UNIT IV MICROSCOPES AND STAINING TECHNIQUES

Microscopy – Light Microscope, Bright Field, Dark Field, Fluorescence Microscope, Electron Microscope (TEM & SEM)

1. **Which of the following is the most commonly used microscope in laboratories?**
   a) Electron microscope
   b) Fluorescence microscope
   c) Light microscope
   d) Dark field microscope
2. **The resolving power of a light microscope is primarily limited by which factor?**
   a) Objective lens
   b) Numerical aperture
   c) Wavelength of light
   d) Condenser lens
3. **In bright field microscopy, the image is formed by:**
   a) Light reflected from the sample
   b) Light absorbed by the sample
   c) Light scattered by the sample
   d) Light transmitted through the sample
4. **Dark field microscopy is particularly useful for observing:**
   a) Stained bacteria
   b) Living, unstained specimens
   c) Fluorescently labeled specimens
   d) Fixed tissue samples
5. **Which type of microscope uses ultraviolet light to visualize specimens?**
   a) Bright field microscope
   b) Dark field microscope
   c) Fluorescence microscope
   d) Phase-contrast microscope
6. **Fluorescence microscopes are especially useful in:**
   a) Observing living organisms
   b) Identifying specific cellular components
   c) Observing non-living objects
   d) Analyzing chemical reactions
7. **Which type of electron microscope provides detailed images of the surface of a specimen?**
   a) Transmission Electron Microscope (TEM)
   b) Scanning Electron Microscope (SEM)
   c) Confocal microscope
   d) Bright field microscope
8. **Transmission Electron Microscopy (TEM) is primarily used for:**
   a) Surface imaging of samples
   b) 3D imaging of cells
   c) Internal structure examination at high resolution
   d) Fluorescent imaging of samples

9. **The main advantage of using an electron microscope over a light microscope is:**
   a) Lower cost
   b) Ability to observe live specimens
   c) Higher resolution
   d) Simplicity of use
10. **What is the purpose of the condenser lens in a light microscope?**
   a) To magnify the image
   b) To focus light on the specimen
   c) To adjust the focus
   d) To capture the image
11. **Which type of microscope would be most appropriate for visualizing viruses?**
   a) Light microscope
   b) Dark field microscope
   c) Scanning Electron Microscope (SEM)
   d) Transmission Electron Microscope (TEM)
12. **Which of the following is NOT a component of a typical light microscope?**
   a) Objective lens
   b) Condenser
   c) Electron gun
   d) Ocular lens
13. **In fluorescence microscopy, the fluorophores are excited by:**
   a) Visible light
   b) Ultraviolet light
   c) Infrared light
   d) X-rays
14. **Which of the following microscopes does not use light for imaging?**
   a) Bright field microscope
   b) Fluorescence microscope
   c) Transmission Electron Microscope (TEM)
   d) Dark field microscope
15. **The image in a scanning electron microscope (SEM) is created by:**
   a) Electrons passing through the sample
   b) Electrons bouncing off the sample's surface
   c) Light reflected by the sample
   d) Fluorescence emitted by the sample
16. **Which microscope is best for visualizing the 3D structure of a sample?**
   a) Transmission Electron Microscope (TEM)
   b) Scanning Electron Microscope (SEM)
   c) Bright field microscope
   d) Phase-contrast microscope
17. **What is the typical magnification range of a light microscope?**
   a) 10x – 100x
   b) 100x – 1,000x
   c) 1,000x – 10,000x
   d) 10,000x – 100,000x

18. **Which staining technique is commonly used in bright field microscopy to differentiate between Gram-positive and Gram-negative bacteria?**
    a) Acid-fast stain
    b) Simple stain
    c) Gram stain
    d) Fluorescent stain
19. **Which microscope would be most appropriate for visualizing the fine details of cellular organelles?**
    a) Light microscope
    b) Dark field microscope
    c) Transmission Electron Microscope (TEM)
    d) Scanning Electron Microscope (SEM)
20. **What is the main advantage of using a dark field microscope?**
    a) Enhanced contrast of unstained samples
    b) Increased resolution
    c) Ability to visualize fluorescent samples
    d) Simplified sample preparation

Staining Methods – Simple Stain, Gram Stain, and Acid-Fast Stain

21. **Which of the following is the primary stain used in the Gram stain procedure?**
    a) Crystal violet
    b) Safranin
    c) Methylene blue
    d) Malachite green
22. **The counterstain in the Gram stain procedure is:**
    a) Crystal violet
    b) Safranin
    c) Methylene blue
    d) Malachite green
23. **Gram-positive bacteria appear what color after Gram staining?**
    a) Red
    b) Pink
    c) Purple
    d) Green
24. **Gram-negative bacteria are typically colored what after Gram staining?**
    a) Red
    b) Blue
    c) Purple
    d) Green
25. **Which of the following is a decolorizing agent used in the Gram stain?**
    a) Ethanol
    b) Water
    c) Acetone
    d) Both a and c
26. **What is the purpose of using a mordant in the Gram stain procedure?**
    a) To bind the stain to the cell wall
    b) To decolorize the sample

