Prescott's Microbiology, 11e **(Willey)**
Chapter 2 Microscopy

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

Answer: focal point
Topic: Microscopy
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.01b Correlate lens strength and focal length

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

Answer: focal length
Topic: Microscopy
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.01b Correlate lens strength and focal length

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

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.01a Relate the refractive indices of glass and air to the path light takes when it passes through a prism or convex lens

4) 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

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.02a Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope

5) A 30× objective and a 20× ocular produce a total magnification of _____.
A) 230×
B) 320×
C) 50×
D) 600×

Answer: D
Topic: Microscopy
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.02a Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope

6) A 45× objective and a 10× ocular produce a total magnification of _____.
A) 900×
B) 55×
C) 450×
D) 145×

Answer: C
Topic: Microscopy
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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7) 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

Answer: D
Topic: Microscopy
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.02c 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

8) 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

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
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9) A substage condenser is used to focus light onto the specimen, which increases the resolution of a light microscope.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02a Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope

10) The _____ is the distance between the specimen and the objective lens when the specimen is in focus.

Answer: working distance
Topic: Microscopy
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02a Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope

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

Answer: wavelength
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.02b Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen

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

Answer: fluorochromes
Topic: Microscopy
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02c 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

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

Answer: 40×
Topic: Microscopy
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02a Evaluate the parts of a light microscope in terms of their contributions to image production and use of the microscope

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

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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15) 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.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02b Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen

16) Resolution improves when the wavelength of the illuminating light decreases.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02b Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen

17) Immersion oil is used to prevent a specimen from drying out.

Answer: FALSE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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18) 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.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02b Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen

19) Immersion oil increases the amount of light entering the objective lens.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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20) 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

Answer: C
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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21) 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

Answer: A
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.02c 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

22) 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

Answer: D
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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23) 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

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
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24) Prior to staining, smears of microorganisms must be heat-fixed in order to _____.
A) allow eventual visualization of internal structures
B) ensure removal of dust particles from the slide surface
C) attach them firmly to the slide
D) create small pores in cells that facilitates binding of stain to cell structures

Answer: C
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03a Recommend a fixation process to use when the microbe is a bacterium or archaeon and when the microbe is a protist

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

Answer: C
Topic: Mycobacteria
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 02 Cell Structure and Function
ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

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

Answer: C
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

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

Answer: D
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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28) In the Gram-staining procedure, the counterstain is _____.

A) iodine
B) safranin
C) crystal violet
D) alcohol

Answer: B
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

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

Answer: A
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

30) 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

Answer: A
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

31) 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

Answer: B
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

32) After the mordant 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

Answer: C
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

33) 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

Answer: D
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

34) 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

Answer: A
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

35) 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

Answer: C
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 5. Evaluate / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

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

Answer: B
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

37) Gram staining divides bacterial species into two groups based on differences in cell wall structure.

Answer: TRUE
Topic: Bacterial Cellular Morphology
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 02 Cell Structure and Function
ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

38) Negative staining facilitates the visualization of bacterial capsules that are intensely stained by the procedure.

Answer: FALSE
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 02 Cell Structure and Function
ASM Objective: 02.01 The structure and function of microorganisms have been revealed by the use of microscopy (including bright field, phase contrast, fluorescent, and electron).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

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

Answer: TRUE
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 02 Cell Structure and Function
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40) Mordants increase the binding between a stain and specimen.

Answer: TRUE
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

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

Answer: TRUE
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 02 Cell Structure and Function
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Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

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

Answer: simple
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

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

Answer: Fixation
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03a Recommend a fixation process to use when the microbe is a bacterium or archaeon and when the microbe is a protist

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

Answer: smears
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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45) 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.

Answer: differential
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

46) The Gram-staining procedure is an example of _____.
A) simple staining
B) negative staining
C) differential staining
D) fluorescent staining

Answer: C
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

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

Answer: FALSE
Topic: Identifying Microorganisms
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03b Plan a series of appropriate staining procedures to describe an unknown bacterium as fully as possible

48) 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

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.04b Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography

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

Answer: FALSE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.04a Create a concept map, illustration, or table that compares transmission electron microscopes (TEMs) to light microscopes

50) 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.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.04b Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography

51) 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.

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.04a Create a concept map, illustration, or table that compares transmission electron microscopes (TEMs) to light microscopes

52) An electron microscope uses _____ lenses to focus beams of electrons onto a specimen.

Answer: magnetic
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.04a Create a concept map, illustration, or table that compares transmission electron microscopes (TEMs) to light microscopes

53) 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

Answer: A
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
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54) Small internal cell structures are best visualized with a _____.
A) light microscope
B) dark-field microscope
C) transmission electron microscope
D) flagellar microscope

Answer: C
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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55) 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

Answer: D
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
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Learning Outcome: 02.04a Create a concept map, illustration, or table that compares transmission electron microscopes (TEMs) to light microscopes

56) _____ 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.

Answer: Freeze-etching
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
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57) The _____ microscope is capable of atomic resolution of specimens, even when they are immersed in water.

Answer: Scanning tunneling
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.05a Distinguish scanning tunneling from atomic force microscopes in terms of how they create images and their uses

58) The designer of the first transmission electron microscope, _____, was awarded the 1986 Nobel Prize in physics.

