SEIZED DRUG ANALYSIS EXAMINATION

Candidate Study Guide

American Board of Criminalistics

Updated June 2024
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Introduction

Congratulations on your decision to pursue certification!

This examination was created through the Developing a Curriculum (DACUM) process. Using a panel of Subject Matter Experts (SME), comprised of practitioners from a variety of types of laboratories (e.g., city/county, state, federal, private, etc.) across the country, a job analysis was completed to define the duties and tasks of a Seized Drug Analyst. As a result of this job analysis, the Seized Drug Analyst Job Description (08-1004S) was created for that position. The tasks and duties in the Job Description may include ones that are not performed specifically by your Forensic Science Service Provider but are part of the larger role of a Seized Drug Analyst.

The tasks were then verified by a survey filled out by the greater forensic science community.

The tasks listed in the job description were aligned to Knowledge-Skill (K-S) categories, and these categories were grouped into larger Domains (e.g., Science and Math, Quality Assurance/Quality Control, etc.) to create an Examination Blueprint. This blueprint was subsequently used to determine the number of questions in each of the larger domains.

The examination is structured around the knowledge and skills needed to perform tasks and duties of the job. The study guide was developed using the Job Description and the Examination Blueprint. All K-S categories are represented in the examination. Refer to the Examination Blueprint for a detailed breakdown of the Knowledge/Skills and Tasks used to create this examination.

References listed in this Study Guide were used to write examination questions; however, not all questions were written using these references.

For more information on the development of this examination, please refer to additional examination development documents on the ABC website.
# Examination Outline

<table>
<thead>
<tr>
<th>Domain</th>
<th>Knowledge-Skill</th>
<th>% of Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and Math</td>
<td></td>
<td>23%</td>
</tr>
<tr>
<td></td>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statistics</td>
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<tr>
<td></td>
<td>Math</td>
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<tr>
<td>Process</td>
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<td>23%</td>
</tr>
<tr>
<td></td>
<td>Organizational (e.g., time management/multitasking)</td>
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<tr>
<td></td>
<td>Critical Thinking (e.g., data interpretation, problem solving)</td>
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<tr>
<td>Quality Assurance/Quality Control</td>
<td></td>
<td>20%</td>
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<td>Accreditation Standards</td>
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<td></td>
<td>Quality Control (e.g., SWGDRUG, OSAC/ASTM)²</td>
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<tr>
<td>Laboratory</td>
<td></td>
<td>18%</td>
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<tr>
<td></td>
<td>Bench Chemistry Procedures</td>
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<tr>
<td></td>
<td>Instrumentation</td>
<td></td>
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<tr>
<td>Communication (e.g. public speaking, report writing)</td>
<td></td>
<td>9%</td>
</tr>
<tr>
<td>Legal System (e.g., court procedure, statutes)</td>
<td></td>
<td>7%</td>
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</table>
Science and Math

The Science and Math domain makes up 23% of the examination. The knowledge and skills needed to succeed in this domain are:

- Chemistry
  - Structural backbones
  - Chemical naming systems
  - General physiological drug classifications
  - Drug origins, physical states, and chemical interactions
- Statistics
  - Statistical sampling methods
  - Gaussian distribution statistics
  - Uncertainty of measurement
  - Basic population statistics
- Math
  - Weights and uncertainty calculations
  - Unit weight conversions
  - Solution preparation
  - Retention time differences

Process

The Process domain makes up 23% of the examination. The knowledge and skills needed to succeed in this domain are:

- Organizational (e.g., time management/multitasking)
  - Organization of steps in liquid extractions
  - Handling of drug evidence within the laboratory
- Critical Thinking (e.g., data interpretation, problem solving)
  - Interpretation of qualitative GC, MS, FTIR, and FID data
  - Instrumental troubleshooting
  - Test result evaluation and interpretation
  - Chemical isolation of drugs from mixtures

Quality Assurance/Quality Control

The Quality Assurance/Quality Control domain makes up 20% of the examination. The knowledge and skills needed to succeed in this domain are:

