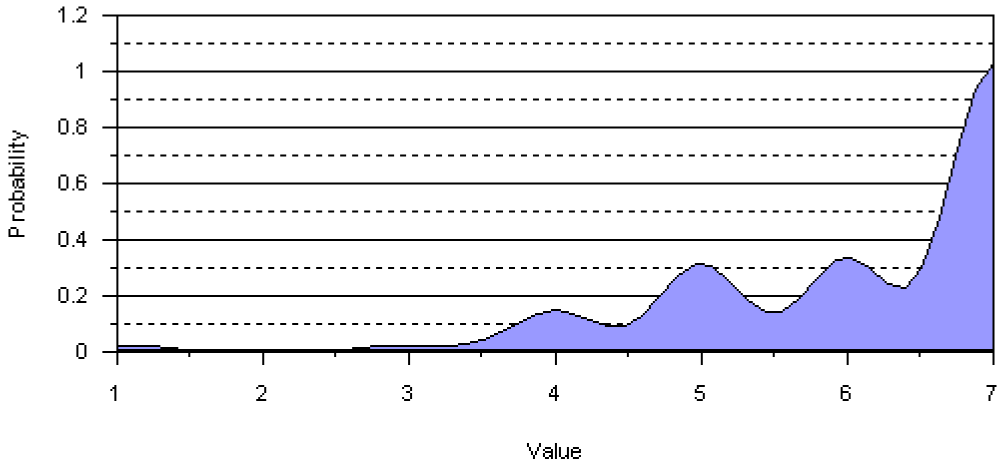


Average:	6.00
Standard Deviation:	1.30
Minimum:	1.00
Maximum:	8.00

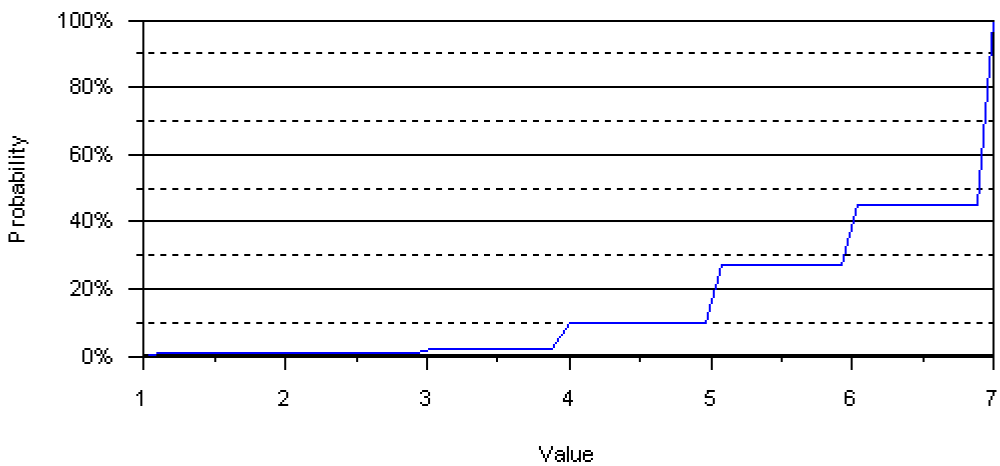
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57e) Construction of military devices (e.g. simulators, rockets, hand grenades)

Probability Density Function



Cumulative Distribution

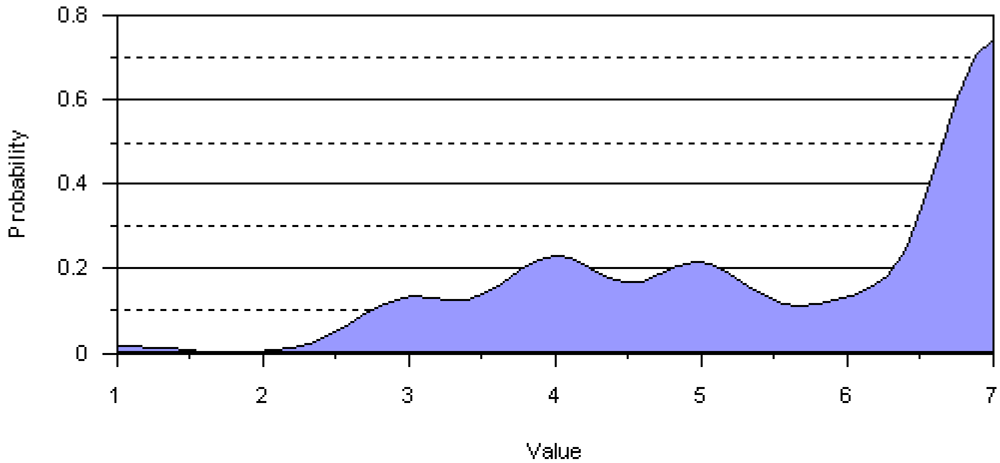


Average:	6.13
Standard Deviation:	1.19
Minimum:	1.00
Maximum:	7.00

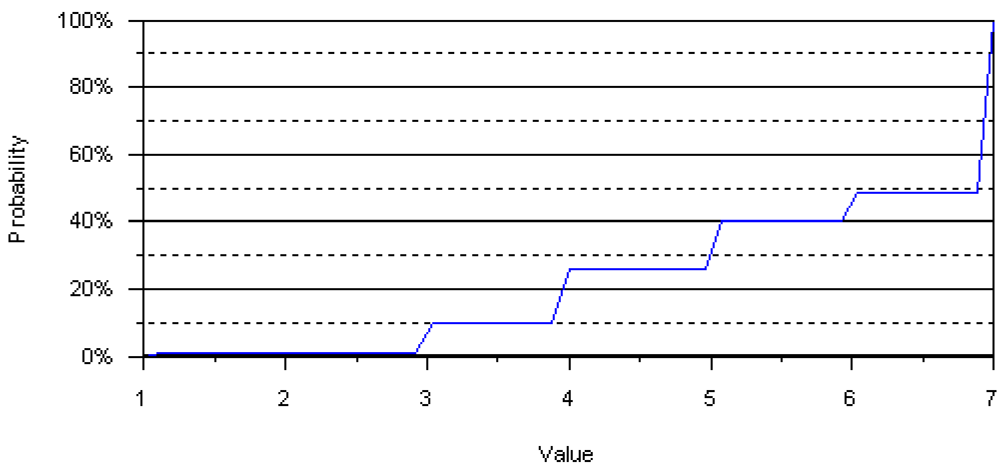
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57f) Range procedures

Probability Density Function



Cumulative Distribution

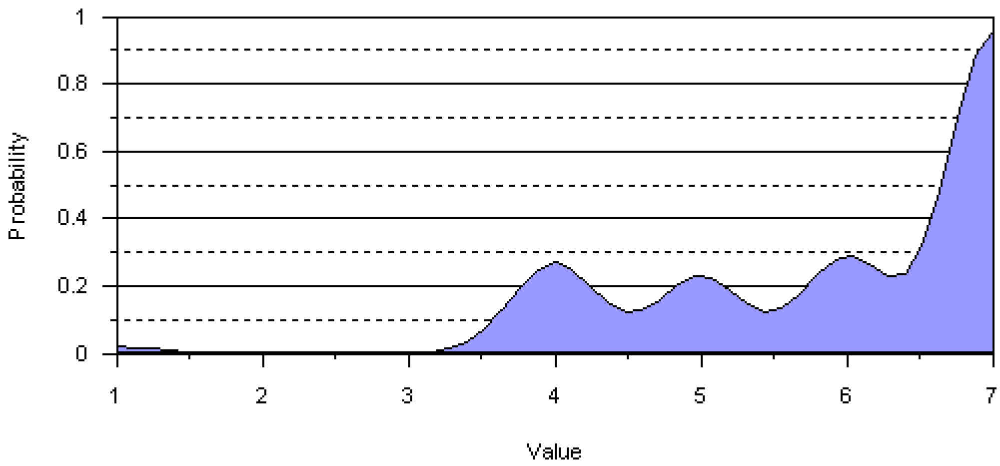


Average:	5.73
Standard Deviation:	1.53
Minimum:	1.00
Maximum:	7.00

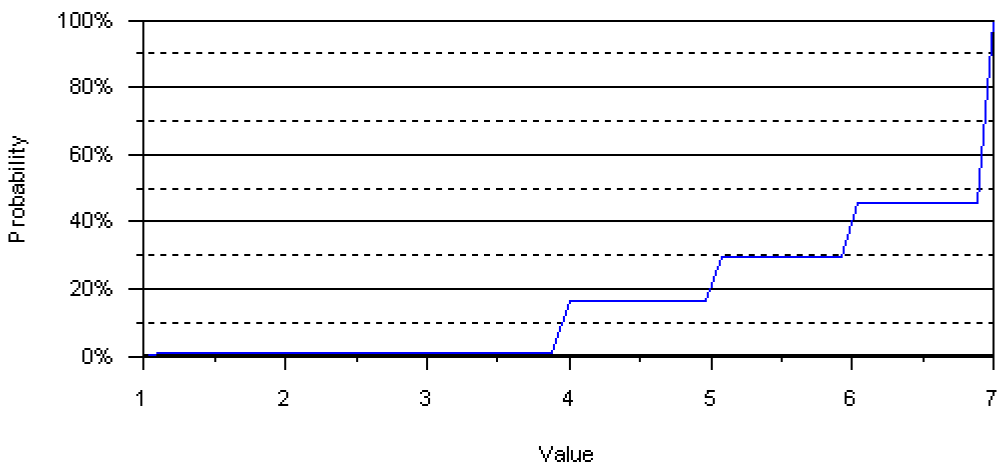
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57g) Peroxide Based Explosives

Probability Density Function



Cumulative Distribution

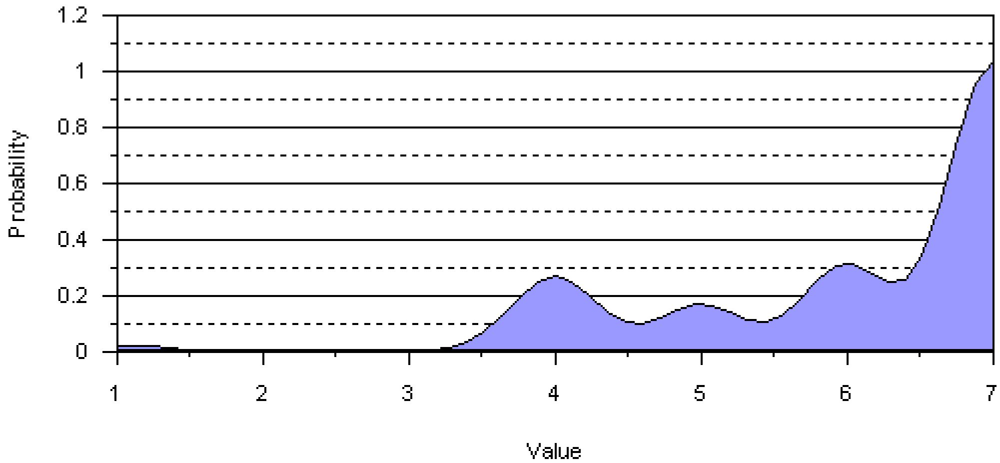


Average:	6.05
Standard Deviation:	1.25
Minimum:	1.00
Maximum:	7.00

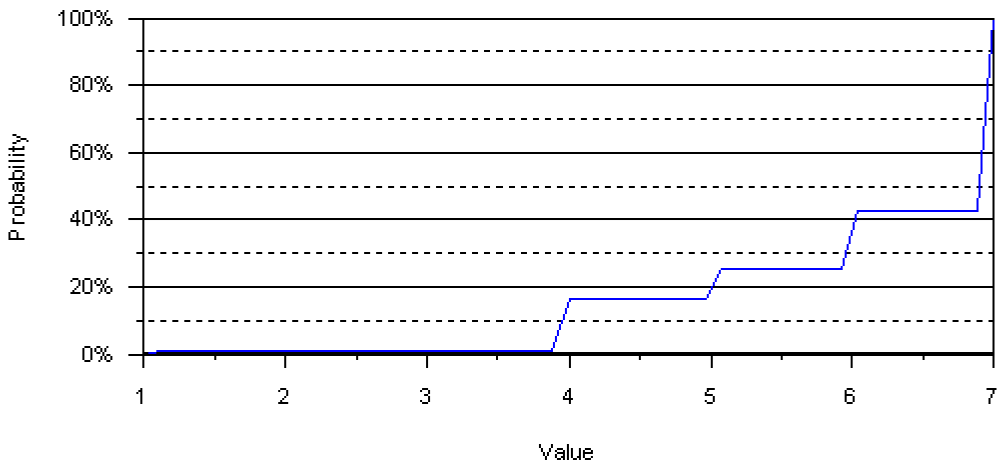
An answer to this question is not required and 315 of 407 respondents chose not to answer.

57h) Manufacturing of explosives

Probability Density Function



Cumulative Distribution

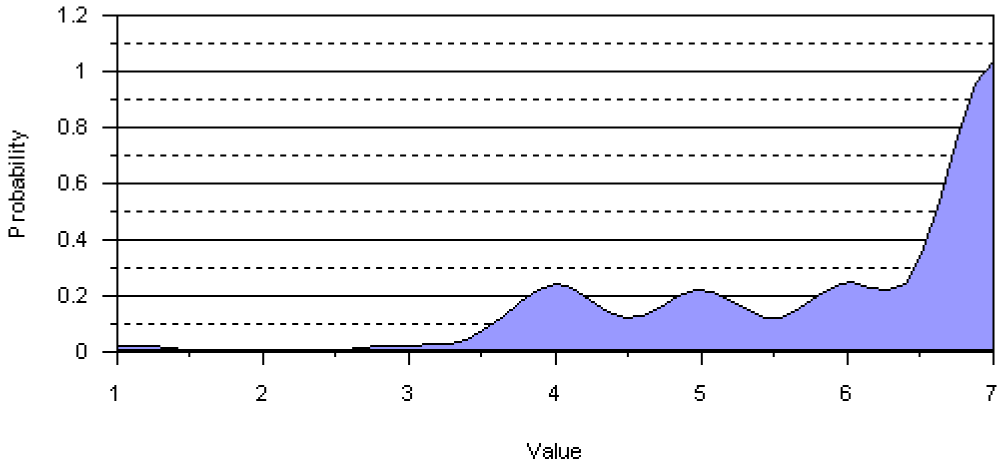


Average:	6.13
Standard Deviation:	1.25
Minimum:	1.00
Maximum:	7.00

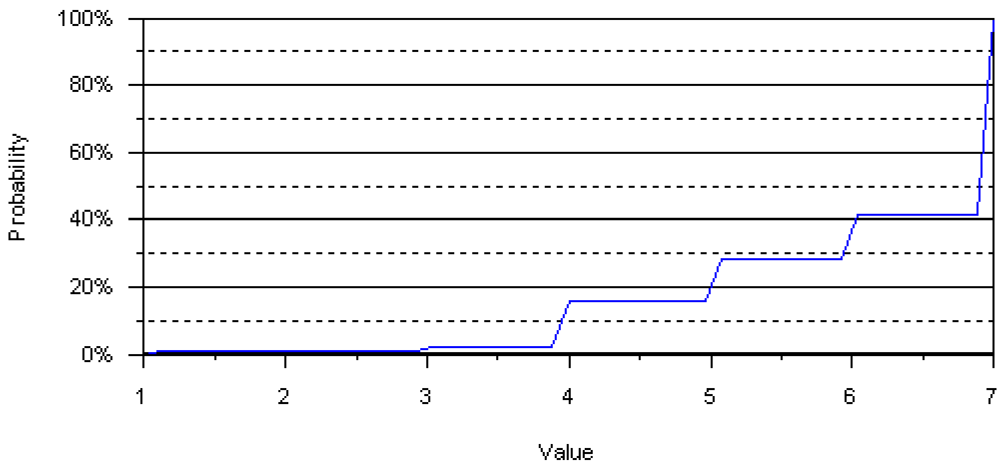
An answer to this question is not required and 320 of 407 respondents chose not to answer.

