

Study Guide for the FSAT Examination

Introduction

Your study guide consists of a Job Description, a list of Knowledge, Skills, and Abilities (KSAs), References, and 20 Sample Question primer for the examination.

- x The **Job Description** describes the education and background for student candidates.
- x The **KSAs** have ten major sections. Sections I-IX cover the core knowledge and skills expected of student candidates. Section X, consisting of the specific, discipline related, in-depth, upper level knowledge, skills, and abilities. Please note that the sub-categories listed under the capital letters in the KSAs are examples and are not meant to be all-inclusive, or to indicate that there will necessarily be a question on the examination from every sub-category.
- x The **References** are broken into core references and discipline-related references. The core references are identical for all the ABC examinations. The discipline-related references are specific to each discipline.
- x There are twenty **Sample Questions** to give you an idea of the range of content and difficulty that will appear on the examination. For further information, please see "Introduction to ABC Certification Examinations."

Please note that this study guide will be updated periodically.

Check for updates.

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Job Description

The student must be enrolled in a forensic science educational program. This examination is designed for graduating seniors and graduate students.

A qualified student candidate must be able to:

- x Understand the major scientific principles behind forensic science analysis.
- x Understand how to recognize, collect, secure, and preserve physical evidence.
- x Understand how to perform physical, chemical, and/or biological analyses to locate and identify items having evidential value.
- x Understand how to interpret and compare analytical data generated from the analyses of physical/chemical evidence and known exemplars.
- x Understand how to recognize the potential for forensic examinations in areas outside an area of specialization, prioritize the sequence of examinations, and handle evidence accordingly.
- x Evaluate the appropriateness and/or the appropriate method of securing samples.
- x Understand the use of laboratory instrumentation.
- x Observe safe practices to ensure the safety of analysts.
- x Understand legal processes including courtroom testimony, relevant legal decisions and concepts.
- x Recognize and employ quality assurance measures to ensure the integrity of the analyses.
- x Understand the importance of impartial and ethical work practices.



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Knowledge, Skills, and Abilities (KSA)

- I. History
 - A. Evolution of practice (past practices)
 - B. Significant historical figures (e.g., Locard, Gross, Orfila, Kirk)
- II. Crime Scene Preservation
 - A. Securing
 - B. Isolating
 - C. Recording
 - D. Searching
 - E. Recognition of evidentiary value
 - F. Safety
- III. Crime Laboratory Operations – Overview
 - A. Laboratory Disciplines
 - 1. Forensic biology
 - 2. Controlled substances
 - 3. Trace analysis
 - 4. Toxicology
 - 5. Latent fingerprints
 - 6. Questioned documents
 - 7. Fire debris
 - 8. Firearms/Toolmarks
 - 9. Digital evidence
- IV. QA/QC
 - A. Accreditation, Certification, Standardization
 - 1. Laboratory accreditation
 - 2. Personnel certification
 - 3. Standardization
 - B. QA/QC Application
 - 1. Definitions
 - 2. Validation and verification
 - 3. Controls and standard reference materials
 - 4. Proficiency Testing
 - C. Document/Data Management
 - 1. Databases
 - 2. Case document preservation/integrity



