**SUPPLEMENTARY QUESTIONS AND ANSWERS**

1. The presence or absence of how many antigens determines an individual’s blood type in the A-B-O system?
   - a. 0
   - b. 1
   - c. 2
   - d. 3
   - e. 4

2. What approximate percentage of the population is type B?
   - a. 80 percent
   - b. 41 percent
   - c. 38 percent
   - d. 15 percent
   - e. 6 percent

3. An individual who is type O has:
   - a. O antibodies
   - b. A antibodies
   - c. B antibodies
   - d. Both A and B antibodies
   - e. Neither A nor B antibodies

4. Antibodies are found:
   - a. On the red blood cells
   - b. On the white blood cells
   - c. In the solid portion of blood
   - d. In the blood serum
   - e. In fibrinogen

5. A precipitin test can be used to identify:
   - a. Human blood
   - b. Dog blood
   - c. Cat blood
   - d. Mouse blood
   - e. All of the above

6. If blood is found to have both A and B antigens it is typed as:
   - a. A
   - b. B
   - c. AB
   - d. O
   - e. Rh positive

7. One parent is type AB; the other parent is type O. A possible genotype for an offspring is:
   - a. AB
   - b. OO
   - c. AO
   - d. All of the above
   - e. None of the above

8. When an animal is injected with an antigen, the animal will respond by producing:
   - a. Polyclonal antibodies
   - b. Monoclonal antibodies
   - c. Both of the above
   - d. Agglutinates
   - e. None of the above
9. During the production of monoclonal antibodies which step is NOT followed?
   a. Inject an animal with the antigen of interest.
   b. Remove the animal’s spleen cells.
   c. Fuse the spleen cells to malignant blood cells.
   d. Hydridoma bearing the antibody activity of interest are selected and cultured.
   e. All of the above.

10. A stain can tentatively be identified as blood by:
    a. The benzidine test
    b. The luminol test
    c. The phenolphthalein test
    d. The Takayama test
    e. All of the above

11. Which of the following statements is FALSE?
    a. Dried bloodstains may tentatively be identified as blood by a peroxidase test.
    b. All bloods contain the enzyme peroxidase.
    c. A-B-O antigens are present in all human blood.
    d. The Kastle-Meyer test is used to determine whether blood is of human origin.
    e. The bonding of an antigen with its specific antibody causes agglutination.

12. The magnification power of a microscope equals the magnifying power of:
    a. The eyepiece lens
    b. The objective lens
    c. The objective lens multiplied by two
    d. The eyepiece lens multiplied by two
    e. The objective lens multiplied by the eyepiece lens

13. The microscope examination of a bullet requires:
    a. Transmitted light
    b. Reflected light
    c. Condensed light
    d. All of the above
    e. None of the above

14. Which of these is NOT part of the optical system of a compound microscope?
    a. Abbe condenser
    b. Objective lens
    c. Eyepiece lens
    d. The illuminator
    e. The body tube
15. Which of the following statements is FALSE?
   a. If the polarizer and analyzer of a polarizing microscope are placed parallel to each other, no light will penetrate.
   b. Light confined to a single plane of vibration is said to be polarized.
   c. Many crystals are birefringent.
   d. The lens nearest the specimen is called the objective lens.
   e. A compound microscope produces a virtual image.

16. The most important tool of the firearms examiner is the:
   a. Compound microscope  
   b. Comparison microscope  
   c. Stereoscopic microscope  
   d. Polarizing microscope  
   e. Scanning electron microscope

17. Which of the following statements is FALSE?
   a. The scanning electron microscope (SEM) produces an image by aiming a beam of electrons onto a specimen.
   b. The major attraction of the SEM is its high magnification and depth of field.
   c. The SEM produces an image that is stereoscopic in appearance.
   d. A SEM can be fitted with an analyzer capable of identifying the elements present in the specimen under examination.
   e. Microwaves are generated when the electron beam of the SEM strikes a target.

18. Match each of the following descriptions to the choices listed.
   b  1. Space between the specimen and objective lens
   g  2. Presents a distinctive three-dimensional image
   h  3. Illumination required to view a transparent object
   a  4. Eyepiece multiplied by objective lens
   d  5. The thickness of a specimen in focus
   e  6. Size of the specimen area being observed
   j  7. Provides a simultaneous view of two specimens
   c  8. Used to examine birefringent materials
   l  9. The image seen through a compound microscope
   a. Magnification  
   b. Working distance  
   c. Polarizing microscope  
   d. Depth of focus  
   e. Field of view  
   f. Real image  
   g. Stereoscopic microscope  
   h. Transmitted illumination  
   i. Vertical illumination  
   j. Comparison microscope  
   k. Objective lens  
   l. Virtual image
19. A “fingerprint” of an element is obtained by the technique of:
   a. Infrared spectrophotometry
   b. Ultraviolet spectrophotometry
   c. Gas chromatography
   d. Emission spectroscopy
   e. Thin-layer chromatography

