Chapter 02
Microscopy

Fill in the Blank Questions

1. The _____ is the point at which a lens focuses parallel beams of light.
focal point

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.01.02 Correlate lens strength and focal length
Section: 02.01
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

2. The _____ is the distance between the center of a lens and the point at which it focuses parallel beams of light.
focal length

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand

Learning Outcome: 02.01.01 Relate the refractive indices of glass and air to the path light takes when it passes through a prism or convex lens Section: 02.01

True / False Questions

3. Light rays are refracted (bent) when they cross the interface between materials with different refractive indices.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.01.02 Correlate lens strength and focal length
Section: 02.01
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Multiple Choice Questions

4. Light rays are refracted (bent) when they cross the interface between materials with different refractive indices.
A. differential interference contrast
B. dark field
C. phase-contrast
D. confocal

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.01.01 Relate the refractive indices of glass and air to the path light takes when it passes through a prism or convex lens Section: 02.01

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

5. Confocal microscopes exhibit improved contrast and resolution by
A. illumination of a large area of the specimen.
B. blocking out stray light with an aperture located above the objective lens.
C. use of light at longer wavelengths.
D. use of ultraviolet light to illuminate the specimen.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Learning Outcome: 02.02.02 Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

6. A 30 objective and a 20 ocular produce a total magnification of
A. 230 .
B. 320 .
C.50 .
D. 600 .

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 3. Apply
Learning Outcome: 02.02.01 Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

7. A 45 objective and a 10 ocular produce a total magnification of
A. 900 .
B.55 .
C. 450 .
D. 145 .

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 3. Apply
Learning Outcome: 02.02.01 Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

8. A microscope that exposes specimens to ultraviolet, violet, or blue light and forms an image with the light emitted at a different wavelength is called a _____ microscope. A. phase-contrast
B. dark-field
C. scanning electron
D. fluorescence

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.02.03 Create a table that compares and contrasts the various types of light microscopes in terms of their uses, how images are created, and the quality of images produced
Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

9. Immersion oil can be used to increase the resolution achieved with some microscope lenses because it increases the _____ between the specimen and the objective lens.
A. optical density
B. refractive index
C. optical density and refractive index
D. neither optical density nor refractive index

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.01.01 Relate the refractive indices of glass and air to the path light takes when it passes through a prism or convex lens Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

True / False Questions

10. A substage condenser is used to focus light onto the specimen, which increases the resolution of a light microscope.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Evaluate light microscopy, electron microscopy, and scanning probe microscopy in terms of their uses, resolution, and the quality of the images create Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Fill in the Blank Questions

11. The _____ is the distance between the specimen and the objective lens when the specimen is in focus.
working distance

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.02.01 Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

12. The useful magnification of a light microscope is limited by the _____ of the light source being utilized.
wavelength

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.02.02 Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

13. The special dyes used in fluorescence microscopy that absorb light at one wavelength and emit light at a different wavelength are called _____.
fluorochromes

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.02.02 Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

14. In order to view a specimen with a total magnification of 400 , a _____ objective must be used if the ocular is 10 .
40

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 3. Apply
Learning Outcome: 02.02.01 Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

True / False Questions

15. Confocal microscopes, in combination with specialized computer software, can be used to create three-dimensional images of cell structures.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 1. Remember
Learning Outcome: 02.02.03 Create a table that compares and contrasts the various types of light microscopes in terms of their uses, how images are created, and the quality of images produced
Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

16. A light microscope with an objective lens numerical aperture of 0.65 is capable of allowing two objects 400 nm apart to be distinguished when using light with a wavelength of 420 nm.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 3. Apply
Learning Outcome: 02.02.02 Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

17. Resolution decreases when the wavelength of the illuminating light decreases.
FALSE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Learning Outcome: 02.02.02 Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

18. Immersion oil is used to prevent a specimen from drying out.
FALSE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

19. It is possible to build a light microscope capable of 10,000 magnification, but the image would not be sharp because resolution is independent of magnification.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.01.02 Correlate lens strength and focal length
Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

20. Immersion oil increases the amount of light passing through a specimen and entering the objective lens.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.01.01 Relate the refractive indices of glass and air to the path light takes when it passes through a prism or convex lens Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Multiple Choice Questions

21. If the objective lenses of a microscope can be changed without losing focus on the specimen, they are said to be
A. equifocal.
B. totifocal.
C. parfocal.
D. optifocal.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.02.01 Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

22. An instrument that magnifies slight differences in the refractive index of cell structures is called a (n) _____ microscope.
A. phase-contrast
B. electron
C. fluorescence
D. densitometric

