

Student name: _____

1) 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.

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

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

- ☐ true
- ☐ false

4) Acid-fast organisms such as *Mycobacterium tuberculosis* contain _____ constructed from mycolic acids in their cell walls.

- A) proteins
- B) peptidoglycan

- C) carbohydrates
- D) lipids

5) _____ 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.

6) The Gram-staining

procedure is widely used because it allows rapid identification of a microorganism with little additional testing.

- Ⓐ true
- Ⓑ false

7) In transmission electron microscopy, spreading a specimen out in a thin film with uranyl acetate, which does

- A) simple staining
- B) shadow staining

not penetrate the specimen, is called _____.

- C) freeze-etching
- D) negative staining

8) 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) pink; pink
- D) purple; pink

9) An instrument that magnifies slight differences in the refractive index of cell structures is called a/an _____ microscope.

- A) phase-contrast
- B) densitometric

- C) fluorescence
- D) electron

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

- Ⓐ true
- Ⓑ false

11) 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
- ☐ false

12) 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) pink; pink

- C) purple; pink
- D) purple; colorless

13) Scanning electron microscopes bombard specimens with a stream of electrons; however, the specimen image is produced by electrons that are derived from atoms of the

specimen itself rather than by the electrons used to bombard the specimen.

- ☐ true
- ☐ false

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

15) 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 less than that of air,

decreasing resolution.

C) The refractive index of water would be greater than air but less than oil, improving resolution less than oil.

D) There would be no difference.

16) After the decolorizer has been added, Gram-positive organisms are stained _____ and Gram-negative

organisms are stained _____.

- A) purple; pink
- B) purple; purple

- C) pink; pink
- D) purple; colorless

17) 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; colorless
- B) purple; pink

- C) purple; purple
- D) pink; pink

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

19) Scanning electron microscopy is most often used to reveal _____.

- A) either surface or internal structures, but not simultaneously
- B) internal structures
- C) surface structures

D) both surface and internal structures simultaneously

20) 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

- ☐ true
- ☐ false

using light with a wavelength of 420 nm.

21) Because transmission electron microscopy uses electrons rather than light, it is not necessary to stain

- ☐ true
- ☐ false

biological specimens before observing them.

22) Confocal microscopes exhibit improved contrast and resolution by _____.

- A) illumination of a large area of the specimen
- B) use of light at longer wavelengths
- C) blocking out stray light with an aperture located

above the objective lens
D) use of ultraviolet light to illuminate the specimen

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

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

- 25) In the Gram-staining procedure, the mordant is _____.
A) safranin
B) crystal violet
C) iodine
D) alcohol
- 26) Gram staining divides bacterial species into two groups based on differences in cell wall structure.
☐ true
☐ false
- 27) The instrument that produces a bright image of the specimen against a dark background is called a/an _____.
A) electron
B) phase-contrast
C) bright-field
D) dark-field
- 28) 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 100 mm
B) A lens with a focal length of 1cm
C) A lens with a focal length of 0.1 mm
D) A lens with a focal length of 1 mm
- 29) The designer of the first transmission electron microscope, _____, was awarded the 1986 Nobel Prize in physics.

30) 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

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

☐ true

☐ false

32) Prior to staining, smears of microorganisms must be heat-fixed in order to _____.

A) allow eventual visualization of internal structures

B) create small pores in cells that facilitates binding of stain to cell structures

C) attach them firmly to the slide

D) ensure removal of dust particles from the slide surface

33) 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

A) equally

_____ electron dense compared to specimen itself.

B) less

C) more

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

☐ true

☐ false

35) Glass has a greater refractive index than air. This means that _____.

A) the velocity of the light is slowed when it passes through the air from the glass

B) the velocity of the light is slowed when it passes through the glass from the air

C) the light is bent away from the normal when

passing through glass from air

D) the velocity of the light accelerates when it passes through the glass from the air

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

☐ true

☐ false

37) The Gram-staining procedure is an example of _____.

A) differential staining

B) fluorescent staining

C) negative staining

D) simple staining

38) If you forgot to apply the safranin counterstain while performing a Gram stain, which outcome would you expect?

