

Exam

Name _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) Which of the following is not a microorganism?

- A) archaea B) helminth C) mosquito D) fungi E) bacteria

Answer: C

2) When do opportunistic pathogens tend to cause disease?

- A) when the host didn't wash with soap
B) when the host is weakened
C) when the host is old
D) after the host is already infected with a different pathogen
E) when the host is young

Answer: B

3) Which of the following could be used as evidence for spontaneous generation?

- A) Flies lay eggs that develop into maggots.
B) Gauze-covered meat will not give rise to maggots.
C) Uncovered meat will give rise to maggots.
D) The broth in Pasteur's S-necked flasks did not spoil.
E) Shaking Pasteur's S-necked flasks did spoil the broth.

Answer: C

4) _____ showed that biogenesis is responsible for the propagation of life.

- A) Antonie van Leeuwenhoek
B) Carl Linnaeus
C) Louis Pasteur
D) Robert Hooke
E) Joseph Lister

Answer: C

5) Robert Koch helped establish the germ theory of disease by discovering that anthrax was caused by a disease. After he isolated and purified the same bacteria from several diseased animals, what would be the next step in order to show that this bacteria caused anthrax?

- A) find out if antibiotics treat the diseased animals
B) perform physiological testing
C) culture the bacteria on Petri dishes
D) introduce the bacteria into a new mouse to see if it established the same infection
E) visualize the bacteria with an electron microscope

Answer: D

6) How many principles are there in Koch's postulates of disease?

- A) 1 B) 2 C) 3 D) 4 E) 5

Answer: D

- 7) Aseptic technique can be used for all of the following except
- A) safely studying microbes in the laboratory.
 - B) sterilizing working surfaces.
 - C) limiting the spread of diseases.
 - D) keeping samples pure for studying.
 - E) preventing healthcare-acquired infections.

Answer: B

- 8) Which of the following individuals does not correctly match with their contribution to microbiology.
- A) Ignaz Semmelweis: First developed aseptic techniques to decrease mortality rates from childbed fever
 - B) Robert Koch: Developed criteria for determining the causative agent of an infectious disease
 - C) Joseph Lister: Developed the first anesthetic solution for use in surgeries
 - D) Louis Pasteur: Showed that biogenesis is responsible for the propagation of life
 - E) Florence Nightingale: Established the use of aseptic techniques in nursing practices

Answer: C

- 9) The scientific method starts with a(n)
- A) observation.
 - B) prediction.
 - C) question.
 - D) hypothesis.
 - E) proposal.

Answer: C

- 10) Inference-observation confusion occurs when someone
- A) incorrectly assesses a patient.
 - B) remembers events wrong.
 - C) lies about what happened.
 - D) jumps to a conclusion.
 - E) cannot understand your accent.

Answer: D

- 11) _____ predict what happens, while _____ explain how and why something occurs.
- A) Theories; laws
 - B) Observations; hypotheses
 - C) Observations; conclusions
 - D) Hypotheses; conclusions
 - E) Laws; theories

Answer: E

- 12) Which of the following is the correct way to type a scientific name?
- A) *escherichia coli*
 - B) *Escherichia coli*
 - C) Escherichia Coli
 - D) *escherichia coli*
 - E) *Escherichia coli*

Answer: E

- 13) What is the order of the taxonomic hierarchy from least specific to most specific?
- A) domain, phylum, order, kingdom, class, family, genus, species
 - B) domain, kingdom, phylum, class, order, family, genus, species
 - C) domain, order, class, kingdom, phylum, species, family, genus
 - D) class, order, phylum, kingdom, domain, genus, family, species
 - E) species, genus, order, family, class, phylum, kingdom, domain

Answer: B

14) All of the following are reasons to classify a new strain of bacteria except

- A) 50% different genetic material.
- B) take up genetic material from their environment.
- C) mutations.
- D) genetic variant.
- E) gene transfers.

Answer: A

15) Why can't prokaryotic species be defined as a group of similar organisms that could sexually reproduce together?

- A) The mating rituals of bacteria have not been studied enough.
- B) Bacteria are all too different to be considered similar.
- C) We can't see them in enough detail to tell how similar they really are yet.
- D) Bacteria reproduce asexually.
- E) They can be.

Answer: D

16) Normal microbiota are responsible for all of the following except

- A) producing vitamins for us.
- B) controlling epigenetic expression.
- C) impacting our moods and brain functions.
- D) training our immune system.
- E) helping us digest foods.

Answer: B

17) Which of the following does not contribute to shifts in our normal microbiota?

- A) proper hand-washing technique
- B) age
- C) diet
- D) hormonal changes
- E) our general environment

Answer: A

18) Microbes and humans have evolved a variety of _____ relationships, including _____ where microbes help the host.