c) To counterstain the bacteria
d) To wash the sample

27. **Which stain is used for acid-fast bacteria?**
    a) Crystal violet
    b) Safranin
    c) Methylene blue
    d) Carbol fuchsin
28. **Acid-fast bacteria appear what color after the acid-fast stain procedure?**
    a) Blue
    b) Red
    c) Green
    d) Purple
29. **Which genus is commonly identified using the acid-fast stain?**
    a) Escherichia
    b) Staphylococcus
    c) Mycobacterium
    d) Bacillus
30. **The simple stain technique is mainly used to:**
    a) Differentiate between different bacterial species
    b) Identify the presence of a capsule
    c) Highlight the shape and arrangement of bacteria
    d) Determine the thickness of the bacterial cell wall
31. **Which of the following is NOT true about the Gram stain?**
    a) It is a differential staining method
    b) It distinguishes bacteria based on cell wall structure
    c) It is used to identify acid-fast bacteria
    d) It uses crystal violet as the primary stain
32. **What is the main purpose of the acid-alcohol solution in the acid-fast staining technique?**
    a) To stain all bacteria red
    b) To fix the bacteria onto the slide
    c) To decolorize non-acid-fast bacteria
    d) To act as a mordant
33. **The mordant in the Gram stain procedure is:**
    a) Crystal violet
    b) Iodine
    c) Safranin
    d) Methylene blue
34. **Which step is critical in differentiating between Gram-positive and Gram-negative bacteria?**
    a) Application of the primary stain
    b) Application of the mordant
    c) Decolorization
    d) Counterstaining
35. **What color do non-acid-fast bacteria appear after acid-fast staining?**
    a) Red

b) Green
c) Purple
d) Blue

36. **The Gram stain procedure was developed by:**
    a) Louis Pasteur
    b) Hans Christian Gram
    c) Robert Koch
    d) Paul Ehrlich
37. **In a simple staining procedure, the cells are usually stained with:**
    a) A single dye
    b) Two different dyes
    c) A combination of dyes
    d) Fluorescent dyes
38. **Why is methylene blue commonly used in simple staining?**
    a) It penetrates the cell wall easily
    b) It provides good contrast
    c) It is a basic dye that binds to negatively charged cellular components
    d) All of the above
39. **Which of the following is NOT a step in the acid-fast staining procedure?**
    a) Primary stain with carbol fuchsin
    b) Decolorization with acid-alcohol
    c) Counterstaining with methylene blue
    d) Use of iodine as a mordant
40. **Which bacteria would be expected to appear purple after Gram staining?**
    a) Escherichia coli
    b) Staphylococcus aureus
    c) Mycobacterium tuberculosis
    d) Bacillus anthracis
41. **What is the main reason for performing a Gram stain in a clinical laboratory?**
    a) To identify acid-fast bacteria
    b) To differentiate bacterial species
    c) To determine bacterial motility
    d) To identify the presence of capsules
42. **Which of the following staining methods is used to highlight bacterial endospores?**
    a) Gram stain
    b) Acid-fast stain
    c) Simple stain
    d) Endospore stain
43. **What is the purpose of the heat fixation step in staining procedures?**
    a) To kill the bacteria
    b) To adhere the bacteria to the slide
    c) To prevent the sample from washing off during staining
    d) All of the above
44. **Which of the following stains is used to differentiate bacterial cell walls?**
    a) Simple stain
    b) Gram stain

c) Acid-fast stain
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45. **Which microscope is best suited for viewing stained bacterial samples?**
    a) Electron microscope
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46. **In the Gram stain procedure, what is the role of the iodine?**
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49. **What type of bacteria are typically identified using the acid-fast staining technique?**
    a) Gram-positive bacteria
    b) Gram-negative bacteria
    c) Acid-fast bacteria
    d) Spore-forming bacteria
50. **The Gram stain is most useful for:**
    a) Identifying viruses
    b) Distinguishing between different types of bacteria
    c) Visualizing fungal infections
    d) Observing the nucleus of eukaryotic cells

Here are 50 multiple choice questions (MCQs) on Microscopy and Staining Methods, covering various types of microscopes and staining techniques. Answers are provided at the end.

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Answers:

1. **c**
2. **c**
3. **d**
4. **b**
5. **c**
6. **b**
7. **b**
8. **c**
9. **c**
10. **b**
11. **d**
12. **c**
13. **b**
14. **c**

15. **b**
16. **b**
17. **b**
18. **c**
19. **c**
20. **a**
21. **a**
22. **b**
23. **c**
24. **a**
25. **d**
26. **a**
27. **d**
28. **b**
29. **c**
30. **c**
31. **c**
32. **c**
33. **b**
34. **c**
35. **d**
36. **b**
37. **a**
38. **d**
39. **d**
40. **b**
41. **b**
42. **d**
43. **d**
44. **b**
45. **c**
46. **a**
47. **d**
48. **a**
49. **c**
50. **b**