57i) Composition of high explosive materials

Probability Density Function



Cumulative Distribution

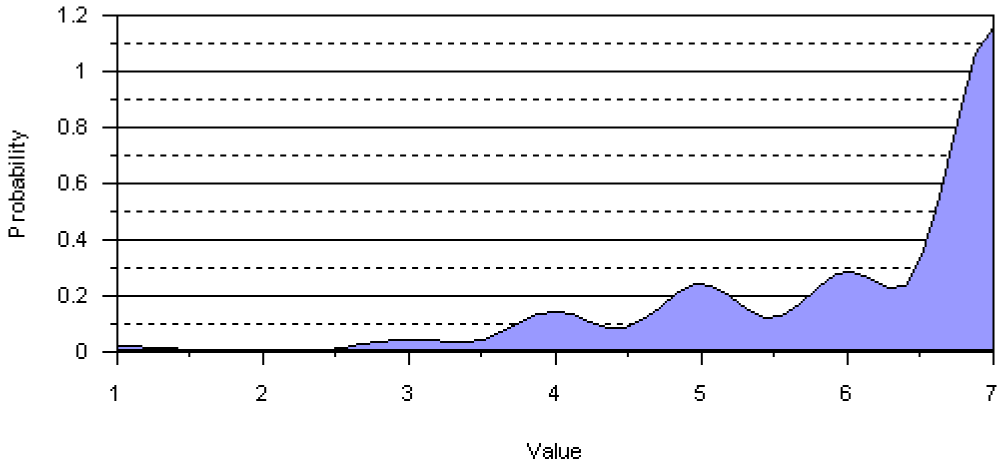


Average:	6.10
Standard Deviation:	1.28
Minimum:	1.00
Maximum:	7.00

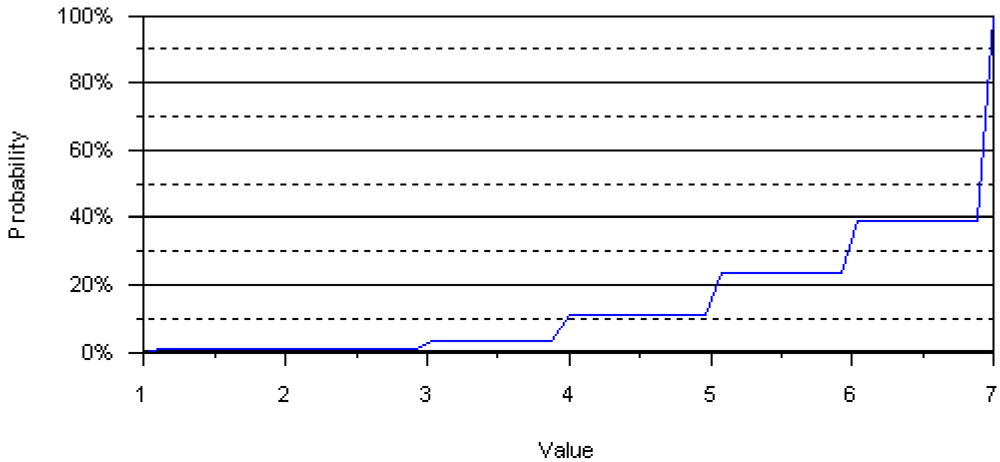
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57j) Construction of improvised devices

Probability Density Function



Cumulative Distribution

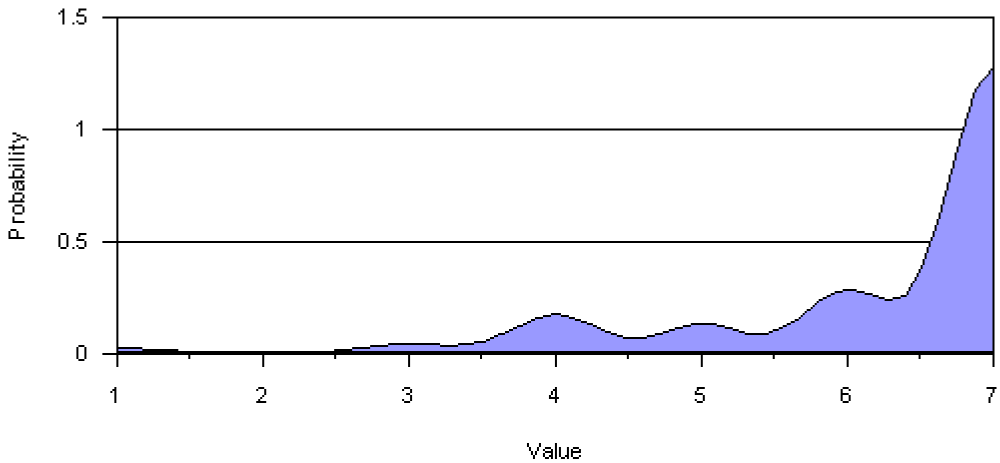


Average:	6.22
Standard Deviation:	1.21
Minimum:	1.00
Maximum:	7.00

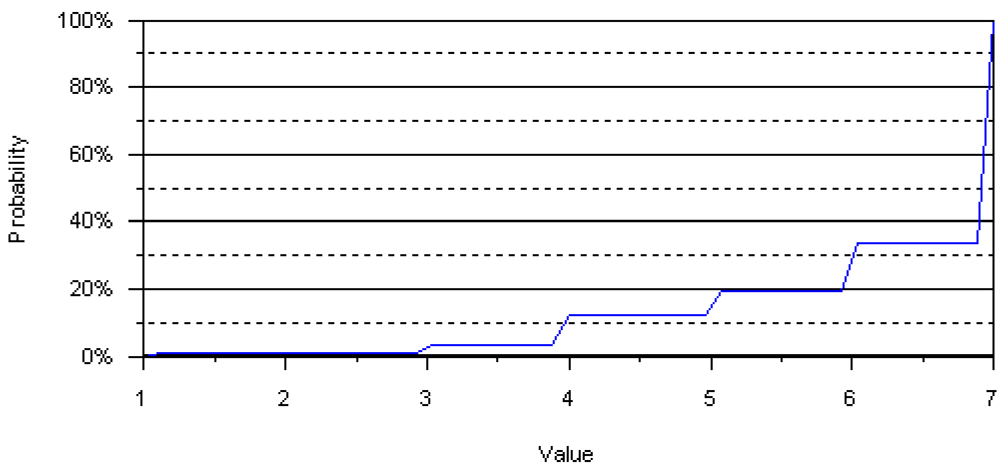
An answer to this question is not required and 314 of 407 respondents chose not to answer.

57k) Analytical examination of high and low explosive materials and residues

Probability Density Function



Cumulative Distribution

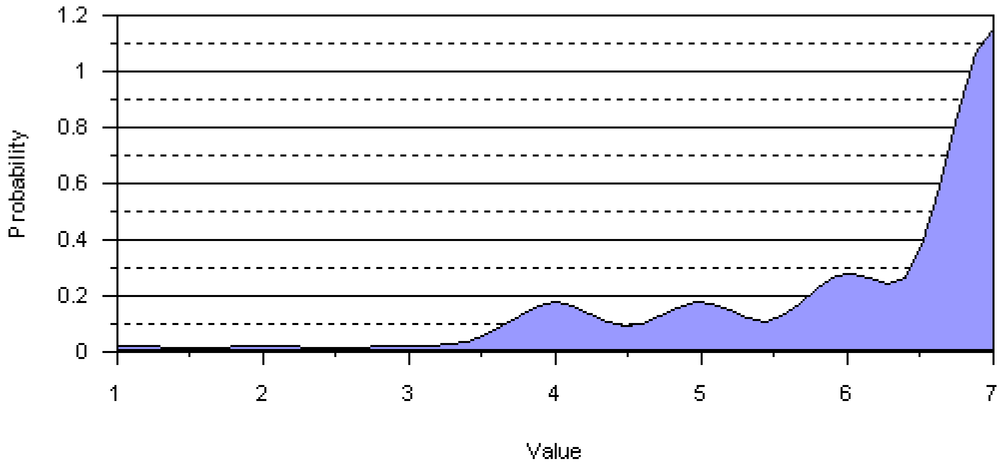


Average:	6.29
Standard Deviation:	1.23
Minimum:	1.00
Maximum:	7.00

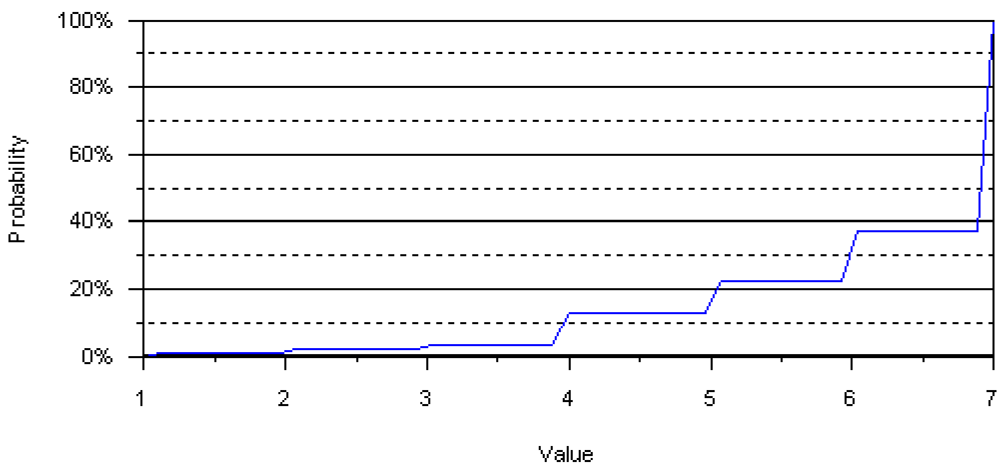
An answer to this question is not required and 318 of 407 respondents chose not to answer.

57l) Recognition of improvised device components

Probability Density Function



Cumulative Distribution

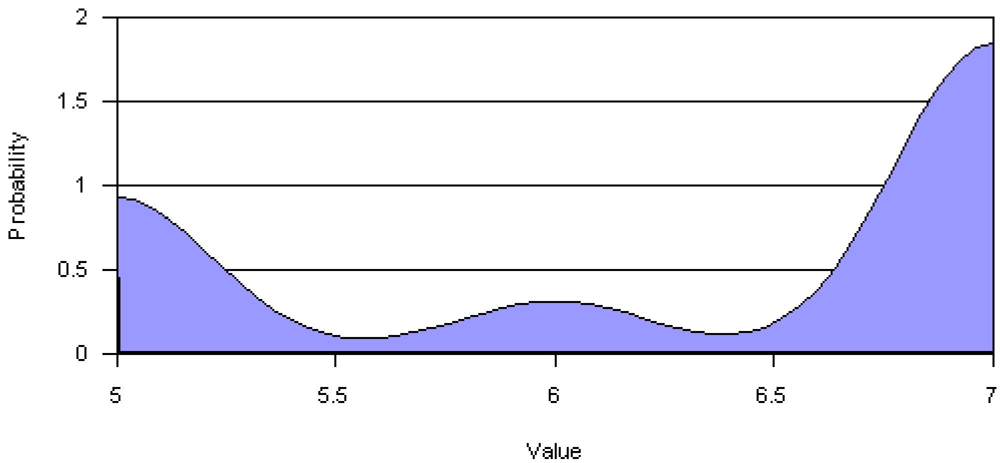


Average:	6.21
Standard Deviation:	1.27
Minimum:	1.00
Maximum:	7.00

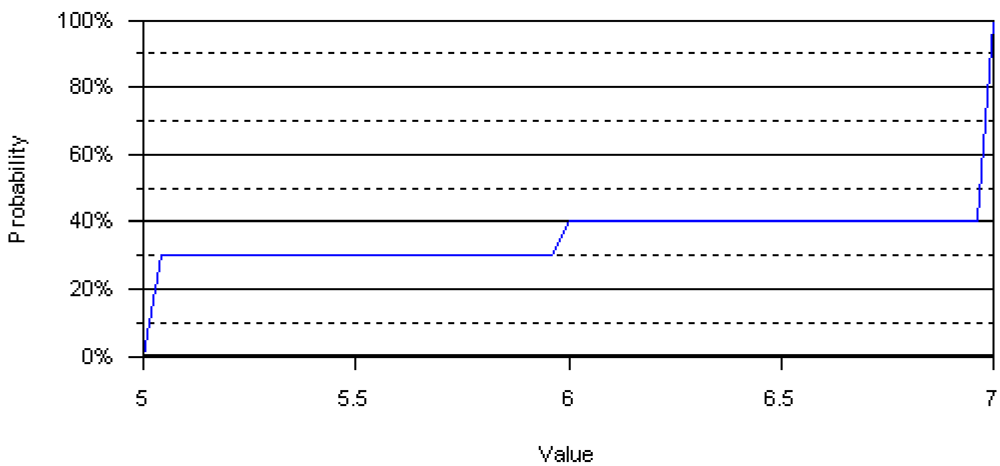
An answer to this question is not required and 313 of 407 respondents chose not to answer.

57m) Other:

Probability Density Function



Cumulative Distribution



Average:	6.30
Standard Deviation:	0.95
Minimum:	5.00
Maximum:	7.00

An answer to this question is not required and 397 of 407 respondents chose not to answer.

57n) (please indicate):

- All sections involving practical
- Oxidizers
- Digital imaging training
- any explosive advanced training

- Post Blast Investigation procedures

An answer to this question is not required and 402 of 407 respondents chose not to answer.

x) **Part I Fire Scene Specialists (Check an answer only on those questions which apply to you)**

58) Indicate the number of fire scenes processed in 2006 by all of the investigators at your physical location (check one):

1-50	(130)	48.1%
51-100	(41)	15.2%
101-250	(41)	15.2%
251-500	(33)	12.2%
501-750	(10)	3.7%
751-1000	(6)	2.2%
1001-2000	(4)	1.5%
>2000	(5)	1.9%
Total	(270)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 137 of 407 respondents chose not to answer.

59) Have you had formal training in the investigation of fire scenes?

Yes	(273)	94.8%
No	(15)	5.2%
Total	(288)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 119 of 407 respondents chose not to answer.

59a) Rate the importance of formal training in the investigation of fire scenes: (1-7 with 1 = Not at all, and 7 = Very)

1	(3)	1.1%
2	(2)	0.7%
3	(2)	0.7%
4	(2)	0.7%
5	(6)	2.2%
6	(26)	9.4%
7	(235)	85.1%
Total	(276)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 131 of 407 respondents chose not to answer.

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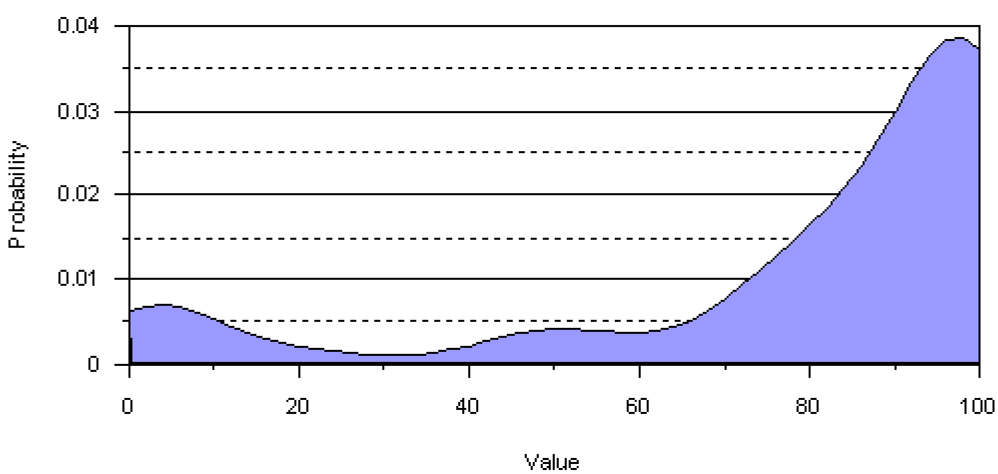
60) What type of containers do you use in submitting fire debris to a laboratory for ignitable liquid determination?