A) Gram-negative bacteria would stain purple.

B) Gram-positive bacteria would stain pink.

C) Gram-negative bacteria would be unstained.

D) Gram-negative and Gram-positive bacteria would be unstained.

- 39) In the Gram-staining procedure, the counterstain is _____.
- A) safranin
B) iodine
C) alcohol
D) crystal violet
- 40) 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) Gram-positive and Gram-negative bacteria would both stain purple.
C) The decolorization step of the Gram stain would not work properly.
D) The smear may not adhere to the slide.
- 41) In order to stain flagella so that they may be readily observed by light microscopy, it is usually necessary to increase their thickness.
- ⊙ true
⊙ false
- 42) In the Gram-staining procedure, the decolorizer is _____.
- A) iodine
B) safranin
C) ethanol or acetone
D) crystal violet
- 43) 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

44) If you forgot the decolorization step while performing a Gram stain, which outcome would you expect?

- A) Gram-positive bacteria would be unstained
- B) Gram-negative bacteria would be unstained
- C) Gram-positive bacteria would stain pink

D) Gram-negative bacteria would stain purple

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

46) In the Gram-staining procedure, the primary stain is _____.

- A) alcohol
- B) iodine

- C) safranin
- D) crystal violet

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

48) 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
- Ⓑ false

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

⊙ true

⊙ false

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

51) A 30× objective and a 20× ocular produce a total magnification of _____.

- A) 50×
- B) 600×

- C) 320×
- D) 230×

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

53) Small internal cell structures are best visualized with a _____.

- A) transmission electron microscope
- B) flagellar microscope

- C) dark-field microscope
- D) light microscope

54) Which of the following is considered to be a differential staining procedure?

- A) Gram stain
- B) Acid-fast stain
- C) Leifson's flagella stain

- D) Both Gram stain and Acid-fast stain

55) 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; lighter
- D) fewer; darker

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

57) 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) neither optical density nor refractive index
- B) refractive index

- C) optical density
- D) optical density and refractive index

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

- Ⓐ true
- Ⓑ false

59) Mordants increase the binding between a stain and specimen.

- Ⓐ true
- Ⓑ false

- 60) After the mordant has been added, Gram-positive organisms are stained _____ and Gram-negative organisms are stained _____.
A) pink; pink
B) purple; purple
C) purple; pink
D) purple; colorless
- 61) A 45× objective and a 10× ocular produce a total magnification of _____.
A) 450×
B) 900×
C) 145×
D) 55×
- 62) 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) scanning electron
B) phase-contrast
C) dark-field
D) fluorescence
- 63) Immersion oil is used to prevent a specimen from drying out.
Ⓐ true
Ⓑ false
- 64) The special dyes used in fluorescence microscopy that absorb light at one wavelength and emit light at a different wavelength are called _____.

A) negatively charged
B) hydrophobic

C) positively
charged
D) aromatic

Answer Key

Microbiology ,
Willey 2th ch2

Test name: Prescotts Principles of

- 1) differential
- 2) magnetic
- 3) TRUE
- 4) D
- 5) Freeze-etching
- 6) FALSE
- 7) D
- 8) A
- 9) A
- 10) TRUE
- 11) TRUE
- 12) B
- 13) TRUE
- 14) working distance
- 15) C
- 16) D
- 17) C
- 18) 40x

- 19) C
- 20) TRUE
- 21) FALSE
- 22) C
- 23) B
- 24) Fixation
- 25) C
- 26) TRUE
- 27) D
- 28) C
- 29) Ernst Ruska
- 30) B
- 31) TRUE
- 32) C
- 33) C
- 34) FALSE
- 35) B
- 36) TRUE
- 37) A
- 38) C
- 39) A

- 40) D
- 41) TRUE
- 42) C
- 43) C
- 44) D
- 45) focal point
- 46) D
- 47) wavelength
- 48) TRUE
- 49) TRUE
- 50) focal length
- 51) B
- 52) simple
- 53) A
- 54) D
- 55) B
- 56) smears
- 57) B
- 58) TRUE
- 59) TRUE
- 60) C

61) A

62) D

63) FALSE

64) fluorochromes

65) A