Answer: Ernst Ruska
Topic: History of Microbiology
Bloom's/Accessibility: 1. Remember / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.04a Create a concept map, illustration, or table that compares transmission electron microscopes (TEMs) to light microscopes

59) 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

Answer: A
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.05a Distinguish scanning tunneling from atomic force microscopes in terms of how they create images and their uses

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

Answer: TRUE
Topic: Microscopy
Bloom's/Accessibility: 2. Understand / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.05a Distinguish scanning tunneling from atomic force microscopes in terms of how they create images and their uses

61) If immersion oil was replaced with water, what would happen?
A) The refractive index would increase, improving resolution.
B) The refractive index of water would be greater than air but less than oil, improving resolution less than oil.
C) The refractive index of water would be less than that of air, decreasing resolution.
D) There would be no difference.

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.02b Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen

62) As the resolution of a microscope system improves, the size of the smallest object that can be seen clearly _____.
A) is larger.
B) is smaller.
C) is not affected.

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.02b Predict the relative degree of resolution based on light wavelength and numerical aperture of the lens used to examine a specimen

63) If you forgot to heat fix a smear before doing a Gram stain, which of the following might occur?
A) The stains would not adhere to the bacteria.
B) The smear may not adhere to the slide.
C) The decolorization step of the Gram stain would not work properly.
D) Gram-positive and Gram-negative bacteria would both stain purple.

Answer: B
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03a Recommend a fixation process to use when the microbe is a bacterium or archaeon and when the microbe is a protist

64) A specimen has been prepared for viewing with a transmission electron microscope, using uranyl acetate as a negative stain. The area stained by the uranyl acetate will be _____ electron dense compared to specimen itself.
A) more
B) less
C) equally

Answer: A
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.04b Decide when it would be best to examine a microbe by TEM, scanning electron microscopy (SEM), and electron cryotomography

65) If you forgot the decolorization step while performing a Gram stain, which outcome would you expect?
A) Gram-positive bacteria would stain pink
B) Gram-negative bacteria would stain purple
C) Gram-negative bacteria would be unstained
D) Gram-positive bacteria would be unstained

Answer: B
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

66) If you forgot to apply the safranin counterstain while performing a Gram stain, which outcome would you expect?
A) Gram-positive bacteria would stain pink.
B) Gram-negative bacteria would stain purple.
C) Gram-negative and Gram-positive bacteria would be unstained.
D) Gram-negative bacteria would be unstained.

Answer: D
Topic: Preparing Microscopy Specimens
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.03c Compare what happens to Gram-positive and Gram-negative bacterial cells during each step of the Gram-staining procedure

67) Which type of microscopy would be preferred for creating a three-dimensional view of the distribution and arrangement of flagella on a bacterial cell surface?
A) Bright-field microscopy
B) Scanning electron microscopy
C) Fluorescence microscopy
D) Transmission electron microscopy

Answer: B
Topic: Microscopy
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.05b Compare and contrast light microscopy, electron microscopy, and scanning probe microscopy in terms of their uses, resolution, and the quality of the images created

68) Which type of microscopy would be preferred for showing fine internal detail of the eukaryotic organelles?
A) Bright-field microscopy
B) Scanning electron microscopy
C) Fluorescence microscopy
D) Transmission electron microscopy

Answer: D
Topic: Microscopy
Bloom's/Accessibility: 4. Analyze / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.05b Compare and contrast light microscopy, electron microscopy, and scanning probe microscopy in terms of their uses, resolution, and the quality of the images created

69) You are researching the structure of a transmembrane protein. Which type of microscopy would provide you the best view of this protein?
A) Bright field microscopy
B) Scanning electron microscopy
C) Transmission electron microscopy
D) Atomic force microscopy

Answer: D
Topic: Microscopy
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.05b Compare and contrast light microscopy, electron microscopy, and scanning probe microscopy in terms of their uses, resolution, and the quality of the images created

70) If the strength of a lens is the reciprocal of its focal length ($^1/_f$), which of the following lenses will have the greatest strength?
A) A lens with a focal length of 1cm
B) A lens with a focal length of 100 mm
C) A lens with a focal length of 0.1 mm
D) A lens with a focal length of 1 mm

Answer: C
Topic: Microscopy
Bloom's/Accessibility: 3. Apply / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.01b Correlate lens strength and focal length

71) Glass has a greater refractive index than air. This means that _____.
A) the velocity of the light is slowed when it passes through the glass from the air
B) the velocity of the light accelerates when it passes through the glass from the air
C) the velocity of the light is slowed when it passes through the air from the glass
D) the light is bent away from the normal when passing through glass from air

Answer: A
Topic: Microscopy
Bloom's/Accessibility: 5. Evaluate / Keyboard Navigation
ASM Topic: Module 08 Microbiology Laboratory Skills
ASM Objective: 08.01 Properly prepare and view specimens for examination using microscopy (bright field and, if possible, phase contrast).
Learning Outcome: 02.01a Relate the refractive indices of glass and air to the path light takes when it passes through a prism or convex lens