20. In neutron activation analysis, an element is identified by measuring the energy of emitting:
   a. Protons               d. Gamma rays
   b. Electrons            e. Alpha rays
   c. Neutrons

21. The emission spectrograph is used to determine:
   a. The mass of a substance
   b. The weight of a substance
   c. The crystalline structure of a substance
   d. The elemental composition of a substance
   e. All of the above

22. Paint chips may be individualized to a single source by examining their:
   a. Infrared spectra          d. Pyrograms
   b. Ultraviolet spectra      e. Their relative size
   c. Color and layer structure

23. The polymeric makeup of paint binders can readily be compared by:
   a. Emission spectroscopy     d. Layer structure
   b. Thin-layer chromatography e. Pyrolysis gas chromatography
   c. Microscopy

24. Automobile finishes typically contain which layer(s)?
   a. Colorcoat              d. Electrocoat primer and colorcoat
   b. An electrocoat primer, colorcoat, and clearcoat
   c. Clearcoat

25. A technique frequently used to compare soils is:
   a. The immersion method     d. Becke Line
   b. Density-gradient tubes   e. Dispersion
   c. Flotation
26. Which of the following statements is true?
   a. All chemical reactions give off heat.
   b. Heat is required to change one element into another.
   c. A chemical equation shows the number of atoms lost during a chemical reaction.
   d. Oxidations are chemical reactions that give off heat.
   e. Oxidation reactions always produce a fire.

27. The chemical reaction associated with a fire is:
   a. Reduction
d. Acid-base
   b. Oxidation
e. None of the above
   c. Precipitation

28. A natural heat-producing process that may give rise to a fire is:
   a. A chain reaction
d. Spontaneous combustion
   b. Flash point
e. Glowing combustion
   c. Ignition point

29. The minimum temperature at which fuel vapor will ignite is known as:
   a. The glow temperature
d. The ignition temperature
   b. The boiling point
e. The vapor temperature
   c. The flash point

30. Gasoline residues are best characterized by:
   a. Ultraviolet analysis
d. Emission spectroscopy
   b. Infrared spectrophotometry
e. Atomic absorption
   c. Gas chromatography

31. Which of the following is NOT possible to determine from a laboratory examination of evidence recovered from an arson?
   a. The presence of gasoline, kerosene, or turpentine found in debris.
   b. Liquid gasolines may be compared for origin.
   c. Examination of the debris may reveal the brand name of gasoline used to start the fire.
   d. The criminalist may be able to reconstruct the ignition mechanism used by the arsonist.
   e. All of the above are possible to accomplish.

32. All combustible fuels simultaneously igniting to engulf a structure un flames is known as:
   a. Pyrolysis
d. Flashover
   b. Spontaneous combustion
e. Flash point
   c. Combustion
33. The transfer of heat energy by the movement of molecules within a liquid or gas is:
   a. Radiation
d. Conduction
   b. Oxidation
e. Pyrolysis
   c. Convection

34. Complex chromatographic accelerant patterns can be simplified by:
   a. Gas chromatography
   b. Thin-layer chromatography
c. Mass spectrometry
d. Headspace analysis
e. A portable hydrocarbon detector

35. Combustion occurring at the surface of a solid describes;
   a. Pyrolysis
d. Glowing combustion
   b. Spontaneous combustion
e. Convection
   c. Flash point

36. An initiating explosive often used in detonators is:
   a. Lead azide
d. Dynamite
   b. PETN
e. Nitrocellulose
   c. TNT

37. The chemical ingredients of black powder are commonly:
   a. Aluminum, potassium, nitrate, nitrocellulose
   b. Sulfur, carbon, nitrogen
c. Carbon, nitrocellulose, potassium chlorate
d. Potassium nitrate, carbon, sulfur
e. None of the above

38. Which of the following statements is FALSE?
   a. Potassium chlorate can be mixed with sulfuric acid and sugar to create a low explosive.
b. Chemicals that supply oxygen are known as oxidizing agents.
c. Thin-layer chromatography is a useful analytical technique for screening debris for explosive residues.
d. Smokeless powder is a low explosive.
e. Dynamite is an initiating high explosive.

39. Which of the following is NOT a military explosive?
   a. RDX
d. TNT
   b. C-4
e. Nitroglycerin
c. PETN
40. The technique commonly used to identify crystalline substances is:
   a. Atomic absorption spectrophotometry
   b. X-ray diffraction
   c. Emission spectroscopy
   d. Neutron activation analysis
   e. Ultraviolet spectrophotometry

41. The necessary ingredients of a low explosive are:
   a. A fuel
   b. An oxidizing agent
   c. A blasting cap
   d. All of the above
   e. A and B

42. Tests typically used to specifically identify unconsumed explosives are:
   a. X-ray diffraction
   b. Infrared spectrophotometry
   c. Thin-layer chromatography
   d. All of the above