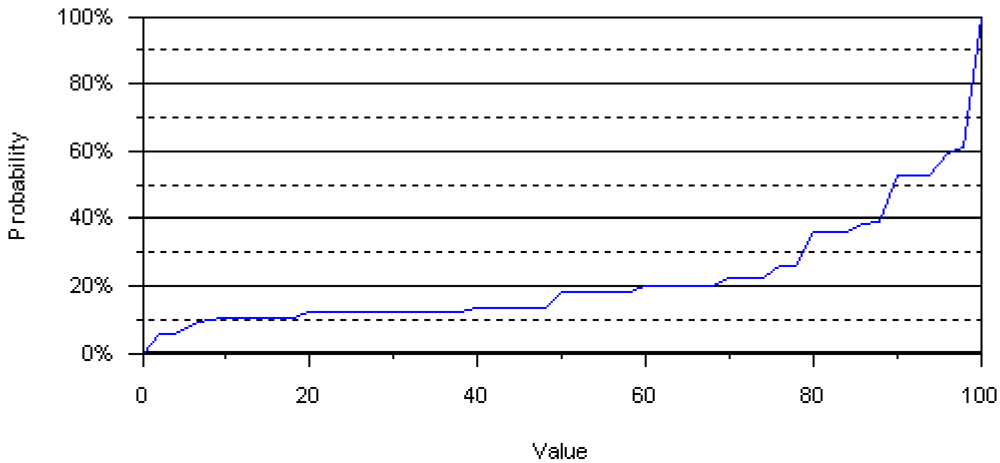
Container / Percent of Time

60a) Clean Unused Paint Cans

Probability Density Function



Cumulative Distribution



Average: 78.82

Standard Deviation: 30.81

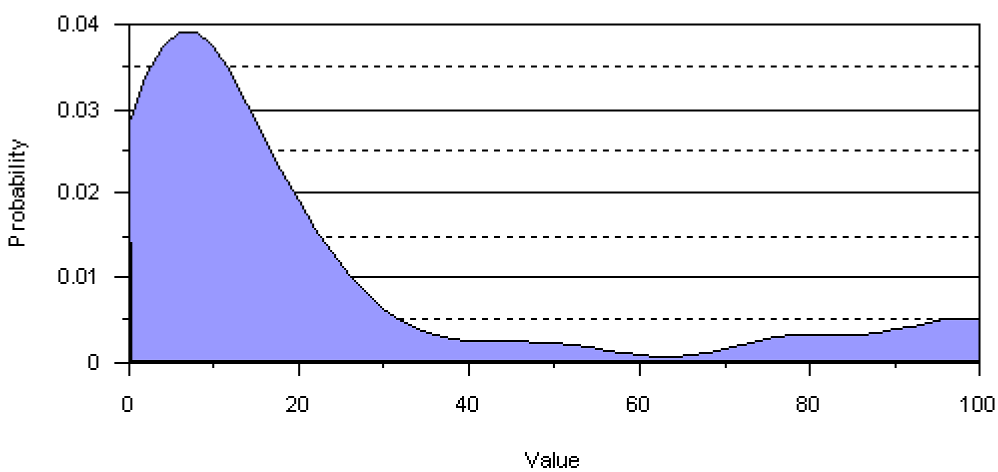
Minimum: 0.00

Maximum: 100.00

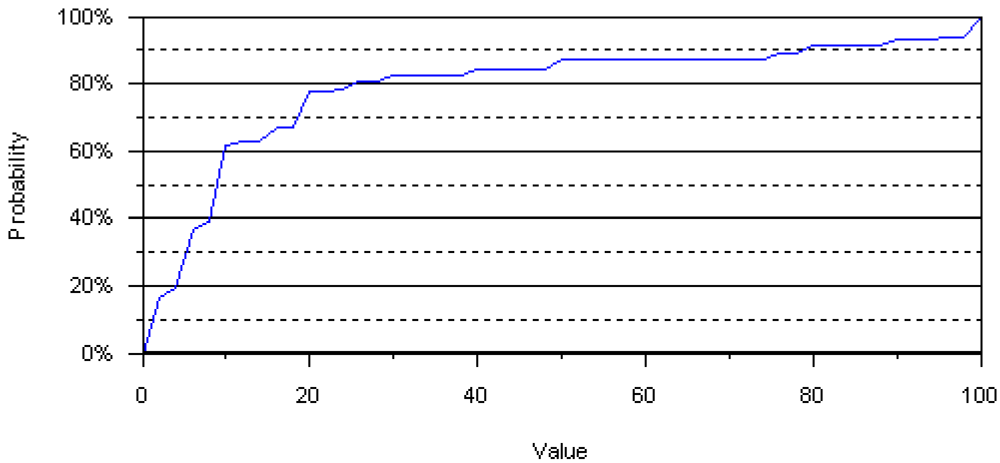
An answer to this question is not required and 199 of 407 respondents chose not to answer.

60b) Glass Jars/Vials

Probability Density Function



Cumulative Distribution



Average: 21.58

Standard Deviation: 29.08

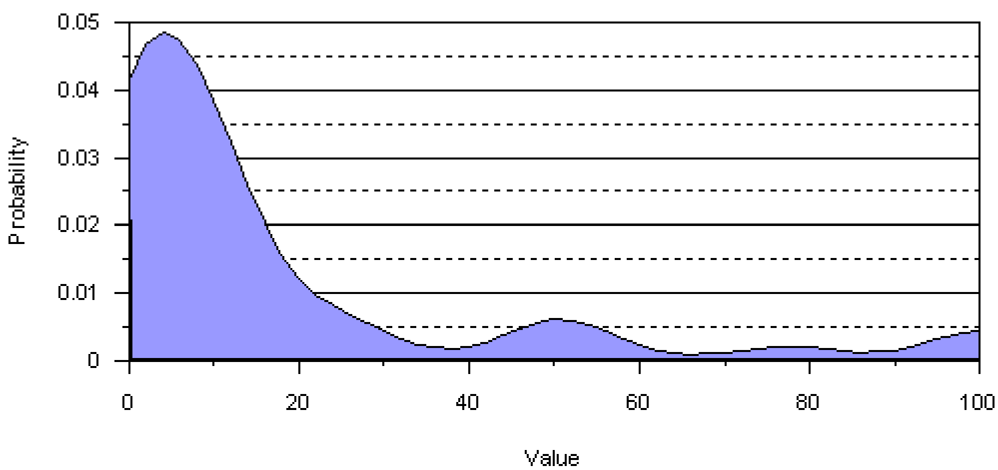
Minimum: 0.00

Maximum: 100.00

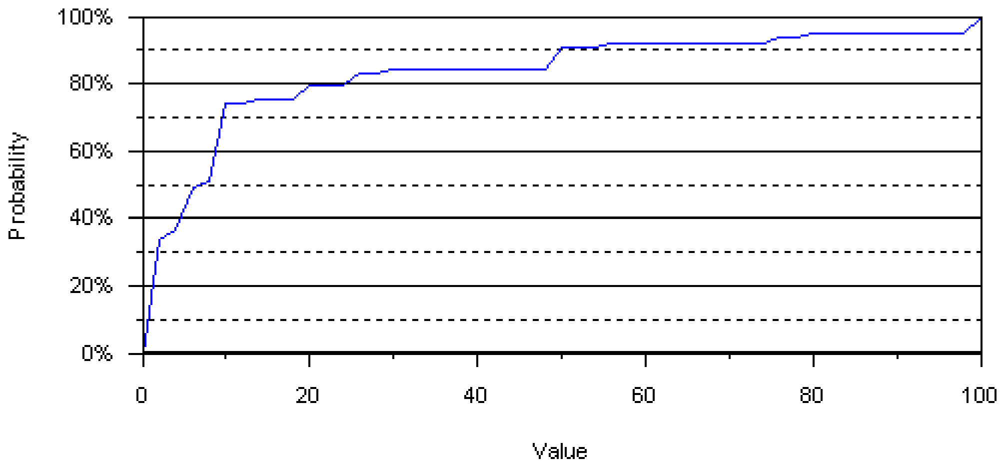
An answer to this question is not required and 292 of 407 respondents chose not to answer.

60c) Nylon Bags

Probability Density Function



Cumulative Distribution



Average: 16.80

Standard Deviation: 26.18

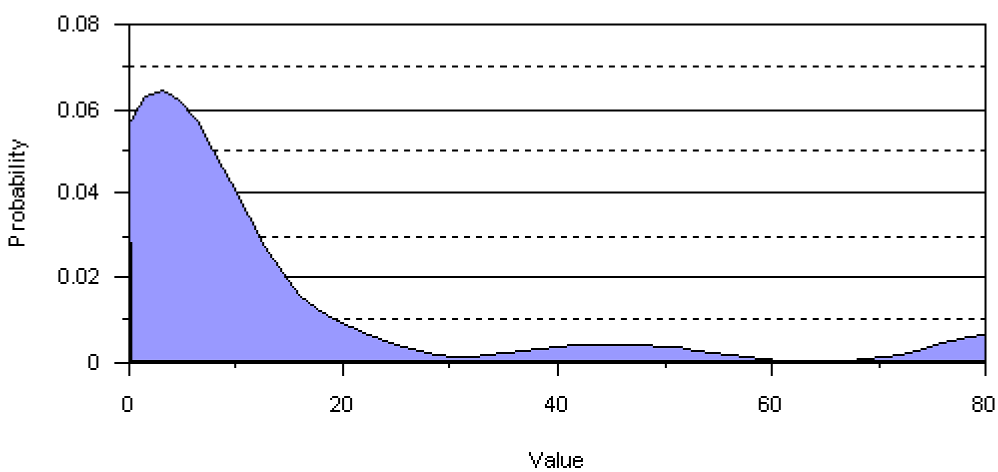
Minimum: 0.00

Maximum: 100.00

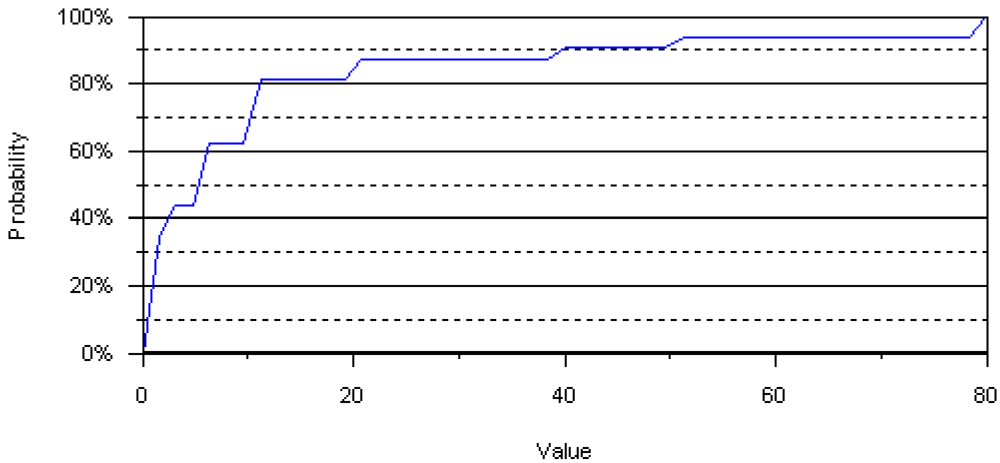
An answer to this question is not required and 330 of 407 respondents chose not to answer.

60d) Other:

Probability Density Function



Cumulative Distribution



Average:	12.24
Standard Deviation:	21.02
Minimum:	0.00
Maximum:	80.00

An answer to this question is not required and 375 of 407 respondents chose not to answer.

60e) If you checked *"Other"* above, (please specify what you would use here):

- Absorbent Pads
- Kapak
- paper bags
- kapak
- PAPER BAGS
- paper bags
- Paper & plastic bags
- Special Sample Containers
- plastic bags
- K pac bags
- bags
- plastic bags
- Clear arson bags
- evidence cans
- choice of CFI and Lab
- paper bags
- sterile cans/jars
- Paper Bags
- paperbags (large items)
- paper bag

- Other Bags, Envelopes
- Plastic bags with sealed bottom exemplar space
- Plastic/paper depending on size of object and what it is being analized for.
- paper sacks
- KPAK
- Kapak Bags
- paper evidence bags
- brown paper bags
- Paper bags

An answer to this question is not required and 378 of 407 respondents chose not to answer.

61) What type of equipment is essential to help you process fire scenes?

- An Accelerant K-9 is one of the most useful tools available outside of a shovel and pointing trowl.
- Proper carpentry tools, cans, gloves, protective gear.
- Shovels, cameras, sieves, scoops, knife, gloves, containers , measuring tools
- rakes, shovels, sreens, magnets, fingerprint processing equipment, hand tools, magnifying glass, sometimes large equipment for debris removal
- knowledgable investigators, accelerant detection canine team, misc. hand tools cans, glass jars/vials, personal protective equipment
- PROTECTIVE GEAR, SEARCHING TOOLS, EVIDENCE CONTAINERS
- Hand Tools
Power Tools
Heavy Equipment
Manpower
Canine
- magnet, directional flags, tweezers, camera, patience. so many more.
- Camera, Hand tools
- Hand Tools
Heavy Equipment
Minimum, Level C protection
Standard Safety Equipment
Vehicle
Digital cameras
Digital Video
- Hydrocarbon detector
UV source
- lighting
evidence collection equiptment cordless saws and drills
- Photographic, VOC monitors, Laptops, Digging equipment, lighting, measuring equopment, evidence collecting
- Good lighting, respiratory protection, basic tools to dig, excellent camera, proper evidence packaging materials, sharp utility knife
- SHOVELS, STRAINER / SIFTERS, SMALL TOOLS & BOLT & NUT DRIVERS, HAND TROWEL, PORTABLE LIGHTING.
- Proper evidence collection and storage facilities on vehicles
- Measuring devices, shovels, evidence containers, hand tools, safety gear

- We use a mobile laboratory containing microscopes and much equipment
- Shovel, drywall puller, flashlight digital camera, safety equipment
- Camera, Shovel, Rake, broom, Screw drivers, Gloves, Evidence collection containers, power tools, hand held tools, boots, cover-alls, 921
- NFPA 921
- Shovel
  rake
  hand shovel
  hand rake
  camera
  tape measure
  lighting
- all listed in NFPA 921
- evidence collection tools and containers
- Gas detectors
  assortment of tools
  camera
  detection canine
- Shovels, rakes and other hand tools
- lot of lights
- Digital imaging equipment
- Shovel, rake, trowel, brush/broom, camera, tape measure
- Camera, disposable gloves, Protective clothing, safety gear, shovels, brooms, eviedence containers, labels, scrappers, Flash light, saw, small tools i.e. screw drivers, wood chisels, razor blades,
- manpower,
- many types starting with shovel and small to big rakes and hoes, electric saws, etc
- liquid and solid material apparatus, shovels, tweezers
- hand tools, gloves, evidence cans, digital cameras, lights, generator
- Temp lighting, camera, tape recorders paper pads ect...
- evidence containers, cut off hoe, screen, TIF8800A accelerant detector, shovels, camera
- Personal Protective Equipment
- too braod of a question
- Paper/Pen; Flashlight; Camera; shovel, rake, broom, etc.; PPE-Gloves,Helmet,Boots, etc.; Decon Equipment; Misc. Hand Tools;
- camera and evidence collection materials as well as resource books
- Basic Hand tools
- Hand tools, safety equipment, lighting
- Paint cans, hand tools, lights, digging tools
- Al various types of construction equipment. Every thing from shovels to sifters.
- Basic tools/Shovel/Protective gloves/Bunker gear/Evidence collection kit/Crime scene tape/Evidence marking cones/Measuring divices/Haz-Mat suits when needed/Lighting/Camera/Canine
- Hydrocarbon Detector, Laser Measuring Device, Shovels, Water Cans, Graph paper, Digital Recorders, Digital Cameras, Respiratory Protection, PPE
- Basic Disposable Hand Tools & Metal Containers
- lights, hand tools, camera, tape recorder, video, portable power, phones/ radios, power saw, ladders, sifters.
- shovels, scoops, brooms, water standard hand tools
- Pickup
  Water
- Hand tools large and small