- Accreditation Standards
  - ISO/IEC 17025 standards
  - Accreditation requirements (ANAB or A2LA)
  - Accreditation process
- Quality Control (SWGDRUG, OSAC/ASTM)
Laboratory

The Laboratory domain makes up 18% of the examination. The knowledge and skills needed to succeed in this domain are:

- Bench Chemistry Procedures
  - Color test reactions and preparation
  - Drug solubility
  - Acid/base extractions
  - Wet chemistry techniques

- Instrumentation
  - GC/MS analysis, theory, maintenance, and evaluation
  - FTIR analysis, theory, maintenance, and evaluation
  - GC/FID analysis, theory, maintenance, and evaluation
  - Microscope use, theory, and maintenance
  - Balance use and maintenance

Communication

The Communication domain and knowledge-skill category makes up 9% of the examination. The knowledge and skills needed to succeed in this domain are:

- Public Speaking
  - Courtroom decorum
  - Proper testimony procedures

- Report Writing
  - SWGDRUG report recommendations
  - ASTM reporting guidelines
  - ISO 17025:2017 reporting requirements

- Effective Forensic Science Communication
  - Chain of custody
  - Ethical guidelines
Legal System

The Legal System domain and knowledge-skill category makes up 7% of the examination. The knowledge and skills needed to succeed in this domain are:

- **Court Procedure**
  - Rules of evidence
  - Chain of custody
  - Courtroom terms and definitions

- **Statutes**
  - United States Drug Scheduling
  - Acts related to drug scheduling

- **United States Supreme Court Cases**
  - Admissibility standard cases
  - Right of Confrontation cases
  - Due process cases
References

<table>
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<tr>
<th>General College Textbooks (or similar)</th>
<th>Edition</th>
<th>Author</th>
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<tr>
<td>Principles of Instrumental Analysis</td>
<td>7th or higher</td>
<td>Skoog et al.</td>
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<th>Forensic Science Books</th>
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<tr>
<td>Forensic Chemistry</td>
<td>1st or higher</td>
<td>Bell, S.</td>
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<td>Clarke’s Analysis of Drugs and Poisons</td>
<td>2nd or higher</td>
<td>Moffat et al.</td>
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<td>Fundamentals of forensic science</td>
<td>2nd or higher</td>
<td>Houck, M. and Siegel, J.</td>
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<td>The Use of Statistics in Forensic Science</td>
<td>1st or higher</td>
<td>Aitken, C.; Stoney, D.</td>
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<td>Handbook of Forensic Drug Analysis</td>
<td>1st</td>
<td>Smith, F.; Siegel, J.</td>
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<td>Criminalistics: An introduction to forensic science</td>
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<td>Rules of Professional Conduct</td>
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<td>ANSI/ASTM Published Seized Drug Standards</td>
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<td>United States Supreme Court Rulings</td>
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<td>Requirements for the operation of various types of bodies performing inspection</td>
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<td>Relevant Accreditation Requirements</td>
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<td>NOTE: either of the below listed documents is</td>
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<td>sufficient; candidates do not need to review both</td>
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<td>o R221 – Specific Requirements – Forensic Examination Accreditation Program - Testing</td>
<td>2020</td>
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Example Questions

Below are 10 questions that represent the structure of questions on the examination. The primary Knowledge-Skill (K-S) Category and Associated Job Task(s) are also included. Refer to the Introduction for additional information regarding K-S and Job Tasks.

**Knowledge-Skill: 6.2 – Bench Chemistry Procedures**
**Job Task: A3 – Prepare screening test reagents**

1. What is a color test reagent consisting of a mixture of aqueous ammonium vanadate and sulfuric acid?
   
   A. Marquis  
   B. Mandelin's  
   C. Froede's  
   D. Mecke's

**Knowledge-Skill: 1.5 – Statistics**
**Job Tasks: B10 – Document sample quantity & I1 – Maintain uncertainty budgets**

2. The uncertainty of a drug weight has been determined to be 0.012 g with a 95% confidence level. What is the approximate uncertainty for a 99% confidence level?
   