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V. Safety

A. Chemical Hygiene

1. Safety labeling (SDS) B.

Universal Precautions

1. Blood born pathogens
2. Person protective equipment

C. Hazardous Waste/Biohazardous Waste Handling

1. Spill control

VI. Legal

A. Decisions/laws

1. *Frye*
2. *Daubert* and related decisions

B. Legal terminology

1. Subpoena, deposition

C. Court Testimony

1. Voir dire/qualification
2. Expert witness

D. Procedural Law

1. Search and seizure (4th Amendment)
2. Discovery

VII. Ethics

A. Professional Ethics

1. Conflict of interest
2. Professional integrity
3. Objectivity
4. Professional obligations

VIII. Evidence Handling

A. Evidence Recognition and Collection

1. Prioritization based on circumstance
2. Sampling

B. Evidence Characteristics (Class/Individual)

1. Identification
2. Primary, secondary transfers
3. Visible vs. latent evidence

C. Evidence Preservation and Integrity

1. Chain of custody
2. Alteration/degradation

D. Evidence Packaging

1. Proper sealing
2. Types of packaging



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- IX. General Science Terms and Principles
 - A. Definitions and applications
 - 1. Scientific Method
 - 2. Microscopy
 - 3. Instrumentation
 - B. General Chemistry Concepts
 - 1. Nomenclature (IUPAC)
 - 2. Type of molecules (e.g., aromatics, isoalkanes)
 - 3. Atomic, molecular weights
 - 4. Acids/bases
 - 5. Periodic Table
 - 6. Elemental Composition
 - 7. Bonding
 - C. General Biology Concepts
 - 1. Cell structure
 - 2. Genetics
 - 3. Characteristics of body fluids
 - D. General Physics Concepts
 - 1. Energy
 - 2. Electromagnetic spectrum
 - 3. Force
 - E. General Physiology and Anatomy Concepts
 - F. General Statistics
 - 1. Central tendency
 - 2. Variation
 - 3. Population characteristics
 - G. Stoichiometry
 - H. Logic
 - I. Metric System
 - 1. Metric to metric conversion
 - 2. Metric to English conversion
- X. Theory and Application
 - A. Forensic biology
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
 - B. Controlled substances
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
 - C. Trace analysis
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation



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- D. Toxicology
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
- E. Latent fingerprints
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
- F. Questioned documents
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
- G. Fire debris
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
- H. Firearms/Toolmarks
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation
- I. Pattern evidence
 - 1. Analytical Techniques
 - 2. Instrumentation
 - 3. Data Interpretation

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References

Techniques of Crime Scene Investigation, 7th Edition, by Fisher, B.J. (Boca Raton: CRC Press, 2004) ISBN 0-8493-1691-X.

Criminalistics, An Introduction to Forensic Science, 7th Edition (or higher), by Saferstein, R. (Upper Saddle River, NJ: Prentice Hall, 1998) ISBN 0-13-592940-7.

Forensic Science Handbook, Volume I, 2nd Edition, edited by Saferstein, R. (Englewood Cliffs, NJ: Prentice Hall, 2002) ISBN 0-13-091058-9.

Forensic Science Handbook, Volume II, 2nd Edition, edited by Saferstein, R. (Englewood Cliffs, NJ: Prentice Hall, 2005) ISBN 0-13-112434-X.

Forensic Science Handbook, Volume III, edited by Saferstein, R. (Englewood Cliffs, NJ: Prentice Hall, 1993) ISBN 0-13-325390-2.

Fundamentals of Forensic Science, by Houck, M., Siegel, J. (Burlington, MA: Elsevier Academic Press, 2006) 0-12-356762-9.

Forensic Chemistry, by Bell, S., (Upper Saddle River, NJ: Pearson Prentice Hall, 2006) ISBN 0-13-147835-4.

"The Rule of Professional Conduct" supplied by the American Board of Criminalistics.

Forensic DNA Typing, by Butler, J. (San Diego, CA: Academic Press, 2001) ISBN 0-12-147951-X

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Sample Questions

1. The primary reason for proving "chain of custody" on a particular item in court is to:
 - A. authenticate the item.
 - B. Show how many people handled the item.
 - C. Show how long it was in each person's possession.
 - D. Deter or prevent unauthorized individuals from handling the evidence.
2. You receive an envelope containing a semi-automatic pistol for an operability check. You open the envelope to examine the weapon. You first remove a fully loaded magazine. The weapon is now:
 - A. Potentially still loaded and unsafe.
 - B. Unloaded and safe.
 - C. Potentially still loaded but safe.
 - D. Rendered safe because of a magazine disconnect.
3. Which of the following actions is not forbidden by the ABC Code of Professional Conduct?
 - A. Embellishing one's qualifications when testifying.
 - B. Utilizing a secret method.
 - C. Refusing to honor a subpoena duces tecum.
 - D. Interpreting equivocal results based only on an employer's wishes.
4. A defendant has a combination of genetic marker types common to a particular evidence stain and 0.1 percent of the population. This means:
 - A. approximately 1 out of 1000 people would have the same types
 - B. the next 999 people that walked into the court room would not have the same combination of types
 - C. we are 99.9% certain that the person responsible is being tried
 - D. we are 0.1% certain that the person responsible is being tried