- Small, clean hand tools; camera; pen and paper; measure device; good lights; latent print kit; circuit tester
- shovesl rakes, cameras
- Camera, shovels, rakes hand tools K-9, ignitable vapor detectors, volt-ohm meters, etc.
- lighting, hand tools, camera, video recorder, tape recorder, sketch pad, tape measure, water, generator, evidence cans and bags
- Tools and sterile evidence cans/jars
- screens, flammable/combustible vapor detector, shovels, volt/ohm meter, various hand tools, personal protective equipment.
- Camera, flash, shovels, trowels, measuring tools, portable ladder, evidence containers; cans, plastic bags, paper bags, clean uncontaminated razor knifes or other cutting tools, Safety equipment; hard hat, nomex clothing, steel toe water proof boots, knee pads
- An open mind. a good forensic team.
- Personal Protective equipment
- Adequate tools and evidence collection equipment
- Shovel, rake, broom, flashlight, camera, clipboard, hammer, drill, screwdriver, crowbar, bags, cans, tape, jack
- Combustible gas detector, shovel, rake, broom, flashlights, leather gloves, evidence collection gloves, cans, tape measure, graph paper, safety boots, hard hat, camera, computer, recorder
- Camera's, Assorted hand tools as well as small gardening tools, brooms, shovels, large tubs, tape measure, flashlight, PPE,
- gloves, respirator, eye protection, head gear, shovel, troughs, evidence containers, labels, camera, absorption material, water, decon soap, brushes
- shovel, masons trowel, garden trowel, screw drivers, hammer, pry bar, various types of wrenches, evidence containers, evidence tags, tape measure, various types of gloves, hard hat, boots, tyvek suits, safty glasses, ladder, camera, notebook, pens, pencils
- Shovel, latex gloves, flashlight, basic tool kit, camera, sketch pad, hose, boots, work gloves, evidence collection tools, note pad
- sifting screens, measuring devices, video & digital photograph, USB microscope
- Brain, proper attitude, eyes, shovel, boots, respirator, camera, graph paper,
- shovels, rakes, brooms, water, ladders, evidence cans, protective equipment
- Hand tools
- Shovels, rakes, small hand tools, Camera, evidence collection supplys
- Lights, Camera, shovel, broom, tape measure
- PPE, Instrument list is endless
- digital camera
- digtial camera, aux lighting
- Photo/Video Equipment. Measuring equipment. Shovel. Evidence collection equipment. Safety equipment. More.
- Photography equipment, hand tools, measuring equipment, safety equipment
- Hand Tools, PPE, Lighting Equipment
- accelerant detection, lighting, tools
- Cameras, measuring devices, K-9
- Hand held shovels
  Fire/debris proof boots
  Hard Hat
  Collection kits
- Shovel, rake, lights, hand tools, evidence collection containers, safety equipment
- accelerant detection equipt.
- LIGHTING
  HAND TOOLS
- Camera, diagram, shovel, rake, broom,

- camera, shovel, flashlight, eyeballs, common sense
- Shovle, hand tools, cleaning agent, water, collection bags, camera, tape, paper, writting tool.
- protective clothing, shovels, rakes, and camera
- camera, type recorder, sketching software, lights. tools
- manpower
- camera
- Hand Tools, Cameras, electronic tape measurement equipment.
- rubber gloves,photo equipment,shovel,
- sniffers
- photographic equipment, evidence containers, gloves, pen, paper, measuring tape, hand tools
- Tools such as shovels, rakes, saws, cameras
- shovel, rake, hoe, tape measure, LIGHTS, camera, ladder, electric drill & saw, prybars, hand tools
- shovel, gardening tools, camera
- Ignitable liquid detector
- Shovels, rakes, Camera, Protective clothing, disposable tyvek suits, forceps, bucket water w.brush to wash foot wear to avoid cross contamination
- MINI RE 2000
- Breather mask, evidence bags, camera, shovel, paint brush
- hand tools and time
- Camera, hand tools, and reports.
- Proper Safety Equipment
Shovel
Other items as necessary
- area to clean tools that is easy to assemble and transport
- tools,cameras, lighting, personal protection devices
- shovels,brooms,rakes, small hand tools,cameras, lighting, evidence containers and bags, fire scene paperwork.
- See NFPA 921
- Hand tools, generators, sniffer
- shovels, saws,trowels, hand shovels, brooms, water,co2 monitor, hydrocarbon detector, canine accelerant detection
- basic
- laptop computer
digital camera
- camera, hand tools, video camera
- Hand Tools, Lighting, Photographic, Videographic, Written Documentation, Dictation
- TIF meters, various HAZMAT meters and air processors
lighting, cameras
- 35mm camera (we don't do digital!), shovel.
- Shovels, rakes, photographic, lighting, magnification, evidence collection evidence packaging
- Clean evidence collection containers and collection equipment including both disposable and cleanable tools. Measuring devices (electronic and scalar), photographic equipment, and field data collection forms.
- shovels, rakes, hand tools, evidence containers,
- Camera, evidence containers, brushes, digging tools,
- Light, protective equiptment, fans, personnel, cameras
- shovels, lights, proper training for knowing what to look for and how to process it. containers
- NFPA 921,camera,tools,lap top,lights,
- Disposable gloves, unlined cans,shovel.razor knife, hatchet, small tools, camera

- buckets, shifters, rakes, camera, lights
- Laser measuring
  Hydrocarbon detector
  shovel
- everthing
- personal protective equipment, camera, paper & pen, tape rule, debris removal tools (shovel, trowel, garden cultivator), sample containers, evidence bags/boxes, ladder
- A GOOD SHOVEL, GOOD LIGHTING AND A STRONG BACK.
  ALSO EXPERIENCE
- Air masks, haligan, pry bar, camera, evidence collection containers, lights, screw drivers, knife,
- Digging tools, lighting, photography equipment(35mm and digital), cad software
- Shovel - 3 Tine Hoe
- good photography and video equipment, good hand tools
- lighting, photography, various large ansd small hand tools,
- Camera, forms, lights, digging tools, evidence collection equipment.
- supply of gloves;handtools
- shovels, scoops, cameras, lighting
- Hand tools, cameras
- evidence containers, lighting, hand tools, cameras and related accessories, digitial voice recorders, personal protective equipment
- documentation supplies: sharpies (various colors), notepad, dial calipers, wire/conductor size tool, pens, pencils, acetate sheets,
  tools: hammer, screw drivers, saw saw, gardening tools (i.e. small spade, claw), wire cutters, side cuts, needle nose pliers, crescent wrenches, mini saw, sifting screens, multi-meter,
  Camera supplies...too much to list
- Lighting, Sniffers, Screens, Hand tools, Heavy Equipment when needed, Cameras, Evidence containers,
- clean hand tools
- Protective gear, leather gloves, helmet, breathing appr., misc. hand tools
- gloves, cutting tools, extraction tools, camera, measurement devices, evidence containers.
- various tools used for digging in debris and collecting samples; proper footwear;
- digging tools, photo equipment, collection materials, lights
- shovel, hand tools, flash light, ppe
- lighting, adequate clean PPE, large evidence collection containers
- Gas Detectors
  Electric Meters
- Proper lighting, camera, work gloves, rubber gloves, coveralls, hard hat, pen and paper, scoop shovel, respirator (full and half-face), evidence collection equipment,
- Camera, trowel, shovel, recorder, multi-meter, brooms
- Various Hand Tools, Computer Equipment, Digital/Video/ SLR Cameras, Electronic Measuring Devices, Drawing Programs etc...
- hydrocarbon detectors, camera, general overhaul tools
- Camera, shovel, trowel, magnifying glass, tape measure, coveralls, evidence cans, vapor detector, gloves, evidence sealing, forms, core borer, knife, scraper, etc., etc.
- Time...
- For wildland fire: Kestrel or other weather reading device;
  GPS unit; digital cameras; 35mm camera; binoculars; magnets; magnifying glass;powerful flashlights; material for casting footprints and tire tracks; measuring tapes, wheels, and rulers; evidence collection material; audio and video recorders; high temperature thermometer with probe; metal detector; and cause determination handbook, fire regulations guides, and fire prevention field guides

- hand tools, lighting, resource materials, heavy equipment at times
- Camera, shovels, etc.
- camera , hand tools , some time heavy equipment
- Clean, hand operated equipment
- Multiple tools
- Lights, flashlight, mirrors, camera, shovel, broom,pry bar, hand tools
- documented, clean cans and collection equipment, reliable mechanical equipment for second opinion on possible accelerent
- Hand tools and sometimes heavy equipment
- hand tools, firefighter turn out gear, disposal nitrile gloves, cameras, evidence marking numbers and collection materials, Dawn dishwashing liquid for decontamination of tools, Battery operated power tools, portable electric generators and so on
- Digital cameras, hand tools for excavation, PPE- respiratory and clothing

An answer to this question is not required and 239 of 407 respondents chose not to answer.

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62) What type of equipment is desirable to help you process fire scenes?

- Electronic sniffer, laser scanner, lighting systems
- portable xray machine, portable sniffing devices, dogs
- Multi-Gas Detector, Handheld identification instrument, (First Defender XL)
- SAME AS ABOVE
- containers, magnet(very large) sectioning rope or twine, camera, lots more.
- Evidence collection kit
- electonic detector for picking sample points
- Mobile internet access for data research in the field
- Portable Full Gas & Chemical ID Chromatagraph
- ignitable liquid detection lighting
- Hydrocarbon dectector, sifting screens, fingerprint and casting kits,
- DISPOSABLE GLOVES, CEMENT TYPE HAND TROWEL FOR SMALL DIGGING & SCRAPING.
- Lights, cans, Evidence bags
- air sampling equipment, fire debris analysis equipment,
- S/A Above # 61
- time, and the willingness to do a thorough analysis.
- sifter screens
- Hand tools
- detectors
camera
canine
- K-9, hydrocarbon detectors
- personnel
- Digital imaging equipment
- Volt meter, Tape recorder, Laptop computer, Large light, Ladder

- same
- saa
- Respiratory Protective
- accelerant detectors
- all of it! bad question!
- Hydrocarbon detector; Accelerant Detection K-9,
- more resource books
- power tools
- As above
- all of the above in addition to trace evicence colleciton.
- Electronic air quality tester/hydrocarbon based fuel detectors
- Extra lighting, exhaust fan, handtools, computer with internet access,
- all of the above
- Portable x-ray
- Generator, electric tools instead of battery
- UV light device; combustible gas detector;
- need a good hydrocarbon detector
- same as above
- Hydrocarbon detector
- all of the above.
- Pry bars, hammer, saw, hand tools, volt ohm meter, microscope (small portable) magnifying glass, sheet rock saw, ph test strips, any one of variety of portable sniffers, CO meter, several magnets of different sizes,
- gloves, cans, camera, shovels, brooms, jars, tweezers, qtips, paper bags, nylon bags, many more
- Advanced scene documentation equipment
- portable x-ray unit,
- gas chromatograph, exray machine,
- It depends on how comples the scene is.
  Anything from buldozers to cranes.
- additional lighting, ventilation, electronic sniffer
- x-ray
- another investigator, electrical engineer, fire protection engineer, canine
- computer
- Technical goods
- cad diagraming program
- The list of equipment necessary and desireable is so vast and varies from fire scene to fire scene that it could never be completed here.
- Same as Above
- Respiratory protection, K-9,
- accelerant detection equipt.
- protective clothing, shovel, rakes, and camera
- gas scopes
- man power
- sniffers,
- alot
- video equipment, multi-meter, respiratory protection, x-ray, thermal imager, Gas meter
- The above listed tools as well as electronic measuring devices for hydrocarbons

- Same as above; video camera
- accelerant detection canine
- portable hydrocarbon detector
- Knowledge then equipment necessary to re-construct scene
- extra manpower
- accelerant sniffers
- Accelerant Detection Canine
- basic
- Hand tools. unsure what eveyone else is using
- Same as Above (61) Resource Laptop with full chemical libraries.
- Better gas meters than what we have.
- Heavy machinery. Backhoe,payloader etc.
- Computer modeling programs.
- Deep pockets $.
- sifters, good personal.
- Disposable gloves, unlined cans,shovel.razor knife, hatchet, small tools,camera, meter to identify ignitible liquids
- meters, computers,
- everthing
- graph paper & colored pencils, laser measuring device, small brushes, sifting screen, generator and lighting, reciprocating saw
- hydrocarbon detection equipment
- Mobile investigation vehicle
- Large Tarp
- measuring devices
- sniffer, multi-gas air monitoring device for safety
- K-9, atmospheric monitor
- infrared thermometers, fire scene resource guides available on laptop computer
- see above
- Flamable liquid detector
- same
- portable gas chromatograph, canine or electronic means
- crime scene kits, digital cameras, florescent lighting
- same as above
- Sniffers
- Two investigators to conduct all fire scene investigations; mandatory two person staffing
- video camera, electronic "sniffer", trailer for all of the invesitgation equipment
- GPS Equipment
- same as above
- analytical-field instruments
- All of the above
- front end loader, backhoe, crane, bobcats, shovels, rakes, wheelbarrels
- Electric power tools
- Accurate GPS that can diagram eveidence collection points.
- documentable onscene detection equipment, documentable collection components,
- Hand tools and sometimes heavy equipment

- man power
- hydrocarbon detection and accelerant detection

An answer to this question is not required and 295 of 407 respondents chose not to answer.

62a) Does your agency have, or have access to, an accelerant (hydrocarbon) detection canine team to assist in investigations?

Don't Know	(5)	1.9%
Yes	(180)	69.2%
No	(75)	28.8%
Total	(260)	

An answer to this question is not required and 147 of 407 respondents chose not to answer.

62b) If yes, what percentage of the investigations would utilize such a team?

1-20%	(96)	50.0%
21-40%	(44)	22.9%
41-60%	(32)	16.7%
61-80%	(7)	3.6%
81-100%	(13)	6.8%
Total	(192)	

An answer to this question is not required and 215 of 407 respondents chose not to answer.

62c) Does your agency have, or have access to, a portable electronic "sniffing" device to assist investigations?

Don't Know	(14)	5.6%
Yes	(121)	48.0%
No	(117)	46.4%
Total	(252)	

An answer to this question is not required and 155 of 407 respondents chose not to answer.

62d) If yes, what percentage of the investigations would utilize such a device?

1-20%	(48)	31.6%
21-40%	(20)	13.2%
41-60%	(28)	18.4%
61-80%	(28)	18.4%
81-100%	(28)	18.4%
Total	(152)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 255 of 407 respondents chose not to answer.

63) Does your agency have a specific criteria used calling out the services of an accelerant (hydrocarbon) detection canine team?

Yes	(79)	32.1%
No	(167)	67.9%
Total	(246)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 161 of 407 respondents chose not to answer.

63a) If "Yes", (please briefly describe the criteria used here):

- If the investigator susects the use of an ignitable liquid for any reason the K-9 should be called. In the event of large scale fires or multiple fires this is required.
- Whenever necessary
- Notify State Fire Marshal
- Anytime a fire task force call out is requested, an accelerant detection canine team is automatically called out to the scene to assist. If as a single investigator am called to a scene and determine by interviews and a preliminary scene investigation, I will call a canine team out if deemed necessary.
- requested by the local authorities or the state police Lt in charge of the fire investigation unit
- FOLLOW THE POLICY OF THE DEPARTMENT WHO AS THE CANINE
- Evidence of the presence or use of an accelerant at a fire scene and investigator unable to locate or identify sample for analysis.
- INCENDIARY FIRES WITH SIGNS OF IGNITABLE LIQUID
  FATALITY SCENES AND LARGE INCIDENTS.

- When I/C or its INv call
- If the client says ok.
- If the fire is considered suspecious
- When the fire is obviously incendiary and there are indications of an ignitable liquid, but no ignitable liquid odor is able to be detected by the investigator on the scene.
- Incendiary fire with difficulty determining points of origin
- State dog thru Fire Dept.
- We have access to ATF and CBI and local FD
- fatalities
  high $ loss
  suspicious / arson known
- we have applied for a grant for a canine
- Contact the State Fire Marshal's Office
- suspected incedianiary fires
- called on most fires
- any significant structure fire
- Investigator reasonably believes accelerants were used or wishes to rule out the use of accelerants (negative scene search)
- Evidence of ignitable liquid involvement, high suspicion
- The accelerant canine is part of local jurisdiction and we have to go through the local ATF agent for calling out. Would use the canine more if we had a canine handler with our agency.
- Investigator discretion
- Contact the State Department of Justice Fire investigation Unit Area Special Agent
- very high probability of positive find.
- Fatality
  High dollar loss
  Investigator request
- o won the dog and use him where there is no ignitable liquid inherently present such as garages, etc.
- Fatality, severe injury, dollar loss exceeding $500000.00
- Request is made through the dispatch center.
- suspicion of illegal fire.
- We have one in the detail
- when the sniffer shows negative
- Looks like arson
- Approval by investigation officer incharge to page canine team
- Agent must respond and evaluate the need
- Any time the investigator feel that canine is required.
- when deemed a large loss and potential accelerant used
- as needed basis OT dependant and monitored closely
- CALLED ON AN AS NEEDED BASIS
- notify through County radio
- Contact OFPC NY State
- 24 hour 7 day a week call out center
- If I determine it is needed a request is made to the 911 communications center
- We have 3 teams in our agency
- Based on the need by the on scene investigator.
- Rely on public sector input

- notify the state fire marshals office
- All undetermined fires and all death/injury fires,
  others if investigator is unsure
- generally fatal fires
- Contact NC SBI via FMO
- Only if fire scene has suspected clues of arson
- In cases where there are large pour patterns or multiple large patterns, we will use a K9 to get quick parameters
- Major Case, Fire death.
- If accelerent use is suspected
- The on scene investigator has the descretion to call a canine unit as part of our Task Force
- Any time the investigator needs the assistance.
- It is up to the lead investigator.
- If arson is suspected the local authority having jurisdiction is notified
- Dollar loss over $30,000. Fire fighter injury or death. Fire fatality. Apparent multiple points of origin.
- The on scene Investigator request the AK-9 through FD communications.
- In house
- STATE FIRE MARSHAL
- When we determine the cause to be incendiary, along with the circumstances.
- if the investigator feels a canine would be helpful, ATF is contacted who has the caninine in this area.
- Rediculous
- state division of fire safety
- Required on all Incendiary Fires
- Incidents where the use of ignitable liquid is suspected, fires where death or serious injury occured, multiple arlarm fire scenes, fire bombings.
- Fatal fires and suspect scenes when the investigator deems it necessary.
- The investigator notifies the EMS dispatcher, who then notifies the neighboring jurisdiction. That jurisdiction then pages the canine accelerant detection team.
- gas detectors
- The Division saw it on TV
- Whenever an ignitable liquid accelerant is suspected
- handler and detection K-9 retired due to medical problems. We used to use the team quite often when the onscene investigator would determine the need.
- High value loss or fatality/serious injury involved

An answer to this question is not required and 330 of 407 respondents chose not to answer.