   A. 0.020 g  
   B. 0.018 g  
   C. 0.006 g  
   D. 0.024 g

**Knowledge-Skill: 2.1 – Accreditation Standards**
**Job Tasks: I6 – Perform laboratory audits, I5 – Participate in laboratory audits, & J3 – Perform validation studies**

3. AR 3125 requires that method validation shall do all the following EXCEPT:
   
   A. establish the criteria for reporting a result.  
   B. be conducted according to a plan.  
   C. include all analysts.  
   D. identify limitations of the method.
Knowledge-Skill: 6.3 – Instrumentation
Job Tasks: C6 – Perform qualitative FTIR analysis & C7 – Evaluate qualitative FTIR data

4. A transmission-IR spectrum will differ from an ATR-IR spectrum of cocaine in that the ATR spectrum will have:

A. greater relative intensities for lower frequency absorptions.
B. similar intensities across all frequencies.
C. greater relative intensities for higher frequency absorptions.
D. greater intensities across all frequencies.

Knowledge-Skill: 2.3 – Quality Control (e.g. SWGDRUG, OSAC/ASTM)
Job Task: B11 – Implement sampling plan & C1 – Select qualitative instrumental analysis

5. What is an example of a quality assurance measure for seized drug analysis recommended by ASTM E2329?

A. analysis with at least two different solvents
B. analysis with at least one quantitation
C. analysis of a single portion at least twice
D. analysis of at least two separate portions

Knowledge-Skill: 1.6 – Math
Job Task: B10 – Document sample quantity (e.g., weight, volume, count)

6. An analyst received 100 stamped bags containing heroin. The total gross weight is 45.20 g and the weight of one stamped bag is 0.05 g. Calculate the total estimated net weight of the population.

A. 45.00 g
B. 38.00 g
C. 40.20 g
D. 47.00 g
Knowledge-Skill: 4.1 – Communication (e.g., public speaking, report writing)
Job Task: G2 – Provide judicial seized drug expert testimony
7. During testimony, which of the following is LEAST helpful for explaining the use of an analytical technique in a case?
   A. describing the process of using a technique one step at a time
   B. using analogies to simplify concepts
   C. providing a brief description after first mentioning the term
   D. using primarily technical language

Knowledge-Skill: 8.1 – Legal system (e.g., court procedure, statutes)
Job Task: H7 – Review judicial rulings & G2 – Provide judicial seized drug expert testimony
8. Which United States Supreme Court case held that a report containing the results of forensic analysis is considered "testimonial", rendering its author subject to the defendant's right of confrontation under the Sixth Amendment?
   A. Giglio v. United States
   B. Frye v. United States
   C. Escobar v. Texas
   D. Melendez-Diaz v. Massachusetts

Knowledge-Skill: 5.1 – Organizational (e.g., time management, multitasking)
Job Task: C2 – Prepare samples for qualitative GC/MS analysis
9. Which of these extraction procedures would allow for the identification of both psilocin and psilocybin in GC/MS analysis with the least interference from sugars?
   A. Grind dry mushroom material with methanol, filter particulates, add acetone and filter, and then add derivatizing agents.
   B. Grind dry mushroom material with water, filter particulates, extract into chloroform, and then add derivatizing agents.
   C. Grind dry mushroom material with acetone, filter particulates, add methanol and filter, and then add derivatizing agents.
   D. Grind dry mushroom material with methanol while heating, filter particulates, add acetone and filter, and then add derivatizing agents.
Knowledge-Skill: 5.2 – Critical thinking (e.g., data interpretation, problem solving) & 1.2 – Chemistry
Job Task: C4 – Evaluate qualitative GC/MS Data

10. What substance is displayed in the above mass spectrum?
   A. codeine
   B. heroin
   C. 6-monoacetylmorphine
   D. morphine
Example Questions Key

1. B
2. B
3. C
4. A
5. D
6. C
7. D
8. D
9. A
10. B

1 ASTM E-30 is a member organization of the ABC. Any test questions derived from ASTM E-30 standards were developed by the ABC without the influence of the ASTM E-30 Executive Board or its membership.