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Learning Outcome: 02.02.03 Create a table that compares and contrasts the various types of light microscopes in terms of their uses, how images are created, and the quality of images produced
Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

23. The instrument that produces a bright image of the specimen against a dark background is called a (n) _____ microscope.
A. phase-contrast
B. electron
C. bright-field
D. dark-field

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.02.03 Create a table that compares and contrasts the various types of light microscopes in terms of their uses, how images are created, and the quality of images produced
Section: 02.02
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

24. As the magnification of a series of objective lenses increases, the working distance
A. increases.
B. decreases.
C. stays the same.
D. cannot be predicted.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.02.01 Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope Section: 02.02

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

25. Prior to staining, smears of microorganisms are heat-fixed in order to
A. allow eventual visualization of internal structures.
B. ensure removal of dust particles from the slide surface.
C. attach it firmly to the slide.
D. create small pores in cells that facilitates binding of stain to cell structures.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
ASM Objective: 08.02 Use aseptic and pure culture techniques to enrich for and isolate microorganisms.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.03.01 Recommend a fixation process to use when the microbe is a bacterium or archaeon and when the microbe is a protist Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

26. Acid-fast organisms such as *Mycobacterium tuberculosis* contain _____ constructed from mycolic acids in their cell walls.
A. proteins
B. carbohydrates
C. lipids
D. peptidoglycan

ASM Objective: 02.02 Bacteria and Archaea have specialized structures (e.g. flagella, endospores, and pili) that often confer critical capabilities. ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

27. In the Gram-staining procedure, the primary stain is
A. iodine.
B. safranin.
C. crystal violet.
D. alcohol.

ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 1. Remember
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

28. In the Gram-staining procedure, the decolorizer is
A. iodine.
B. safranin.
C. crystal violet.
D. ethanol or acetone.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

29. In the Gram-staining procedure, the counterstain is
A. iodine.
B. safranin.
C. crystal violet.
D. alcohol.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

30. In the Gram-staining procedure, the mordant is
A. iodine.
B. safranin.
C. crystal violet.
D. alcohol.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

31. After the primary stain has been added but before the decolorizer has been used, gram-positive organisms are stained _____ and gram-negative organisms are stained _____.
A. purple; purple
B. purple; colorless
C. purple; pink
D. pink; pink

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

32. After the decolorizer has been added, gram-positive organisms are stained _____ and gram-negative organisms are stained _____.
A. purple; purple
B. purple; colorless
C. purple; pink
D. pink; pink

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

33. After the secondary stain has been added, gram-positive organisms are stained _____ and gram-negative organisms are stained _____.
A. purple; purple
B. purple; colorless
C. purple; pink
D. pink; pink

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

34. If the decolorizer is left on too long in the Gram-staining procedure, gram-positive organisms will be stained _____ and gram-negative organisms will be stained _____.
A. purple; blue
B. purple; colorless
C. purple; pink
D. pink; pink

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 3. Apply
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

35. If the decolorizer is not left on long enough in the Gram-staining procedure, gram-positive organisms will be stained _____ and gram-negative organisms will be stained _____.
A. purple; purple
B. purple; colorless
C. purple; pink
D. pink; pink

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 3. Apply
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

36. Which of the following is considered to be a differential staining procedure?
A. Gram stain.
B. Acid-fast stain.
C. both Gram stain and Acid-fast stain.
D. Leifson's flagella stain.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

37. Basic dyes such as methylene blue bind to cellular molecules that are
A. hydrophobic.
B. negatively charged.
C. positively charged.
D. aromatic.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

38. The Schaeffer-Fulton procedure is used to stain
A. flagella.
B. fat deposits.
C. endospores.
D. DNA of chromosomes.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

True / False Questions

39. Gram staining divides bacterial species into roughly two equal groups.
TRUE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

40. Negative staining facilitates the visualization of bacterial capsules which are intensely stained by the procedure.
FALSE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

41. Negative staining with India ink can be used to reveal the presence of capsules that surround bacterial cells.
TRUE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

42. Mordants increase the binding between a stain and specimen.
TRUE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

43. In order to stain flagella so that they may be readily observed by light microscopy, it is usually necessary to increase their thickness.
TRUE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Fill in the Blank Questions

44. The procedure in which a single stain is used to visualize microorganisms is called _____ staining.
simple

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

45. _____ is the process by which internal and external structures of cells and organisms are preserved and maintained in position.
Fixation

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.01 Recommend a fixation process to use when the microbe is a bacterium or archaeon and when the microbe is a protist Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

46. Thin films of bacteria that have been air-dried onto a glass microscope slide are called _____.
smears

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.03.01 Recommend a fixation process to use when the microbe is a bacterium or archaeon and when the microbe is a protist Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

47. A procedure that divides organisms into two or more groups depending on their individual reactions to the same staining procedure is referred to as _____ staining. **differential**

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.02 Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible
Section: 02.03
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Multiple Choice Questions

48. The Gram-staining procedure is an example of:
A. simple staining.
B. negative staining. **C.**
differential staining. D.
fluorescent staining.