---

64) Does your agency officially track the usage of accelerant (hydrocarbon) detection canine team in each investigation?

Yes	(80)	33.3%
No	(160)	66.7%
Total	(240)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 167 of 407 respondents chose not to answer.

---

65) Does your agency officially track the track positive/negative hit rate of accelerant (hydrocarbon) detection canine team in each investigation in which a team is used?

Yes	(64)	28.1%
No	(164)	71.9%
Total	(228)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 179 of 407 respondents chose not to answer.

---

66) Do your fire/explosion scene investigators have access to laboratory tests other than fire debris/ignitable liquid analysis (e.g. flame spread testing, identification of unknown materials in debris, fire modeling, etc.)?

Yes	(108)	42.9%
No	(144)	57.1%
Total	(252)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 155 of 407 respondents chose not to answer.

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67) Do you think that you would benefit from having access to a national and/or international data base of certified accelerant (hydrocarbon) detection canine teams?

Yes	(185)	72.8%
No	(69)	27.2%
Total	(254)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 153 of 407 respondents chose not to answer.

---

68) Does your agency have ready access to a fire debris analyst/scientist for consultation either with you at the fire scene or by

telephone or Internet?

Yes	(131)	50.4%
No	(129)	49.6%
Total	(260)	

An answer to this question is not required and 147 of 407 respondents chose not to answer.

68a) If Yes, how often was their expertise called upon while you were processing fire scene in 2006?

1-5	(67)	61.5%
6-10	(17)	15.6%
11-15	(10)	9.2%
16-20	(4)	3.7%
21-30	(4)	3.7%
31-40	(2)	1.8%
41-50	(1)	0.9%
>50	(4)	3.7%
Total	(109)	

An answer to this question is not required and 298 of 407 respondents chose not to answer.

69) If No, would you want to have access to this type of expertise to assist you with your investigation?

Yes	(144)	91.7%
No	(13)	8.3%
Total	(157)	

An answer to this question is not required and 250 of 407 respondents chose not to answer.

69a) Rate the importance of having a fire debris analyst/scientist available for consultation while you are processing a scene. (1-7 where: 1 = Not at all, 7 = Very)

1	(3)	2.1%
2	(5)	3.4%
3	(7)	4.8%
4	(18)	12.4%
5	(38)	26.2%
6	(32)	22.1%
7	(42)	29.0%
Total	(145)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 262 of 407 respondents chose not to answer.

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xi) **Part J. Explosive Scene Specialists (Check an answer only on those questions which apply to you)**

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70) Indicate the number of explosive scenes analyzed/processed by all of the investigators at your physical location (check one):

1-50	(137)	87.3%
51-100	(13)	8.3%
101-250	(4)	2.5%
251-500	(1)	0.6%
501-750	(0)	0.0%
751-1000	(0)	0.0%
1001-2000	(0)	0.0%
>2000	(2)	1.3%
Total	(157)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 250 of 407 respondents chose not to answer.

---

71) Have you had formal training in the investigation of bombing crime scenes?

Yes	(152)	76.8%

No	(46)	23.2%
Total	(198)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 209 of 407 respondents chose not to answer.

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72) How important is formal training in the investigation of bombing crime scenes?
(1-7 where: 1 = Not at all, 7 = Very)

1	(2)	1.0%
2	(3)	1.6%
3	(2)	1.0%
4	(2)	1.0%
5	(9)	4.7%
6	(14)	7.3%
7	(159)	83.2%
Total	(191)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 216 of 407 respondents chose not to answer.

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73) What types of containers do you use in submitting explosion debris to a laboratory for examination?

Container / Percent of Time

73a) Clean Unused Paint Can

0%	(3)	2.0%
1% to 20%	(23)	15.5%
21% to 40%	(13)	8.8%
41% to 60%	(17)	11.5%
61% to 80%	(36)	24.3%
81% to 100%	(56)	37.8%
Total	(148)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 259 of 407 respondents chose not to answer.

73b) Glass Jars / Vials

0%	(11)	11.5%
1% to 20%	(47)	49.0%
21% to 40%	(16)	16.7%
41% to 60%	(7)	7.3%
61% to 80%	(6)	6.2%
81% to 100%	(9)	9.4%
Total	(96)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 311 of 407 respondents chose not to answer.

73c) Nylon Bags

0%	(10)	11.5%
1% to 20%	(41)	47.1%
21% to 40%	(15)	17.2%
41% to 60%	(10)	11.5%
61% to 80%	(3)	3.4%
81% to 100%	(8)	9.2%
Total	(87)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 320 of 407 respondents chose not to answer.

73d) Other

0%	(8)	19.0%
1% to 20%	(18)	42.9%
21% to 40%	(5)	11.9%

41% to 60%	(4)	9.5%
61% to 80%	(2)	4.8%
81% to 100%	(5)	11.9%
Total	(42)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 365 of 407 respondents chose not to answer.

73e) If you checked *"Other"* above, (please specify what container you used here):

- paper bags/envelopes
- paper bags
- paper bags
- anti static
- PAPER BAG/BOX
- paper bags
- paper bag
- Kpac
- bags
- paper bags/boxes
- paper bags
- choice of Lab
- Paper containers, plastic zip lock bags (10-40 gal size)
- clear plastic bag
- brown paper bags
- paper bags
- PAPER BAG
- Paper bags
- paper
- Sealable Plastic bags
- paper bags
- paper/cardboard
- commercial plastic containers
- cardboard box for larger items;
- Kapak
- paper bags or cardboard boxes

An answer to this question is not required and 381 of 407 respondents chose not to answer.

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74) What type of equipment is essential to help you process bombing scenes:

- Tape measures
  Survey and/or GPS equipment
  Flags
- Camera, Video, Gloves, Paper Bags, Secured Explosive Boxes (For low ordered explosives)
- Lots of people, rope, stakes, magnets, magnifying glass,
- digital camera
- gc-ms
  sem-eds
- ROBOTS, PROTECTIVE GEAR
- Hand Tools
  Power Tools
  Heavy Equipment
  Canine
- sifting screens, shovels, rakes, brooms, wheel barrows, marker flags, tape measure, laser transit, gloves, tweezers, cameras (digital still and video) lights, tents
- Same as Above
- UV source
- Same as fire scenes
- MANPOWER SHOVELS BROOMS POWER TOOLS AND HAND TOOLS
- ANy thing available Usually call ATF
- S/A as #60 and 61
- NFPA standard
- Small hand tools
- Digital imaging equipment
- Shovel, rake, trowel, brush/broom, camera, tape measure
- hand tools, lighting, digital photo, equipment
- lighting, camera equipment for documenting scene
- Certified Bomb Tech for screening for secondary devices
- Hand tools, safety equipment, lighting
- Same as arson
- All items listed for fire scenes with the addition of EOD suits and robots/X-ray machine
- same as above
- Metal Detector, Explosive swabs
- marking flags, barrier tape, camera, video recorder, tape recorder, hand tools, generator, lighting, evidence containers
- Magnets, shovels, brooms, dust pans, bags, cans, bottles, camera, flash, flagging tape, evidence markers, mirrors, safety equip;
- same as fire scenes
- Adequate tools and evidence collection equipment
- swab kits, photographic equipment, screens for sifting
- areial photography
- Proper Safety Gear
- Scene documentation equipment. Safety equipment. Evidence Collection supplies/equipment.
- CGI, robotics, xray, photographic, protective clothing, equipment and training consistent with FEMA type 1 Bomb

Squad classification

- PPE, Hand Tools Lighting Equipment
- sniffer and outside team resources
- Shovel, rake, hand tools, lights, personnel
- portable x-ray equipment, bomb suit, shovels, rakes, disrupter, energetic tools, metal detecter, assorted hand tools and power tools.
- Shovel, camera, tape measure, knife, large magnet, unused paint cans, gloves,
- small flgs, hand tools, mapping equipment, photography equipment, laser range finders & thermal imaging camers
- screen sifters, metal detectors,
- Normal fire scene equipment is used.
- rakes, sifting screens, portable tables, shovels, disposable forceps and tyvek suits, camera decomtamintion station
- MY EYES.
- Same as I would use at any fire scene
- Gloves, packing equipment
- sifting screens, quality hand tools, sterile evidence containers.
- qualified man power
- A method of securing and marking the scene
- knowledge
- basic evidence collection materials
- See NFPA 921
- shovels, clean shoes and cloths, de-con equipment. sifting screens, gloves.
- same as fire scene
- Standard Tools, Markers, Magnets, Metal Detectors, Small Hand Tools, Brushes, Photographic - Videographic - Written and Artistic Documentation.
- Evidence collection equipment, photography. debris sifting equipment, explosive detection dogs
- more training, more money
- gloves , containers, boots, misc itmes
- Disposable gloves, unlined cans,shovel.razor knife, hatchet, small tools, camera
- Lighting, wire screen sifters, personnel trained in post blast investigations.
- buckets, shifters, rakes, lights, camera
- Eyes, shovel
- qualified personnel
- photography equipment, measuring devices, video equipment
- the same as fire's
- camera
evidence containers
tools (uncontaminated)
- handtools, camera
- In addition to equipment listed in question #61, sifting screens
- Too numerous to provide
- Standard evidence collection equipment
- Cans, plastic evidence bags, flags, string, nitrile gloves, safety glasses, digital cameras, Total Station GPS
- K-9, misc. handtools, protective equipment to include gloves, eye protection, boots, and scuba equipment for underwater investigation.
- any
- digital camera and various tools used in general evidence collection;
- laser range finders, instruments for collection, disposable brooms-dust pans, sifting screens

- same as above
- same as fire debris with more evidence collection and a measuring wheel.
- New (uncontaminated) supplies
- Lights, flashlight, camera, shovel, broom, pry bar, hand tools,
- no idea
- Hand tools and sometimes heavy equipment
- gps,
- PPE - Uncontaminated clothing,

An answer to this question is not required and 323 of 407 respondents chose not to answer.

---

75) What type of equipment is desirable to help you process bombing scenes:

- Better evidence preservation system
- Explosive Detection Instruments
- portable xray machine
- SAME AS ABOVE
- Portable Chemical ID
- same as fire scenes
- MANPOWER - SHOVELS BROOMS & HANDTOOLS
- Digital imaging equipment
- Power tools
- SAA
- Mobile command center
- same as above
- Same as above
- same as above
- Hand tools, screens, wheel barrows, pry bars, hammer, ladders, magnifying glass, microscope, explosive residue test kit,
- Another list that is too long for this venue.
- Same as Above
- Air sampling device, more personnel, K-9
- portable x-ray equipment, bomb suit, shovels, rakes, disrupter, energetic tools, metal detecter, assorted hand tools and power tools
- Same
- Unknown
- Same as above
- Chemical identifiers
- elevation equipment
- Bomb Componet Blanket
- basic evidence collection materials
- State of the Art - Handheld Explosives Residue Detection Equipment

- Heavy construction machinery
- odor detection equipment
- Disposable gloves, unlined cans,shovel.razor knife, hatchet, small tools, camera
- meters, computers
- good hand tools, total station
- UV illumination
  field test instrument
- handrools camera
- residue detection
- Total Station GPS System, Laser Range Finders, Blast Modeling Software
- any
- total station or like equipment.
- same as above
- sams as fire debris
- no idea
- Hand tools and sometimes heavy equipment
- accident reconstruction equipment for mapping debris position in reference to the seat of the blast
- Blast modeling software, metal detectors

An answer to this question is not required and 363 of 407 respondents chose not to answer.

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76) Do you currently utilize the equipment you listed?

Yes	(75)	85.2%
No	(13)	14.8%
Total	(88)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 319 of 407 respondents chose not to answer.

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77) Are there other types of training/classes that you feel would be helpful to you in order to do your job?

- Better access to continuing education.
- Advanced Post Blast; Crime Scene Technician
- Chemistry
- Hands-on processing of explosion scenes to "get the feel" of looking for clues
- POST BOMB INVESTIGATION
- EOD training

- Required annual update training on current events and cituations that private invesytigators may be confronted with on a day-to-day basis.
- Post Blast School
- Digital imaging equipment
- hands on evidence collection, scene excavation
- Any as we have none at this time.
- Pattern (high/low order) Recognition, evidence preservation
- Advanced scene documentation equipment
- Any and all Training
- always. You can never have enought of it.
- Explosives/post blast
- yes
- any and all
- continuation of post blast re-construction
- Formal post blast schools, blast analysis, a list of essential equipment to process the scenes.
- BOMB TRAINING.
- Advanced training in scene investigations
- More Post Blast Investigation Classes and follow-up courses to keep people proficient
- Any and all training and information is allways helpfull
- High profile fire scene examinations, scene control, WMD scene examinations
- Explosive detection courses
- on the job training with federal agencies
- EOD training made available to fire service personel
- land survey classes using total stations to map and analize debris patterns
- higher level/more advanced levels of training, there is a lot of basic training but little advanced
- More post blast courses
  Post blast instructors course
- A class that focused on case studies of complex fire scenes would be helpful
- Advance field evidence collection
- any post blast.
- 40 hour post-blast investigation course taught at local level;
- more intensive on-scene training
- Anti-terrorisim training
- this is not my area of responsibility

An answer to this question is not required and 369 of 407 respondents chose not to answer.

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78) Does your agency have, or have access to an explosives detection canine team to assist in investigations?

Don't know	(20)	11.3%
No	(43)	24.3%
Yes	(114)	64.4%

Total	(177)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 230 of 407 respondents chose not to answer.

79) If yes, what percentage of the investigations would utilize such a team?

1-20%	(66)	53.7%
21-40%	(16)	13.0%
41-60%	(10)	8.1%
61-80%	(11)	8.9%
81-100%	(20)	16.3%
Total	(123)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 284 of 407 respondents chose not to answer.

80) Does your agency have a specific criteria used calling out the services of an explosive detection canine team?

Yes	(61)	37.2%
No	(103)	62.8%
Total	(164)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 243 of 407 respondents chose not to answer.

80a) If "Yes", (please briefly describe the criteria used here):

- Dependent on size of crime scene or area to be searched.
- Our agency K-9 division refuses to comply with the ATF/FBI K-9 Explosive Detection Canine Certificiation program and only uses NAPWDA. Therefore, we use another agency.
- Call State Fire Marshal
- state police dispatcher off hours and Lt incharge of the state police bomb squad
- FOLLOWING THE DEPARTMENTS GUIDELINES THAT HAVE THE CANINE
- EDU supervisor or duty officer request EDU K9
- AT OUR REQUEST

- IC OR Inv Call along with PD dective
- Any scene that seems suspecious
- Contact local Bomb Squad and CBI & ATF
- Investigator discretion
- very high probability of positve results.
- Same as above
- Suspicious packages, deaths/serious injuries where possibility exists of a secondary device.
- Request is made through the dispatch center.
- suspicion of an accelerant present at scene.
- when unidentified material cannot be found
- Notify State Police
- Must be approved by USAF Base Commander @ Cannon AFB after request is submitted through local channels of command, Chief - City Manager - Mayor - then to AFB
- At the discretion of the Bomb Squad Commander
- Through County radio
- 24 hour 7 day a week call out center
- Suscipous Packages without threat
- Bombing incident where the threat of a secondary device exists.
- Go through the Bomb Squad Sergeant.
- To conduct protective and dignitary sweeps, on bomb threats or when requested by bomb technicians.
- When necessary - call ATF for K-9
- Supervisor calls Bomb Squad commandar and he calls k-9.
- If explosives are suspected
- when ever the lead investigator or Bomb Commander calls them out
- determined by Police Department
- Request with proper guidelines
- If arson is suspected the local authority having jurisdiction is notified
- Used for sweep before significant events. Threats at certain location.
- The request is made through FD communications
- request of on scene commander
- fer secondary checks, never wothout a tech
- Called by the bomb squad
- Bomb Squad Commander activates team when needed.
- large event's
- when requested by bomb tech
- supervisor approval
- Discretion of bomb squad commander
- phone call
- vip visits and when a technician requests it
- protocol set by the fbi, atf, nabscab and the ipwda
- Bomb threats, dignitary protection and special event details. Upon the request of bomb technicians

An answer to this question is not required and 360 of 407 respondents chose not to answer.