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5. A drunk driver struck a pedestrian at a dark intersection. Realizing that the headlamps were not on, the driver turns them on before the police arrive. The broken right front low beam flashes and goes out. The police collect the headlamp and submit it to you for examination. You are likely to find which of the following indicators?
- I. A sharp break
 - II. Hot deformation
 - III. Fused glass
 - IV. Large amounts of WO_3 deposits
- A. IV only
B. I only
C. II and III
D. II, III, and IV
6. Which one of the following statements applies to FT-IR but NOT to dispersive IR?
- A. the technique is considered to be a confirmatory test
 - B. the resulting spectrum is a measure of molecular vibration
 - C. the infrared radiation is analyzed utilizing interferometer
 - D. solid samples are prepared by mixing the sample with KBr and pressing a pellet
7. The differences in striation markings along a gun's bore could be the result of:
- A. imperfections of the rifling cutter, distortions caused by a broach cutter, and wear from the firing of bullets over time
 - B. imperfections of the rifling cutter
 - C. distortions caused by a broach cutter
 - D. wear from the firing of bullets over time
8. How will the R_f values for eluents most likely be affected if a TLC tank is not kept saturated with the developing solvent?
- A. They will increase.
 - B. They will decrease.
 - C. They will increase or decrease unpredictably.
 - D. They will not be affected.



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9. If the IR absorbance spectrum for a previously unidentified drug matches that of an l-amphetamine HCL standard, which of the following would be a justifiable conclusion?
- A. The unknown is l-amphetamine hydrochloride.
 - B. The unknown could be d-amphetamine hydrochloride.
 - C. The unknown could be l-amphetamine sulfate.
 - D. The unknown could be methamphetamine hydrochloride.
10. With which one of the following drugs will the Marquis reagent *NOT* produce a colored reaction product?
- A. morphine
 - B. mescaline
 - C. amphetamine
 - D. barbiturate
11. The term "theoretical plate" refers to which one of the following parameters in gas chromatography?
- A. retention time
 - B. polarity
 - C. efficiency
 - D. stationary phase thickness
12. In microscopy, which one of the following terms describes the relationship between retardation and thickness?
- A. Aberration
 - B. Dispersion
 - C. Scattering
 - D. Birefringence
13. What is the range of probabilities that two genes on the same chromosome will remain together after meiosis?
- A. 5% to 25%
 - B. 1% to 99%
 - C. 25% to 75%
 - D. 50% to 99%
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14. A nucleic acid must contain a nitrogenous base and which of the following?
- I. Aromatic ring
 - II. 4-carbon ring
 - III. 5-carbon ring
 - IV. phosphate
- A. I, II, and IV
 - B. III and IV
 - C. I and III
 - D. I and IV
15. Which of the following factors DO NOT affect the migration of DNA fragments through an electrophoretic system?
- I. pore size
 - II. tracking dye
 - III. DNA shape
- A. II only
 - B. II and III
 - C. I and II
 - D. I and III
16. A three banded isoenzyme pattern with a 1:2:1 intensity ratio indicates a _____ protein.
- A. monomeric
 - B. dimeric
 - C. trimeric
 - D. tetrameric
17. What are organic compounds having the basic formula $\text{NH}_2\text{-R-COOH}$ (where R = an aliphatic or aromatic side chain) that are polymerized to form peptides and proteins termed?
- A. amino acids
 - B. enzymes
 - C. phospholipids
 - D. polysaccharides
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18. Which one of the following products would be expected to contain the **HIGHEST** concentration of aromatic hydrocarbons?
- A. Paint thinner.
 - B. Gasoline.
 - C. Kerosene.
 - D. Coleman fuel.
19. Which of the following classes of compounds is the **MOST** indicative of gasoline?
- A. Polynuclear hydrocarbons.
 - B. Aliphatic hydrocarbons.
 - C. Alicyclic hydrocarbons.
 - D. Aromatic hydrocarbons
20. Which of the following garments would be the most suitable for collection of trace evidence by using a tape lift technique?
- A. Nylon shell windbreaker
 - B. Mohair sweater
 - C. Cotton/polyester blend dress shirt
 - D. Pair of blue denim trousers