

# Advanced Forensic Science Principles

Forensic Science · Answer Key · 20 Questions

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**1. Which analytical technique is primarily used to identify volatile organic compounds in fire debris analysis?**

- A) High-performance liquid chromatography
- B) Gas chromatography-mass spectrometry**
- C) Fourier-transform infrared spectroscopy
- D) Atomic absorption spectroscopy

**2. In forensic anthropology, which feature is the most reliable indicator for determining biological sex from skeletal remains?**

- A) The shape of the sternum
- B) The morphology of the pelvis**
- C) The length of the humerus
- D) The dental arcade curvature

**3. What is the chemical composition of the 'white residue' often found in presumptive tests for cocaine using cobalt thiocyanate?**

- A) Cocaine hydrochloride
- B) Cocaine base**
- C) Cocaine sulfate
- D) Cocaine nitrate

**4. During DNA profiling, which specific genetic marker type is currently the gold standard for human identification in the CODIS system?**

- A) Restriction Fragment Length Polymorphism
- B) Short Tandem Repeats**
- C) Single Nucleotide Polymorphisms
- D) Variable Number Tandem Repeats

**5. Which phase of hair growth is characterized by the cessation of cellular division and follicle shrinkage?**

- A) Anagen
- B) Catagen**
- C) Telogen
- D) Exogen

**6. In bloodstain pattern analysis, what does an 'elliptical' bloodstain shape reveal about the impact angle?**

- A) The height of the source
- B) The velocity of the impact
- C) The directionality and impact angle**
- D) The blood volume

**7. Which reagent is utilized to detect latent bloodstains by producing a chemiluminescent reaction upon contact with heme?**

- A) Ninhydrin
- B) Silver nitrate
- C) Luminol**
- D) Crystal violet

**8. What is the primary function of the 'cortex' in a hair shaft during forensic microscopic analysis?**

- A) Providing the pigment color and structural integrity**
- B) Acting as the protective outer layer
- C) Containing the medullary canal
- D) Regulating keratin production

**9. In forensic toxicology, which enzyme is most commonly involved in the phase I metabolism of xenobiotics?**

- A) Cytochrome P450**
- B) Alcohol dehydrogenase
- C) Glutathione S-transferase
- D) N-acetyltransferase

**10. What is the critical temperature range for 'glass transition' in the study of forensic polymer analysis?**

- A) The temperature where amorphous solids become brittle**
- B) The temperature where the polymer melts into a liquid
- C) The range where the material loses its refractive index
- D) The point of thermal degradation

**11. Which type of firearm rifling produces a distinctive 'land and groove' impression due to the cutting process?**

- A) Broach rifling**
- B) Polygonal rifling
- C) Button rifling
- D) Hammer forging

**12. What does the 'Kerckhoffs's principle' imply in the context of forensic digital cryptography?**

**A) Security should rely on the secrecy of the key, not the algorithm**

B) Encryption must be based on prime number factorization

C) Digital evidence is immutable if hashed

D) Steganography is easily detected via entropy analysis

**13. Which skeletal feature is used to estimate the age of an adult individual using the Suchey-Brooks system?**

**A) Pubic symphysis**

B) Cranial sutures

C) Clavicle epiphysis

D) Dental attrition

**14. In soil analysis, which mineral is most frequently utilized for 'geological fingerprinting' due to its resistance to weathering?**

**A) Zircon**

B) Calcite

C) Gypsum

D) Halite

**15. What is the primary mechanism of action for the 'Cyanoacrylate fuming' method in latent print development?**

**A) Polymerization on the ridges**

B) Oxidation of amino acids

C) Fluorescence under UV light

D) Precipitation of silver salts

**16. Which forensic instrument is best suited for the elemental analysis of trace glass fragments?**

**A) Scanning Electron Microscopy with Energy Dispersive X-ray (SEM-EDX)**

B) Gas Chromatography

C) Mass Spectrometry

D) Polarized Light Microscopy

**17. What is the term for the tendency of a bullet to follow a curved path due to the rotation imparted by rifling?**

**A) Gyroscopic precession**

B) Yaw

C) Magnus effect

D) Drag coefficient

**18. Which entomological stage is used to estimate the Post-Mortem Interval (PMI) when dealing with necrophagous Diptera?**

**A) Larval instar progression**

B) Adult emergence

C) Pupal eclosion

D) Egg hatching duration

**19. In forensic odontology, which classification system uses the 'FDI World Dental Federation' notation to identify teeth?**

**A) ISO 3950**

B) Universal Numbering System

C) Palmer Notation

D) Zsigmondy system

**20. Which phenomenon explains the separation of components in paper chromatography based on their solubility?**

**A) Differential partitioning**

B) Capillary action

C) Molecular weight exclusion

D) Adsorption kinetics