81) Does your agency officially track the usage of explosive detection canine team in each investigation?

Yes	(59)	37.1%
No	(100)	62.9%
Total	(159)	

An answer to this question is not required and 248 of 407 respondents chose not to answer.

82) Does your agency officially track the track positive/negative hit rate of explosive detection canine team in each investigation in which a team is used?

Yes	(48)	30.6%
No	(109)	69.4%
Total	(157)	

An answer to this question is not required and 250 of 407 respondents chose not to answer.

83) Do you think that you would benefit from having access to a national and/or international data base of certified explosive detection canine teams?

Yes	(115)	69.3%
No	(51)	30.7%
Total	(166)	

An answer to this question is not required and 241 of 407 respondents chose not to answer.

84) Does your agency have ready access to an explosives analyst/scientist for consultation either with you at the bombing scene or by telephone or Internet?

Yes	(80)	47.6%

No	(88)	52.4%
Total	(168)	

An answer to this question is not required and 239 of 407 respondents chose not to answer.

---

85) If Yes, how often was their expertise called upon while you were processing bombing scenes in 2006?

1-5	(52)	76.5%
6-10	(9)	13.2%
11-15	(1)	1.5%
16-20	(2)	2.9%
21-30	(3)	4.4%
31-40	(0)	0.0%
41-50	(0)	0.0%
>50	(1)	1.5%
Total	(68)	

An answer to this question is not required and 339 of 407 respondents chose not to answer.

---

86) If No, would you want to have access to this type of expertise to assist you with your investigation?

Yes	(98)	96.1%
No	(4)	3.9%
Total	(102)	

An answer to this question is not required and 305 of 407 respondents chose not to answer.

---

87) Rate the importance of having an explosives analyst/scientist available for consultation while you are processing a scene: (1-7 where: 1 = Not at all, 7 = Very)

1	(4)	2.4%
2	(4)	2.4%
3	(7)	4.2%
4	(16)	9.6%
5	(24)	14.5%
6	(34)	20.5%
7	(77)	46.4%
Total	(166)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 241 of 407 respondents chose not to answer.

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88) In 2006 how often did you respond to scenes which contained the following:

88a) Intact Explosives

0	(54)	40.0%
1 to 20	(68)	50.4%
21 to 50	(9)	6.7%
51 to 100	(2)	1.5%
101 to 150	(2)	1.5%
151 to 200	(0)	0.0%
>200	(0)	0.0%
Total	(135)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 272 of 407 respondents chose not to answer.

88b) Intact IED

0	(68)	51.9%
1 to 20	(53)	40.5%
21 to 50	(6)	4.6%
51 to 100	(2)	1.5%
101 to 150	(1)	0.8%

151 to 200	(1)	0.8%
>200	(0)	0.0%
Total	(131)	

An answer to this question is not required and 276 of 407 respondents chose not to answer.

88c) Post Blast Explosives

0	(55)	39.3%
1 to 20	(79)	56.4%
21 to 50	(6)	4.3%
51 to 100	(0)	0.0%
101 to 150	(0)	0.0%
151 to 200	(0)	0.0%
>200	(0)	0.0%
Total	(140)	

An answer to this question is not required and 267 of 407 respondents chose not to answer.

88d) Post Blast IED

0	(68)	52.3%
1 to 20	(56)	43.1%
21 to 50	(4)	3.1%
51 to 100	(2)	1.5%
101 to 150	(0)	0.0%
151 to 200	(0)	0.0%
>200	(0)	0.0%
Total	(130)	

An answer to this question is not required and 277 of 407 respondents chose not to answer.

88e) Intact Incendiary Device

0	(49)	35.0%
1 to 20	(85)	60.7%
21 to 50	(4)	2.9%
51 to 100	(1)	0.7%
101 to 150	(0)	0.0%
151 to 200	(0)	0.0%
>200	(1)	0.7%
Total	(140)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 267 of 407 respondents chose not to answer.

88f) Post Reaction Incendiary Device

0	(54)	39.4%
1 to 20	(73)	53.3%
21 to 50	(6)	4.4%
51 to 100	(1)	0.7%
101 to 150	(1)	0.7%
151 to 200	(0)	0.0%
>200	(2)	1.5%
Total	(137)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 270 of 407 respondents chose not to answer.

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89) In 2006, of the scenes in which it was necessary to "render safe" a device, please indicate the method and times employed:

89a) Hands on

0	(44)	54.3%
1 to 20	(35)	43.2%
21 to 50	(2)	2.5%

51 to 100	(0)	0.0%
101 to 150	(0)	0.0%
151 to 200	(0)	0.0%
>200	(0)	0.0%
Total	(81)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 326 of 407 respondents chose not to answer.

89b) Remote Cutter

0	(54)	75.0%
1 to 20	(16)	22.2%
21 to 50	(1)	1.4%
51 to 100	(1)	1.4%
101 to 150	(0)	0.0%
151 to 200	(0)	0.0%
>200	(0)	0.0%
Total	(72)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 335 of 407 respondents chose not to answer.

89c) Disrupter

0	(26)	28.3%
1 to 20	(43)	46.7%
21 to 50	(12)	13.0%
51 to 100	(8)	8.7%
101 to 150	(2)	2.2%
151 to 200	(0)	0.0%
>200	(1)	1.1%
Total	(92)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 315 of 407 respondents chose not to answer.

89d) Other

0	(26)	57.8%
1 to 20	(15)	33.3%
21 to 50	(2)	4.4%
51 to 100	(2)	4.4%
101 to 150	(0)	0.0%
151 to 200	(0)	0.0%
>200	(0)	0.0%
Total	(45)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 362 of 407 respondents chose not to answer.

89e) If you checked *"Other"* above, (please specify what container you used here):

- ROBOT
- Water cannon
- MWB, Hydrajet
- counter charge
- N/A
- robot
- Burning in place
- Mineral water bottle
- Rigging procedures
- MWB
- MWB, Hydra Jet
- disruptor
- robot manipulation
- counter charge
- counter charge
- robot
- water cannon
- robot

An answer to this question is not required and 389 of 407 respondents chose not to answer.

xii) **Part K. Laboratory Research Needs (Check an answer only on those questions which apply to you)**

90) What major breakthrough in the area of ignitable liquid or explosives analysis would have the most impact on the area of forensic science? (Think big the sky is the limit)

- A machine that is portable, cost effective and produces reliable ignitable fluid results from samples while at the scene. (you said the sky is the limit)
- Field usable (and hand-held size) GC/MSD
- Good matching software that could match unknowns to a library std like we do with drug standards.
  Also to be able to id an ignitable to a company like they do with oil spills etc.
- 100% accuracy in identifying significant residues and excluding all backgorund interferences
- easily detectable taggants in flammable products
- Library Searchable Database
- manufacter identification markers in products.
- The ability to identify the source of ignitable used in a fire scene.
- SOFTWARE TO HELP INTERPRET TICS
- Pyrolysis library
- ability to distinguish source of individual compounds (acetone from decomposition or ignitable liquid?; nitrate form black powder or fertilizer?).
- Acess to a database of published research papers (similar to the FBI library- but more conprehensive) without having to pay for a membership or a particular artical.
- isotopes
- for explosives, portable instrumentation that could positively identified post blast explosive residue.
- DETECTION OF WHITE GAS
- More training opportunities
- Tagging of gasoline samples
- I am not sure
- low cost IMS instruments bought by Feds and distributed to agencies
- Being able to make a statistical comparison to compare how well two samples "match".
  Applying supercritical fluid extraction
  Ion Cyclotron MS for explosives.
  A single comrehensive analytical technique for conclusive ID of either organic or inorganic explosives (affordable technology)
- Addressing some of the beliefs that you can track ignitable liquids through a scene from your footwear, or dog.

  Comparing fire debris samples and comparing to known gasoline sources to determine if it came from same container, supplier, vendor, service station etc.
- Portable analysis at the scene
- Portable (on-scene) GCMS
- Video documentation of the collection and analysis process to provide a jury with real-time information concerning the information and conditions that were available at the time of the collectyion and/or processing.
- A kit to conduct initial testing on scene.

- To identify if an starting fluid or similar flammable liquid was used to start a fire.
- Make the lab as capable as the dog.
- Matching a specific gasoline to a specific brand/gas station.
  Matching a specific sample at the scene to residue on clothing.
  Degree of decay of ignitable liquid - i.e., this residue was laid out x hours prior to collection.
- Perfected accelerant detectors with air proof seal evidence containers
- dna identification on containers, incendiary devices
- Inexpensive, indestructible, hand held analyzer, for the instantaneous fire scene identification of suspected ignitables and explosives, that was courtroom bullet-proof.
- If there was a way to better distinguish the specific types of agents present in the samples, to clear up confusion in court proceedings
- The field of fire debris analysis is settled! The techniques we have are sensitive enough and specific enough. If a lab can do E1412, E1386 and E1618, that is sufficient. Too much treasure is wasted on SPME, MSMS and other intereasting but forencsically useless techniques.
- Training in explosives, IED IID, and post blast evaluation
- A statisitcal probability in the identification of an ignitable liquid.
- on scene analysis
- Differentiation between natural turpentine residue in wood fire debris and turpentine as an accelerant/ignitable liquid.
- RSP of HME's or PBE's. Not spray misting but actual RSP methods.
- A reliable field unit that will give the investigator correct results quickly.
- I have no idea, the ISP lab never gets us what we need anyway.
- Portable equipment for on scene preliminary determinations
- ALS (Alternative Light Sources), Portable Carbon Counting Technologies that will indicate the approximate total burn time and temperature.
- hand-held mass spec or explosive analysis devices
- Portable/battery operated devices that are pre-calibrated and can be used at the scene.
- Process for positive identification of ignitable liquids that can be used in the field without laboratory analysis
- not enough knowledge to answer question
- Have a central labratory when submitting fire debris where an accelerant detection canine was utilized. As a handler I find it difficult when different agencies are utilizing different labratories. Even though there is a standard in place it is not always followed by different labratories.
- Field GC
- Use of alternate light sources to find where the residue is at the fire scene.
- low-cost and extremely reliable portable detection equipment able to identify/classify
- any
- GC-MS-MS
- safer solvents
- hand held instrument, court room acceptable, detection of results on scene, printable, documentable--- easy to zero out- documented- and free.
- more definative explinations of the liquids found within the samples, the ability to be able to track the ignitable liquid to it source such as seperate chemical markers added to each manufactures gasoline and hydrocarbon products

An answer to this question is not required and 352 of 407 respondents chose not to answer.

91) Rank the following research areas in terms of how likely you believe they will have a significant impact on ignitable liquid or explosive analysis? (1-7 where: 1 = not likely, 3 is possible, 5 is probable, and 7 is extremely likely)

91a) New Analytical Methods

1	(3)	2.8%
2	(7)	6.5%
3	(11)	10.2%
4	(11)	10.2%
5	(31)	28.7%
6	(12)	11.1%
7	(33)	30.6%
Total	(108)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 299 of 407 respondents chose not to answer.

91b) New and Improved Databases

1	(1)	0.9%
2	(3)	2.7%
3	(8)	7.2%
4	(10)	9.0%
5	(26)	23.4%
6	(18)	16.2%
7	(45)	40.5%
Total	(111)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 296 of 407 respondents chose not to answer.

91c) New Data Analysis Methodology

1	(1)	0.9%
2	(3)	2.8%

3	(17)	15.7%
4	(14)	13.0%
5	(30)	27.8%
6	(8)	7.4%
7	(35)	32.4%
Total	(108)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 299 of 407 respondents chose not to answer.

91d) New Standards

1	(4)	3.7%
2	(7)	6.5%
3	(19)	17.6%
4	(21)	19.4%
5	(26)	24.1%
6	(5)	4.6%
7	(26)	24.1%
Total	(108)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 299 of 407 respondents chose not to answer.

91e) Sample archiving practice/method

1	(5)	4.9%
2	(8)	7.8%
3	(17)	16.5%
4	(13)	12.6%
5	(20)	19.4%
6	(9)	8.7%
7	(31)	30.1%
Total	(103)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 304 of 407 respondents chose not to answer.

92) Is additional research required in the area of explosives disposal/disruption?

Yes	(107)	93.0%
No	(8)	7.0%
Total	(115)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 292 of 407 respondents chose not to answer.

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93) In your opinion, which of the following issues would provide the most significant improvement on the efficiency of useful sample collection at the fire and explosive scenes? (please select only one)

New field instrumentation/sensors to aid in sample selection	(61)	36.3%
Training of sample collection personnel	(55)	32.7%
Development of standard sampling plans	(10)	6.0%
Implementation of data quality objectives for sampling	(2)	1.2%
Improved real-time coordination between laboratory and field personnel	(40)	23.8%
Total	(168)	0 10 20 30 40 50 60 70 80 90 100%

An answer to this question is not required and 239 of 407 respondents chose not to answer.

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94) Please rank the importance of an analyst's knowledge of the fate and transport of explosives in the environment as related to forensic casework? (1-7 where: 1 is not at all, 3 is fairly important, 5 is very important, 7 is urgent)

1	(2)	1.6%
2	(5)	4.1%
3	(7)	5.7%
4	(11)	9.0%
5	(32)	26.2%
6	(20)	16.4%

7	(45)	36.9%
Total	(122)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 285 of 407 respondents chose not to answer.

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95) How important is it to push for lower detection limits in the laboratory analysis of explosives? (1-7 where: 1 is not at all, 3 is fairly important, 5 is very important, 7 is urgent)

1	(2)	1.9%
2	(6)	5.6%
3	(10)	9.3%
4	(20)	18.7%
5	(28)	26.2%
6	(15)	14.0%
7	(26)	24.3%
Total	(107)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 300 of 407 respondents chose not to answer.

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96) In fifteen words or fewer, what is the biggest challenge that you face as a fire or explosion analyst?

- Turn-around time - useful data for the investigator to use in a timely manner
- Obtaining training and education at a professional level that is affordable for an agency with budget limitations.
- Detecting extremely low amounts of an ignitable liquid in a case and its likely-hood that it was intentionally used as an accelerant.
- Time
- lack of resources and training
- Cooperation and Communication between agencies
- Making sure appropriate comparison samples are collected at the scene
- not adequate training in analysis procedures
- Sample Identification
- Pyrolysis product interference
- need more training and equipment
- Determining what is found in the can. Whether we are looking at something that is placed there as an accelerant, or if that pattern is originating from the material itself, in the can.
- finding time to develop and maintain skills
- limited workers experienced to analyze cases.