- A) symbiotic; mutualism
- B) dynamic; commensalism
- C) symbiotic; commensalism
- D) commensal; mutualism
- E) symbiotic; parasitism

Answer: A

19) Carriers of the sickle-cell gene

- A) are often found in high concentrations in U.S. cities.
- B) experience painful changes in nerve cell shape.
- C) are more likely to die from a malaria infection.
- D) have a survival advantage in areas where malaria is common.
- E) are more susceptible to contracting malaria.

Answer: D

20) Which of the following is true about bioremediation?

- A) Coagulators are used to condense the spill.
- B) Bioremediation never harms the environment.
- C) The Environmental Protection Agency documents a handful of chemical spills per year in the United States alone.
- D) A mix of bacteria, archaea, and fungi species is used to seed the spill zone.
- E) Nitrogen, sulfur, phosphate, and sometimes iron supplements are added to the spill zone to encourage microbial growth.

Answer: E

21) All of the following are or can be produced by microbes except

- A) biofuels like diesel.
- B) drugs like penicillin.
- C) food like chocolate.
- D) consumer products like biodegradable plastics.
- E) electronics like computer memory.

Answer: E

22) All of the following involve biofilms except

- A) inner ear infections.
- B) kidney stones.
- C) conjunctivitis.
- D) endocarditis.
- E) atherosclerosis.

Answer: C

23) _____ bacteria can create sticky communities called _____, which are made up of single or diverse microbial species.

- A) Planktonic; biofilms
- B) Plaque; hangouts
- C) Pathogenic; quorums
- D) Infectious; flora
- E) Matrix; cavities

Answer: A

24) Which of the following statements is true?

- A) Picking which type of media format to use depends only on the space available.
- B) Picking which type of media to use depends on how much money you willing to spend.
- C) Scientists were not able to grow bacteria in the lab until the creation of the Petri dish.
- D) Media for bacterial growth only comes in a few varieties.
- E) Agar is used as a solidifying agent for bacterial culture.

Answer: E

25) When practicing aseptic culturing techniques, it is important to keep all of the following in mind except

- A) the media used to grow the specimen is sterile.
- B) as long as nothing unintended touches the media, there will be no contamination.
- C) all of the instruments and lab ware that directly touch the specimen is sterile.
- D) gloves and other protecting clothing may be required depending on the specimen being used.
- E) surrounding surfaces are decontaminated before and after handling cultures.

Answer: B

- 26) A biological safety cabinet minimizes the chances of contaminating cultures by all of the following except
- A) maintaining a specific flow of filtered air.
 - B) readily being decontaminated using UV light.
 - C) limiting access to inside the cabinet.
 - D) regular surface cleaning with an antimicrobial solution.
 - E) consistent flame sterilization on the inside surfaces.

Answer: E

- 27) The goal of the streak plate technique is to
- A) compare how the shape, color and margin differ in colonies from a pure culture.
 - B) spread out a thick layer of bacteria and isolate the bacteria that outcompete the rest.
 - C) visualize all of the colonies on a plate from a pure culture.
 - D) compare all of the colonies on a plate with a mixed culture.
 - E) isolate a pure culture for study from a single colony.

Answer: E

- 28) Which of the following can be determined using simple stains?
- A) the presence of capsules
 - B) size and shape
 - C) size, shape and cellular arrangement
 - D) the number and position of flagella
 - E) the presence of endospores

Answer: C

- 29) All of the following can make interpreting the Gram stain difficult except
- A) testing bacteria that are forming endospores.
 - B) the culture is between 24 and 48 hours old.
 - C) testing bacteria with especially resistant cell walls.
 - D) testing bacteria that have a waxy cell wall.
 - E) the culture is more than 48 hours old and contains damaged cells.

Answer: B

- 30) The acid-fast stain is an important diagnostic tool for detecting the causative agent(s) of
- A) malaria.
 - B) plague.
 - C) gonorrhea.
 - D) Lyme disease and necrotizing fasciitis.
 - E) tuberculosis and leprosy.

Answer: E

- 31) Which of the following statements is true about the decolorizing step for the acid-fast stain?
- A) The decolorizing step is the differentiating step.
 - B) Because acid-fast bacteria have a waxy cell wall that resists decolorization by the acetone-alcohol rinse, they appear a deep blue at the end of the procedure.
 - C) Over-decolorizing can lead to false-positive results.
 - D) Non-acid-fast bacteria appear bright pink-red at the end of the procedure.
 - E) Acetone-alcohol solution is the decolorizing agent.

Answer: A

- 32) Which of the following statements about bright field microscopy are true?
- A) Bright field microscopy is great for seeing living samples.
 - B) Bright field microscopy has the sample appear as a brighter contrasting image on a dark background.
 - C) Dark field, phase contract, and differential interference contract microscopy are better for observing dead samples.
 - D) Bright field microscopy is the simplest and most common form of microscopy.
 - E) Bright field microscopy is able to see specimens without natural coloration.