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

True / False Questions

9. The Gram-staining procedure is widely used because it allows rapid identification of a microorganism with little additional testing.
FALSE

ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast). ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.03.03 Compare what happens to Gram-positive and Gram-negative bacterial cells at each step of the Gram-staining procedure Section: 02.03

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Multiple Choice Questions

50. Regions of a specimen with higher electron density scatter _____ electrons and, therefore, appear _____ in the image projected onto the screen of a transmission electron microscope.
A. more; lighter
B. more; darker
C. fewer; darker
D. fewer; lighter

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment. ASM Topic: Module 08 Microbiology Skills
Blooms Level: 2. Understand
Learning Outcome: 02.04.02 Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography Section: 02.04

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

True / False Questions

51. Because transmission electron microscopy uses electrons rather than light, it is not necessary to stain biological specimens before observing them.
FALSE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Evaluate light microscopy, electron microscopy, and scanning probe microscopy in terms of their uses, resolution, and the quality of the images create
Section: 02.04
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

52. Scanning electron microscopes bombard specimens with a stream of electrons; however, the specimen image is produce by electrons that are derived from atoms of the specimen itself rather than by the electrons used to bombard the specimen.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.04.02 Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography Section: 02.04

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

53. It was possible to view viruses only after the invention of the electron microscope because they are too small to be seen with a light microscope.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 3. Apply
Learning Outcome: 02.04.01 Create a concept map, illustration, or table that compares transmission electron microscopes (TEM) to light microscopes Section: 02.04
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Fill in the Blank Questions

54. An electron microscope uses _____ lenses to focus beams of electrons onto a specimen.
magnetic

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.04.01 Create a concept map, illustration, or table that compares transmission electron microscopes (TEM) to light microscopes Section: 02.04
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Multiple Choice Questions

55. Scanning electron microscopy is most often used to reveal
A. surface structures.
B. internal structures.
C. both surface and internal structures simultaneously.
D. either surface or internal structures, but not simultaneously.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.04.02 Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography Section: 02.04

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

56. Small internal cell structures are best visualized with a
A. light microscope.
B. dark-field microscope.
C. transmission electron microscope.
D. flagellar microscope.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.04.02 Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography Section: 02.04

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

57. In transmission electron microscopy, spreading a specimen out in a thin film with uranyl acetate, which does not penetrate the specimen, is called
A. freeze-etching.
B. simple staining.
C. shadow staining.
D. negative staining.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 08 Microbiology Skills
Blooms Level: 1. Remember
Learning Outcome: 02.04.02 Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography Section: 02.04

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

Fill in the Blank Questions

58. _____ breaks frozen specimens along lines of greatest weakness, often down the middle of lipid bilayer membranes so that they may be observed by transmission electron microscopy.
Freeze-etching

59. The _____ microscope is capable of atomic resolution of specimens, even when they are immersed in water.
Scanning tunneling

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 2. Understand
Learning Outcome: 02.05.01 Distinguish scanning tunneling from atomic force microscopes in terms of how they create images and their uses Section: 02.04

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

60. The designer of the first transmission electron microscope, _____, was awarded the 1986 Nobel Prize in physics.
Ernst Ruska

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
Blooms Level: 1. Remember
Section: 02.04

Multiple Choice Questions

61. Atomic force microscopes use a scanning probe that maintains a fixed distance from the surface of the specimen. It is useful for specimens that
A. do not conduct electricity well.
B. have extremely uneven surfaces.
C. both do not conduct electricity well and have extremely uneven surfaces are correct.
D. neither do not conduct electricity well nor have extremely uneven surfaces is correct.

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.05.01 Distinguish scanning tunneling from atomic force microscopes in terms of how they create images and their uses Section: 02.05

Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms

True / False Questions

62. Scanning tunneling electron microscopes create a three-dimensional image of specimens at atomic level resolution.
TRUE

ASM Objective: 08.05 Use appropriate microbiological and molecular lab equipment.
ASM Topic: Module 02 Structure and Function
Blooms Level: 2. Understand
Learning Outcome: 02.05.02 Evaluate light microscopy, electron microscopy, and scanning probe microscopy in terms of their uses, resolution, and the quality of the images create
Section: 02.05
Topic: Tools and Methods of Culturing, Classifying, and Identify Microorganisms