- being able to postivel identified trace post blast residue
- Lack of funding for good equipment/training
- Striving for perfections to be 100% correct.
- Coordinating the case with the collecting agency.
- SAFETY, THE COLLECTION OF EVIDENCE, AND COOPERATION FROM THE LAB PEOPLE, EDUCATION OF PROSECUTORS
- Acquiring the latest Ignitable liquid standards
- Getting casework done in a timely way.
- Explaining why our comparison capabilities between two samples is not as exact as the DNA analysts
- Fighting the defense of "Didn't follow 921 to the letter so he/she is wrong."
- To be capable of interpreting the patterns and pin point the location of proper samples
- funding for research
- Gaining access to necessary traing for fire and EOD.
- Getting funding to properly man and equipt MAnpower with the right tools
- Court attacks from other fire investigators that are not applying NFPA 921 principles or practices.
- Proving our case after a public/state investigator has conducted an inadequate investigation prior to ours.
- The scene tampering of a municipality and the practices imposed to process a scene.
- Getting proper funding from the muncipal government
- Collaborating with fire investigators for expert analysis of fire debris for cause and origin determination
- Getting the cases into an over crowded court system and not plea deals.
- turn around time from evidence submittal until results of testing are returned.
- That you do not get to focused on what you see and hear
- personnel and time managmen
- Figuring out how the fire or explosion took place is the biggest.
- Court cases seem to be the biggest challenge. You can pay anyone to say anything these days. A standard for defense experts would be welcome.
- getting the scene secured, collecting the proper evidence.
- Use of NFPA 921 to defeat by technicality
- new legal issues
- Determining electrical cause or result of a fire.
- Lack of desire to be objective in collecting data.
- Getting to the scene as quickly as possible - cutting down on the time between the incident and the time the incident is assigned by claims personnel to investigator.
- Early access to the scene before evidence is destroyed
- being able to
- Dealing with hack fire investigators with no real scientific training.
- resources- budget, training, personnal
- getting the local politicians to take it serious
- Lawyers
- ELIMINATION OF CIGARETTES AS POSSIBLE IGNITION SOURCE
- Getting samples evaluated on a timely manor.
- Obtaining the correct location for a sample
- not enough training
- For peers to evaulate new research with an open mind.
- Higher national standards placed on bomb squads making it harder for smaller squads to keep up or survive.
- Getting the Department to support you even though there is are only a few call for service.

- positively identifiying TATP and other peroxide based explosives
- Getting non experts to listen and understand.
- As a fire analyst my biggest challenge is being able to respond timely to a fire scene
- The need to stay a head of the bomb makers and their capabilities to make HME.
- Lack of understanding by prosecutors what fire scene investigators do.
- safety
- Coordination between me in the private sector and those in the goverment or public sector. Standardization of my datapoints and those of the many different agencies.
- scene contamination before inv. arrival and proper collection techniques
- Obtaining data from samples that have not been contaminated by poor handling
- not enough training time or money
- The frequency of changes in standards and laws regarding how we collect samples.
- Investigators standpoint is the LABRATORY.
- The preservation and security of the scene until the Investigator arrives to the scene.
- Getting reports out before the next fire.
- AS A FULL TIME FIREFIGHTER, THE PROBLEM IS OVERTIME TO DO A THROUGH JOB
- Information sharing
- Keeping current with proper investigation methods
- Managing the time required to perform a thorough examination with the resources at hand
- Dealing with people and ORGANIZATIONS who do not understand this business, yet they feel as if they have some right to stick their nose into the business.
- Cost of the materials and training
- The abiolity to allocate of time to train.
- pip bomb explosion's
- Lack of sufficient manpower to sustain an operation.
- ever changing world of petrochemical formulations
- Having the right equipment to conduct the proper analysis

An answer to this question is not required and 325 of 407 respondents chose not to answer.

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97) What area(s) of your investigation analysis is(are) most frequently challenged in court? List up to 3 please.

97a) Area 1

- professional qualifications
- Quality of analysis
- Who put it there.
- In Service Training
- Significance of findings
- results

- Can you tell how long the ig liq has been there?
- origin of sample
- comparing similar ignitable liquids
- fire debris
- potential for contamination by investigators/analysts
- My Knowledge of NFPA 921
- GETTING PROSECUTOR TO TAKE A CHANCE
- COC
- RT and Mass spec of accumulated target compounds in GC/MS
- Methodology
- Determination
- Credibility
- Documentation
- CFI and CFEI Certifications
- Expertise
- Why isn't my scene analysis the same as municipality.
- Skill Set
- Knowledge
- Suspect identification
- Origin and cause
- training
- Conclusions
- possible sample contamination by the FD
- My lack of college degree
- Application of Codes & Standards
- evidence collection
- Credentials
- Cause determination
- sample identification on lab analysis sheet
- Bias for my client
- Voir Dire
- ELIOMINATION OF CIGARETTES AS IGNITION SOURCE
- testimoney
- Type of explosive
- evidence collection
- NFPA 921
- objectivity
- Very rarely challenged
- Chain of custody
- Origin opinion
- bomb scene investigation
- Motive
- Background
- Elimination of other potential causes
- Documentation

- How evidence is collected
- interpretation of results
- Contamination
- electrical faults
- Canine detection
- origin & cause classification
- Record keeping
- Investigation process
- cause
- collection
- methodology
- collection of evidence
- general sessions court
- chain of evidence
- Collection and Storage
- Expertise
- pyrolysis samples
- Intent

An answer to this question is not required and 338 of 407 respondents chose not to answer.

97b) Area 2

- documentation of evidence locations (where found)
- chain of custody
- Certifications
- Exclusion of interferences
- chain of custody
- relevancy of results
- quantifying ignitable liquids
- gunshot residue analysis
- could the IL "belong" on the substrate
- PUTTING SUSPECT AT THE SCENE
- Subjectivity of Pattern Interpretation
- Responsible party
- Report
- NFPA 921
- Education
- Accidental fires vs. arson fires
- Spoliation.
- Training
- technique

- suspect identification/invov
- guilt of the accused
- Methodology
- Area of Expertise
- report writing
- Sense of smell
- Evidence collection methods
- contamination/spoliation
- Personal qualifications
- evidence
- explosive potential of particular devices
- Methodology
- thoroughness
- contamination
- Cause opinion
- explosive knowledge
- Actual guilt of suspect
- method
- Specific item[s] involved
- My Background
- significance of pattern analysis
- alternative hypotheses
- Chain of custody
- Fire scene examination
- Investigator's creditability
- credentials
- area of origin
- chain of custody
- photograpgy
- TrainingExperience
- Source of IL
- Qualification - Explosive cases rarely go to trial

An answer to this question is not required and 356 of 407 respondents chose not to answer.

97c) Area 3

- opinion
- Evidence Submission/Packaging
- Contamination issues
- interpretation of results
- connecting lab results with the defendant

- explosives analysis
- why did the dog alert to the sample yet you called it negative?
- CONNECTION BETWEEN SUSPECT AND EVIDENCE
- Alternative Hypotheses
- LAb results
- Contract requirements
- Engineers.
- qualifications (very rare)
- Report Writing
- evidence storage
- Prosecutoers who are stupid
- Cause elimination
- expertise in field/accepted testing
- samples
- Experience
- training in explosives
- education
- determination of conclusion
- evidence
- initial on scene investigation

An answer to this question is not required and 382 of 407 respondents chose not to answer.

98) How significant are the Daubert/Frye standards when it comes to introducing a new methodology into your laboratory practice, and if this is an issue, can you suggest a method for overcoming the challenge? (1-7 where: 1 is not at all, 3 is fairly important, 5 is very important, 7 is urgent)

1	(11)	10.3%
2	(6)	5.6%
3	(9)	8.4%
4	(14)	13.1%
5	(28)	26.2%
6	(16)	15.0%
7	(23)	21.5%
Total	(107)	0 10 20 30 40 50 60 70 80 90 100 %

An answer to this question is not required and 300 of 407 respondents chose not to answer.

99) Would a "new practices" review panel comprised of academic and practicing forensic chemists facilitate the implementation of

new methodologies and their importance in court? (Yes, No, Possibly)

Yes	(48)	38.1%
No	(7)	5.6%
Possibly	(71)	56.3%
Total	(126)	

An answer to this question is not required and 281 of 407 respondents chose not to answer.

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100) Are you or the analysts in your laboratory interested in collaborating with university researchers to provide an avenue for implementing new analytical and field methodologies? (Yes, No, Possibly)

Yes	(35)	30.2%
No	(27)	23.3%
Possibly	(54)	46.6%
Total	(116)	

An answer to this question is not required and 291 of 407 respondents chose not to answer.

Questionnaire

Because this survey is posted in a variety of locations, we ask that you fill and submit only one version. We also ask that you only complete answers to those questions that pertain to you. If a question does not pertain to the work you performed in 2006, please leave it blank.

1) **Part A. Demographics and General Questions**

Indicate the type of work you do and assign a percentage of time in that activity (if you perform in multiple areas please indicate):

Job Title / Percentage of Time

Fire Debris Analyst	-- Choose one --
Explosive Debris Analyst	-- Choose one --
Fire Scene Investigation	-- Choose one --
Explosives (Post Blast) Investigation	-- Choose one --
Supervisor/Administrator for either Laboratory Analyses or Scene Investigations	-- Choose one --
Academic/Teaching	-- Choose one --

2) Indicate the type of organization for which you work (check one):

-- Choose one --

3) List the number of all employees (including you) in your laboratory or unit involved in fire debris or explosives analysis, scene investigation, and/or reporting for each of the following categories:

Position / Number of Employees

Analyst /Scientist	
Lab. Supervisor/Manager	
Scene Investigator/EOD	
Scene/EOD Supervisor	

4) Years of Experience in this field / Number of employees

0-2	
2-5	
5-10	
10-15	
20-25	
25-30	

>30 [ ]

5) List the number of all employees (including you) in your laboratory or unit involved in fire debris or explosives analysis, scene investigation, and/or reporting for each of the following categories:

Highest Education attained by each employee / Number of Employees:

High School [ ]

2-3 year degree / diploma [ ]

4 year BA or BS or BSc [ ]

Master's degree [ ]

PhD [ ]

6) Indicate the number of times you testified in court in 2006

-- Choose one --

Part B. Professional Development (Check an answer only on those questions which apply to you)

7) Which, if any, of the following professional development activities will your laboratory or agency pay (in part or in full) for employees to attend (check all that apply):

- [ ] local/state/regional professional association meeting
- [ ] conference, seminar, or symposium held within the state/province
- [ ] conference, seminar, or symposium held outside the state/province
- [ ] conference, seminar, or symposium held outside home country
- [ ] seminar or course held off-site
- [ ] seminar or course held on-site
- [ ] classes held a local university
- [ ] on-line classes from an accredited university
- [ ] employer does not offer to pay for courses, seminars, or for conference/symposium attendance

8) On average, in 2006 what level of funding support did your agency provide for your continuing education/training/professional development? (This includes tuition, registration, travel, lodging, meals, and incidentals.)

-- Choose one --

9) Rate your level of interest (along the following scale) in attending college level courses if: (1-7 where: 1 = Never, 4 = Likely, 7 = Absolutely)

You had to pay 100% of the costs -- Choose one --

You had to pay 75% of the costs -- Choose one --

You had to pay 50% of the costs -- Choose one --

You had to pay 25% of the costs -- Choose one --

You had to pay 0% of the costs -- Choose one --

10) Rate how interested you would be in taking each of the following types of continuing education courses: (1-7 where: 1 = Never, 4 = Likely, 7 = Absolutely)

- EOD Range Time (Training with EOD personnel)
- Fire Scene Evidence Collection, Preservation, and Packaging
- Explosives Scene Collection, Preservation, and Packaging
- Fire Dynamics (including Chemistry and Physics)
- Petroleum Refining Processes
- Ignitable Liquid Classification System
- Electrical circuitry and fire
- Testifying as an Expert Witness
- Explosives Manufacturing Processes
- IED recognition and construction
- Computer Fire Modeling
- Gas Chromatography
- Mass Spectral Interpretation
- Raman Spectrosopy for Explosives
- X-Ray Analysis Techniques (Diffraction, Fluorescence, Energy Dispersive)
- Ion Chromatography
- Capillary Electrophoresis
- Fourier Transform Infrared Spectroscopy
- Advanced Organic Chemistry for Fire Debris Analysis
- Advanced Topics in the Chemistry of Organic Explosives
- Advanced Topics in the Chemistry of Inorganic Explosives
- Forensic Fire Scene Examination
- Forensic Explosive Scene Examination
- Communication and Cooperation between Investigators and Analysts in Fire Investigations
- Communication and Cooperation between Investigators and Analysts in Explosion Investigation

11) List a maximum of 3 other training / classes that you feel would be helpful to you in order to do your job better?

12) Rank how important would each of the following resources be to you? (1-7 where: 1 = Not at all, 7 = Very Important)

- Comprehensive Listing of people working in the field (private and government)
- Creation of a secure Internet link for E-mail and information exchange between professionals in the field of explosives and fire debris analysis
- Establishment of a collection of sample laboratory reports
- Creation of a glossary of analytical, explosives, and fire debris-related technology
- Creation of information templates for evidence submission

Establishment of a collection of methods and protocols for analytical techniques

Establishment of databases of reference materials for analytical techniques

Creation of a national database for tracking bombing matters

Creation of a national database for tracking arson matters

Establishment of a national resource database (for lab equipment, expertise, etc.)

Establishment of a national explosives formulation database

Creation of a bulletin board for communication between explosives analysts

Creation of a bulletin board for communication between fire debris

Creation of an library of manufacturers' literature

Database of explosives analyst training manuals and materials

Information center for inter-agency training exercises

13) Are you given time and resources to perform research in your field(s)?

- Yes
- No

14) If so, approximately how many hours in 2006?

Fire debris analysis

Explosives Analysis

Fire Scenes

Explosive Scenes

15) Rate each of the following statements as they apply to your laboratory or to you using the scale given below: (1-7 where: 1 = Not at all, 7 = Very)

How sufficient are the explosives and fire debris publications provided by your laboratory?

How interested would your laboratory be in receiving a library of ignitable liquid standards on a regular basis?

How interested would your laboratory be in receiving a library of pyrolysis standards on a regular basis?

How important do you feel it would be to have national standards for report writing?

How important would it be to have a specific protocol for wording of both positive and negative samples?

How important would it be to have a national database for chromatographic data for ignitable liquids?

How important would it be to have a national source for ignitable liquid standards?

How interested are you in participating in the fire and explosives debris analysis technical working group?

Part C. Fire Debris Analysis Case Work (Check an answer only on those questions which apply to you)

Indicate the total number of fire debris samples analyzed/processed in 2006 by all the analysts within your agency (check one): -- Choose one

Indicate the total number of ignitable liquid samples analyzed/processed in 2006 by all the analysts within your agency (check one): -- Choose one

Part D. Fire Debris Analytical Methods (Check an answer only on those questions which apply to you)

17) Extraction method routinely used for fire debris analysis (check one):

- [ ] activated charcoal (passive headspace sampling - includes strips, “tea bags”, wires, and ribbons)
- [ ] activated charcoal (dynamic headspace sampling)
- [ ] TENAX (passive or dynamic headspace sampling)
- [ ] SPME (please indicate the phase used):
- [ ] Other absorbent:

If you checked *"SPME"* (Please indicate the phase used here): ______

If you checked *"Other* absorbent" above, (please specify which one used here): ______

18) Indicate which eluting solvent used for extracts from fire debris:

- [ ] no eluting solvent used (e.g. thermal desorption or SPME)
- [ ] carbon disulfide (CS2)
- [ ] dichloromethane (CH2Cl2)
- [ ] diethyl ether
- [ ] pentane
- [ ] Other (specify):

If you checked *"Other"* above (please specify which one was used here): ______

19) Internal standard routinely added to fire debris?

- ( ) Yes
- ( ) No

If "Yes", (please specify which compound(s) used): ______

20) Internal standard routinely added to eluting solvent (if solvent used to elute absorbent)?