Answer: D

- 33) Which of the following statements is false?
- A) Immersion oil is used to get a better resolution at high-power magnifications.
 - B) Immersion oil has a lower refractive index than the glass slide to help increase sample clarity.
 - C) Resolution is the ability to distinguish two distinct points as separate.
 - D) Immersion oil channels as much light as possible up through the objective lens instead of being bent.
 - E) Ultimately, the resolving power of bright field microscopes is limited by the wavelength of visible light.

Answer: B

- 34) Which of the following statements is false?
- A) Fluorochromes can be natural or synthetic.
 - B) Scanning electron microscopy provides information about surface structures.
 - C) Fluorescence microscopy is when fluorochromes stain a sample so it will fluoresce when exposed to UV light.
 - D) Immunofluorescence is when fluorochromes bind to a specific target and fluoresce after exposure to UV light.
 - E) Transmission electron microscopy provides information about internal structures.

Answer: D

- 35) Why do electron microscopes have a better resolution versus light microscopes?
- A) The lenses, knobs, and strength of the electron beam can all be highly controlled, which also explains why electron microscopes are so expensive.
 - B) An electron beam has a wavelength of about 800 nm, and resolution improves with larger wavelengths.
 - C) An electron beam has a wavelength of about 1 nm, and resolution improves with smaller wavelengths.
 - D) The additional steps necessary to prepare the sample for viewing provide the improved resolution.
 - E) The lenses used to focus the electron beam are more adjustable than the ones in a light microscope.

Answer: C

TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

- 36) Robert Hooke refined earlier versions of the microscope and became the first to see bacteria.

Answer: True False

- 37) Florence Nightingale investigated processes for aseptic surgery and her work in the 1860s proved that sterilizing instruments, and sanitizing wounds with carbolic acid encouraged healing and prevented pus formation.

Answer: True False

- 38) Only a small minority of microbes are human pathogens.

Answer: True False

- 39) Proper hand-washing technique can remove normal microbiota.

Answer: True False

40) Biofilms allow microbes to coordinate responses within an environment, making the community much more durable than single free-floating bacteria.

Answer: True False

41) Fixation adheres the sample to the slide, so that it is not as easily washed away during the staining process, but does not kill most of the cells in the specimen so that they can be clearly viewed.

Answer: True False

42) Simple staining techniques use one dye.

Answer: True False

43) Knowing the Gram property of a specimen has important clinical implications, including potential pathogenic features of the organism, and what antibiotics might be most effective in combating it.

Answer: True False

ESSAY. Write your answer in the space provided or on a separate sheet of paper.

44) Explain the differences between a hypothesis, law, and theory.

Answer: A hypothesis is based on prior experience or observation, and is proposed as a potential answer to a specific question. A law is a precise statement, or mathematical formula, that predicts a specific occurrence. Laws only hold true under carefully defined and limited circumstances. By contrast, a theory is a hypothesis that has been proven through many studies with consistent, supporting conclusions. Laws predict what happens, while theories explain how and why something occurs. Unlike a hypothesis, which focuses on a specific problem, theories are comprehensive bodies of work that are useful for making generalized predictions about natural phenomena. Theories unite many different hypotheses and laws.

45) Explain how disruptions in normal microbiota can lead to infections.

Answer: When an antibiotic is used, it may kill many types of benign resident bacteria along with the pathogen being targeted. With normal microbiota reduced, opportunistic pathogens are able to establish infections. A common example of this is when a woman takes antibiotics to treat a urinary tract infection (UTI), only to develop a vaginal yeast infection soon after the antibiotic therapy concludes. The yeast *Candida albicans* is an opportunistic pathogen that is usually present in the vagina. Its growth is kept in check by the normal microbiota of the vagina. Thus, when the vaginal normal microbiota is disrupted, the yeast has an opportunity to thrive and cause symptoms. Similarly, diarrhea is a common side effect of antibiotic therapies, likely due to how our gut microbiome is affected.

46) Explain the differences between basic and acidic dyes and how they are used.

Answer: Basic dyes are mildly basic on the pH scale. Being basic means they are positively charged, resulting in the stain being attracted to the negatively charged cell surface of microbes and easily entering cells. Frequently used basic dyes include methylene blue, crystal violet, safranin, and malachite green. Occasionally acidic dyes, such as nigrosin or India ink, are also used. Acidic dyes are negatively charged, so they do not easily enter cells. They stain the background of a specimen in a technique called negative staining. An advantage of negative staining is that it doesn't require heating or chemical fixation, and the dye is not absorbed by the sample. This means the sample has a more true-to-life appearance, with fewer distortions of delicate cellular features.