- ( ) Yes
- ( ) No

If "Yes", (please specify which compound(s) used): ______

21) For Instrumentation used in fire debris and/or ignitable liquid analysis, how often do you use each of the following analytical techniques? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

GC-FID [ ]

GC-MS [ ]

GC-MS-MS [ ]

FTIR [ ]

GC-FTIR [ ]

other: (specify) [ ]

If you checked "Other", (please specify which technique(s) used): ______

22) Sample introduction to GC

(check one): -- Choose one --

If you checked "*SPME*" above, (please specify phase used):

If you checked "*Other*" above, (please specify which was used):

23) Type of column phase routinely used for GC separation (check all that apply):

- [ ] 100% polydimethylsiloxane (e.g. DB-1, DB-1ms, HPMS-1, OV-1, Rtx-1, DB-PETRO, etc.)
- [ ] (5% phenyl)-methylpolysiloxane (e.g. DB-5, DB-5ms, HPMS-5, OV-5, Rtx-5, etc.)
- [ ] (14%-Cyanopropyl-phenyl)-methylpolysiloxane (e.g. DB-1701, SPB-1701, Rtx-1701, etc.)
- [ ] polyethylene glycol (e.g. DB-WAX, Carbowax, HP-20M, Supelcowax 10, HP-Innowax, etc.)
- [ ] other: (specify)

If you checked "*Other*" above, (please specify column phase used):

24) For fire debris analyses, how often do you use the following QA/QC tests? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

ASTM 1387 test mix or similar mixture

Internal Standards (e.g., 3-phenyltoluene)

Solvent Blanks

Apparatus Blanks (e.g., strips, glassware)

Recovery Checks (e.g., simulated case extractions

Peer Review

Other: (specify)

If you checked "Other" above, (please specify QA/QC tests used):

25) If you adhere to the following ASTM standards and guides, please indicate how closely you follow them? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

ASTM-E 1387-01 (Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography)

ASTM-E 1618-06 (Standard Test Method for Ignitable Liquid Extracts by Gas Chromatography – Mass Spectrometry)

ASTM-E 1385-00 (Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Steam Distillation)

ASTM-E 1412-00(2005) (Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration)

ASTM-E 1413-06 (Standard Practice for Separation and Concentration of Liquid Residues from Fire Debris Samples by Dynamic Headspace Concentration)

ASTM-E 1388-05 (Standard Practice for Sampling of Vapors from Fire Debris Samples)

ASTM-E 1386-00(2005) (Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction)

ASTM-E 1492-05 (Standard Practice for Receiving, Documenting, Storing and Retrieving Evidence in a Forensic Science Laboratory)

ASTM-E 1459-92(2005) (Physical Evidence Labeling and Related Documentation)

26) Are you aware of new equipment or techniques on the market or in development that could be potentially of use in fire debris analysis? These may be in the extraction, analysis, instrumentation, or interpretation of fire debris and ignitable

liquids. Please indicate the type of potential improvement such as: reduction of analysis time, elimination of background, specificity of identification, etc...?

- Yes
- No

Description and/or Contact

27) What are the short-term needs in analytical methods for fire debris analysis?

28) What are the long-term needs in analytical methods for fire debris analysis?

Part E. Fire Debris Data Interpretation (Check an answer only on those questions which apply to you)

29) How often do you use an in-house ignitable liquid reference collection in case work?

-- Choose one --

30) How often have you used the on-line Ignitable Liquid Reference Collection (ILRC) in case work? (See http://ncfs.ucf.edu/databases.html for more information about this database)

-- Choose one --

31) How does your laboratory routinely identify an ignitable liquid in fire debris (check one):

-- Choose one --

If you checked "Other" above please specify how your laboratory would identify an ignitable liquid:

32) Rate the importance of the following courses as part of the education of fire debris analysts. (1-7 where: 1 = Not Important, 4 = Moderate, 7 = Extremely)

General chemistry

Advanced organic chemistry

Inorganic chemistry

Introductory physics

Instrumental analysis

Organic chemistry

Analytical chemistry

Advanced physics

Physical chemistry

Advanced physics

Advanced mathematics

Other:

(if other please indicate course names here):

Part F. Explosives Analysis Case Work (Check an answer only on those questions which apply to you)

Please indicate which, if any, of the following explosives analytical laboratory procedures your agency performed (items 34 through 41) and the number of times they were performed items 42 through 49) in 2006:

Analytical Procedure (Yes/No)

33) Intact Low Explosives

- Yes
- No

34) Intact High Explosives

- Yes
- No

35) Intact IED's

- Yes
- No

36) Post-Blast Low Explosives

- Yes
- No

37) Post Blast High Explosives

- Yes
- No

38) Post Blast IED's

- Yes
- No

39) Intact Incendiary Device

- Yes
- No

40) Post-Reaction incendiary

- Yes
- No

41) Intact Low Explosives

-- Choose one --

42) Intact High Explosives

-- Choose one --

43) Intact IED's

-- Choose one --

44) Post-Blast Low

-- Choose one --

45) Post Blast High

-- Choose one --

46) Post Blast IED's

-- Choose one --

47) Intact Incendiary Device

-- Choose one --

48) Post-Reaction incendiary

-- Choose one --

Part G. Explosives Analytical Methods (Check an answer only on those questions which apply to you)

49) In explosives analyses, how often do you use each of the following analytical techniques? (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

Microchemical analysis using PLM	
Spot tests	
Ignition analysis	
Microchemical analysis using stereomicroscopy	
TLC	
Field explosives screening	
IR	
Raman spectroscopy	
SEM-EDX	
ICP	
XRF	
GC/MS	
GC/FID	
CE	
HPLC	
HPLC/TEA	
FTIR	
NMR	
SEM-WDX	
IMS	
XRD	
GC/TEA	
GC/ECD	

IC

HPLC/MS

Other:

(please indicate):

50) Are you aware of new equipment or techniques on the market or in development that could be potentially of use in explosives analysis? These improvements may be in analytical instrumentation, recovery of post-explosion residue, isolation of un-reacted products, component reconstruction, etc... Please indicate the type of potential improvement such as: reduction of analysis time, elimination of background, specificity of identification, etc...?

Yes

No

Description and/or Contact

51) What are the short-term needs in analytical methods for explosives analysis?

52) What are the long-term needs in analytical methods for explosives analysis?

53) For explosives/explosives residue analysis, how often do you see the following QA/QC tests: (1-7 where: 1 = Never, 2 = Rare, 5 = Often, 7 = Exclusive)

8095 Calibration Mix A

8095 Calibration Mix B

Smokeless Powder (or similar) mixture

Internal Standard

(please indicate):

Solvent Blank

Peer Review

Other:

(please indicate):

Part H. Explosives Data Interpretation (Check an answer only on those questions which apply to you)

54) How often do you use an in-house explosives reference collection in case work?

-- Choose one --

55) Would you use an on-line explosives data (morphological descriptions, microphotographs, IR, MS, etc...) in case work?

-- Choose one --

56) Rate the importance of the following courses as part of the education of explosives analysts. (1-7 where: 1 = Not Important, 4 = Moderate, 7 = Extremely)

General Chemistry

Advanced organic chemistry

Inorganic chemistry

Introductory physics

Advanced physics

(please indicate):

57) Rate training or course work in the following areas for explosives analysts? (1-7 where: 1 = Not Important, 4 = Moderate, 7 = Extremely)

History of Explosives

Terminology and vocabulary of explosives

Composition of low explosive materials

Construction of commercial pyrotechnic devices

Construction of military devices (e.g. simulators, rockets, hand grenades)

Range procedures

Peroxide Based Explosives

Manufacturing of explosives

Composition of high explosive materials

Construction of improvised devices

Analytical examination of high and low explosive materials and residues

Recognition of improvised device components

Other:

(please indicate):

Part I Fire Scene Specialists (Check an answer only on those questions which apply to you)

58) Indicate the number of fire scenes processed in 2006 by all of the investigators at your physical location (check one):

-- Choose one --

59) Have you had formal training in the investigation of fire scenes?

Yes

No

Rate the importance of formal training in the investigation of fire scenes: (1-7 with 1 = Not at all, and 7 = Very) -- Choose one -

-

60) What type of containers do you use in submitting fire debris to a laboratory for ignitable liquid determination?

Container / Percent of Time

Clean Unused Paint Cans

Glass Jars/Vials

Nylon Bags

Other:

If you checked *"Other"* above, (please specify what you would use here):

61) What type of equipment is essential to help you process fire scenes?

62) What type of equipment is desirable to help you process fire scenes?

Does your agency have, or have access to, an accelerant (hydrocarbon) detection canine team to assist in investigations? -- Choose one --

If yes, what percentage of the investigations would utilize such a team? -- Choose one --

Does your agency have, or have access to, a portable electronic "sniffing" device to assist investigations? -- Choose one --

If yes, what percentage of the investigations would utilize such a device? -- Choose one --

63) Does your agency have a specific criteria used calling out the services of an accelerant (hydrocarbon) detection canine team?

- Yes
- No

If "Yes", (please briefly describe the criteria used here):

64) Does your agency officially track the usage of accelerant (hydrocarbon) detection canine team in each investigation?

- Yes
- No

65) Does your agency officially track the track positive/negative hit rate of accelerant (hydrocarbon) detection canine team in each investigation in which a team is used?

- Yes
- No

66) Do your fire/explosion scene investigators have access to laboratory tests other than fire debris/ignitable liquid analysis (e.g. flame spread testing, identification of unknown materials in debris, fire modeling, etc.)?

- Yes
- No

67) Do you think that you would benefit from having access to a national and/or international data base of certified accelerant (hydrocarbon) detection canine teams?

Yes

No

68) Does your agency have ready access to a fire debris analyst/scientist for consultation either with you at the fire scene or by telephone or Internet?

Yes

No

If Yes, how often was their expertise called upon while you were processing fire scene in 2006? -- Choose one --

69) If No, would you want to have access to this type of expertise to assist you with your investigation?

Yes

No

Rate the importance of having a fire debris analyst/scientist available for consultation while you are processing a scene. (1-7 where: 1 = Not at all, 7 = Very) -- Choose one --

Part J. Explosive Scene Specialists (Check an answer only on those questions which apply to you)

70) Indicate the number of explosive scenes analyzed/processed by all of the investigators at your physical location (check one):

-- Choose one --

71) Have you had formal training in the investigation of bombing crime scenes?

Yes

No

72) How important is formal training in the investigation of bombing crime scenes?
(1-7 where: 1 = Not at all, 7 = Very)

-- Choose one --

73) What types of containers do you use in submitting explosion debris to a laboratory for examination?

Container / Percent of Time

Clean Unused Paint Can -- Choose one --

Glass Jars / Vials -- Choose one --

Nylon Bags -- Choose one --

Other -- Choose one --

If you checked *"Other"* above, (please specify what container you used here):

74) What type of equipment is essential to help you process bombing scenes:

75) What type of equipment is desirable to help you process bombing scenes:

76) Do you currently utilize the equipment you listed?

- ( ) Yes
- ( ) No

77) Are there other types of training/classes that you feel would be helpful to you in order to do your job?

78) Does your agency have, or have access to an explosives detection canine team to assist in investigations?

-- Choose one --

79) If yes, what percentage of the investigations would utilize such a team?

-- Choose one --

80) Does your agency have a specific criteria used calling out the services of an explosive detection canine team?

- ( ) Yes
- ( ) No

If "Yes", (please briefly describe the criteria used here):

81) Does your agency officially track the usage of explosive detection canine team in each investigation?

- ( ) Yes
- ( ) No

82) Does your agency officially track the track positive/negative hit rate of explosive detection canine team in each investigation in which a team is used?

- ( ) Yes
- ( ) No

83) Do you think that you would benefit from having access to a national and/or international data base of certified explosive detection canine teams?

- ( ) Yes
- ( ) No

84) Does your agency have ready access to an explosives analyst/scientist for consultation either with you at the bombing scene or by telephone or Internet?

- ( ) Yes
- ( ) No

85) If Yes, how often was their expertise called upon while you were processing bombing scenes in 2006?

-- Choose one --

86) If No, would you want to have access to this type of expertise to assist you with your investigation?

- ( ) Yes
- ( ) No

87) Rate the importance of having an explosives analyst/scientist available for consultation while you are processing a scene: (1-7 where: 1 = Not at all, 7 = Very)

-- Choose one --

88) In 2006 how often did you respond to scenes which contained the following:

Intact Explosives	-- Choose one --
Intact IED	-- Choose one --
Post Blast Explosives	-- Choose one --
Post Blast IED	-- Choose one --
Intact Incendiary Device	-- Choose one --
Post Reaction Incendiary Device	-- Choose one --

89) In 2006, of the scenes in which it was necessary to "render safe" a device, please indicate the method and times employed:

Hands on	-- Choose one --
Remote Cutter	-- Choose one --
Disrupter	-- Choose one --
Other	-- Choose one --
If you checked *"Other"* above, (please specify what container you used here):	

Part K. Laboratory Research Needs (Check an answer only on those questions which apply to you)

90) What major breakthrough in the area of ignitable liquid or explosives analysis would have the most impact on the area of forensic science? (Think big the sky is the limit)

91) Rank the following research areas in terms of how likely you believe they will have a significant impact on ignitable liquid or explosive analysis? (1-7 where: 1 = not likely, 3 is possible, 5 is probable, and 7 is extremely likely)

New Analytical Methods	-- Choose one --
New and Improved Databases	-- Choose one --
New Data Analysis Methodology	-- Choose one --
New Standards	-- Choose one --
Sample archiving practice/method	-- Choose one --

92) Is additional research required in the area of explosives disposal/disruption?

- Yes
- No

93) In your opinion, which of the following issues would provide the most significant improvement on the efficiency of useful sample collection at the fire and explosive scenes? (please select only one)

-- Choose one --

94) Please rank the importance of an analyst's knowledge of the fate and transport of explosives in the environment as related to forensic casework? (1-7 where: 1 is not at all, 3 is fairly important, 5 is very important, 7 is urgent)

-- Choose one --

95) How important is it to push for lower detection limits in the laboratory analysis of explosives? (1-7 where: 1 is not at all, 3 is fairly important, 5 is very important, 7 is urgent)

-- Choose one --

96) In fifteen words or fewer, what is the biggest challenge that you face as a fire or explosion analyst?

97) What area(s) of your investigation analysis is(are) most frequently challenged in court? List up to 3 please.

Area 1

Area 2

Area 3

98) How significant are the Daubert/Frye standards when it comes to introducing a new methodology into your laboratory practice, and if this is an issue, can you suggest a method for overcoming the challenge? (1-7 where: 1 is not at all, 3 is fairly important, 5 is very important, 7 is urgent)

-- Choose one --

99) Would a "new practices" review panel comprised of academic and practicing forensic chemists facilitate the implementation of new methodologies and their importance in court? (Yes, No, Possibly)

-- Choose one --

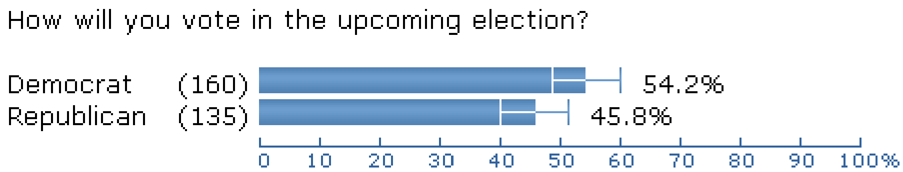
100) Are you or the analysts in your laboratory interested in collaborating with university researchers to provide an avenue for implementing new analytical and field methodologies? (Yes, No, Possibly)

-- Choose one --

Notes

Bar Graph Confidence Intervals:

The bar graphs presented in the Results Analysis section include 95% confidence intervals to illustrate the degree of precision available in your results. For example, in the following graph 54.2% (160/295) of the respondents indicated they will vote Democrat vs. 45.8% (135/295) Republican.



However, because the survey is based on the results of only 295 respondents, the actual percent of people who will vote Democrat could be somewhat higher or lower than 54.2%. Confidence intervals tell you how much higher or lower the percent could be. The I-bar show and the tip of each bar illustrates the spread between the lowest and highest value you are likely to see if you were to survey the entire population. In the example above, you can be 95% certain that the actual percent of people who will vote Democrat will be between 48% and 60%. Furthermore, somewhere between 40% and 52% of people will vote Republican. As you increase the number of respondents the range of uncertainty shrinks.

Confidence:

Each bar graph group is followed by the text "Confidence:" and a percentage. This number is the largest confidence interval found on any of the bars in the group and can be used as a summary measure of precision. The more precise, non-symmetrical confidence intervals are illustrated separately on each bar.

Average Score:

Some bar graph groups are followed by the text "Average Score:" and a number that represents the weighted average of all options chosen by the respondents. For example, if you asked respondents to rate their satisfaction on a scale including *Very satisfied, Satisfied, Neutral, Dissatisfied*, and *Very dissatisfied* and half responded *Very satisfied* and half responded *Satisfied*, the average score would be 1.5--half chose the first option (score=1) and half chose the second option (score=2), so the average score is 1.5.

Correlation:

The answers to two questions are correlated when they tend to move together. For example, if you ask respondents to rate their overall satisfaction with your company and also ask if they are likely to purchase from your company again, the answers to these questions will probably show a strong correlation. That is, when satisfaction is high, the likelihood of repeat purchase is high. This is a positive correlation. Some question pairs have negative correlation. For example, the time a person spends on hold when calling for support usually has a negative correlation with overall satisfaction. Correlation is presented as a number from -1 to 1 where -1 is perfect negative correlation, 0 is no correlation, and 1 is perfect positive correlation.

When a statistically significant correlation between the answers of any two questions is found the report will include a note highlighting the correlation. This information can be used to gain insight into what factors drive key measures such as overall satisfaction.