

INTRODUCTION TO MICROBIOLOGY REVIEW QUESTIONS

MATCHING

Match the following terms with the correct definition

- _____ 1. Infection
- _____ 2. Infectious disease
- _____ 3. Opportunistic infection
- _____ 4. Nosocomial infection
- _____ 5. Colonization

- a. Condition associated with functional and structural harm to the host, accompanied by signs and symptoms
- b. Infection in an immunocompromised host that does not cause infection in an immunocompetent individual
- c. Infection acquired in a health care setting
- d. Presence and multiplication of a microorganism in a host with no clinical signs of infection
- e. Entrance and multiplication of a microorganism in a host

MULTIPLE CHOICE

6. All the following sites contain normal flora except:

- a. Oral cavity
- b. Skin
- c. Colon
- c. Herpes simplex virus and Treponema pallidum
- d. Plasmodium and Borrelia

10. Which of the following organisms are spread through arthropod vectors?

- a. N. meningitidis and S. pyogenes
- b. Salmonella and Shigella
- c. Herpes simplex virus and T. pallidum
- d. Plasmodium and Borrelia

d. Cerebrospinal fluid

7. Which of the following is not classified as a direct route of infection?

- a. Ingestion of contaminated food or water
- b. Sexual contact
- c. Hand-to-hand contact
- d. Congenital contact

8. Droplet infection through contact with infectious respiratory secretions may be described as:

- a. Inhalation of infectious aerosols during laboratory procedures
- b. Transmission of rhinovirus through failing to wash hands
- c. Spread of respiratory viruses and Streptococcus pyogenes through coughing or sneezing

d. Inhalation of bacteria or viruses that have dried on bedding or clothing

9. Which of the following organisms are typically spread through the ingestion of contaminated food or water?

- a. Neisseria meningitidis and S. pyogenes
- b. Salmonella and Shigella

11. Innate, or natural, immunity involves which of the following mechanisms?

- a. Mucus and cilia in the respiratory tract that help to trap and clear microorganisms
- b. Humoral immunity
- c. Cell-mediated immunity
- d. Immunity resulting from vaccination

12. The movement of neutrophils and monocytes from the blood to injured tissue is known as:

- a. Diapedesis
- b. Chemotaxis

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- c. Ingestion
d. Hematopoiesis
13. Antibody-producing white blood cells are:
a. Macrophages
b. Neutrophils
c. T lymphocytes
d. B lymphocytes
14. Which of the following cells play a major role in cell-mediated immunity?
a. Macrophages
b. Neutrophils
c. T lymphocytes
d. B lymphocytes
15. The immunoglobulin found in the highest concentration in normal serum is:
a. IgA
b. IgD
c. IgE
d. IgG
e. IgM
16. Which of the following immunoglobulins is involved mainly in the primary immune response?
a. IgA
b. IgD
c. IgE
d. IgG
e. IgM
17. Gram-negative bacteria contain _____, which are not found in gram-positive bacteria.
a. Capsules
b. Periplasmic space and outer membrane
c. Teichoic acids
d. Cross-linked peptidoglycan
18. Which of the following is true for bacterial cells?
a. The DNA is contained within a nuclear membrane.
b. Their mitochondria, Golgi bodies, and endoplasmic reticulum are present in the cytoplasm.
c. The DNA is found in the nucleoid.
d. The ribosomes are 80S.
19. The _____ are important for motility of the bacterial cell.
a. pili
b. capsules
c. flagella
d. LPS
20. Phenotypic properties used to classify bacteria include all of the following except:
a. DNA relatedness
b. Colonial morphology
c. Biochemical properties
d. Antibiotic resistance patterns

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MULTIPLE CHOICE

1. An infection that may occur as a result of accidental needlesticks or through broken glass is classified as which of the following routes?

- a. Airborne
- b. Ingestion
- c. Direct inoculation
- d. Mucous membrane contact

2. Standard precautions state:

- a. Handle only known HBV-positive or HIV-positive specimens as infectious.
- b. Personal protective equipment is required for only direct patient contact.
- c. Blood and body fluid precautions must be observed for all patients' blood and body fluid specimens.
- d. Infectious specimens must be labeled with the biohazard symbol.

3. The Biosafety Level that includes most common laboratory microorganisms and involves organisms such as HBV, HIV, and enteric pathogens is:

- a. BSL 1
- b. BSL 2
- c. BSL 3
- d. BSL 4

4. Which of the following biological safety cabinets sterilize both the air entering and leaving the cabinet and utilize a HEPA filter?

- a. Class I
- b. Class II
- c. Class III
- d. Class IV

5. Autoclave standards for decontamination of most microbiological materials are:

- a. 100°C at 15 psi for 45 minutes
- b. 121°C at 15 psi for 45 minutes
- c. 121°C at 15 psi for 60 minutes

d. 100°C at 10 psi for 60 minutes

6. Which germicide is intended to destroy all microorganisms and their spores on inanimate surfaces?

- a. Sterilizer
- b. Disinfectant
- c. Antiseptic
- d. Antibiotic

7. Which of the following types of hazardous chemicals causes serious biological effects following inhalation, ingestion, or skin contact with even small amounts?

- a. Corrosive
- b. Toxic
- c. Carcinogenic
- d. Ignitable e. Explosive

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Match the medium with its classification (some responses may be used more than once):

1. Modified Thayer-Martin agar
 2. Colistin-nalidixic acid agar
 3. MacConkey agar
 4. Hektoen enteric agar
 5. Blood agar
 6. Eosin-methylene blue agar
 7. Chocolate agar
-
- a. Enriched, nonselective
 - b. Differential recovery of gram-negative bacilli
 - c. Selective for fecal pathogens
 - d. Antibiotic, selects for gram-positive bacteria
 - e. Antibiotic, selects for pathogenic Neisseria

MULTIPLE CHOICE

8. Complete hemolysis of blood is known as:
 - a. α -hemolysis
 - b. β -hemolysis
 - c. γ -hemolysis
 - d. Synergistic hemolysis
9. The specimen of choice for bacterial culture of urine is a:
 - a. Clean-catch midstream
 - b. Catheterized sample
 - c. Suprapubic
 - d. Routine void
10. The optimal wound specimen for culture of anaerobic organisms should be:
 - a. A swab of lesion obtained before administration of antibiotics
 - b. A swab of lesion obtained after administration of antibiotics
 - c. A syringe filled with pus obtained before administration of antibiotics

d. A syringe filled with pus obtained after administration of antibiotics

11. A throat swab is submitted for anaerobic culture.

This specimen should be:

- a. Set up immediately
- b. Rejected
- c. Inoculated into thioglycollate broth
- d. Sent to a reference laboratory

12. A spinal fluid specimen is submitted for Gram stain and culture during an afternoon shift. The physician also requests that an aliquot be saved for possible serological studies, which are performed only on day shift. The most correct action is:

- a. Inoculate culture, perform a Gram stain, and refrigerate remaining spinal fluid
- b. Inoculate culture, perform a Gram stain, and incubate remaining spinal fluid at 35°C to 37°C
- c. Incubate entire specimen at 35°C to 37°C and perform culture and Gram stain the next day
- d. Refrigerate entire specimen and perform culture and Gram stain the next day

13. The general guidelines for collection of blood cultures state:

- a. Disinfect skin with an alcohol swab only.
- b. Large amounts of bacteria are required to cause bacteremia.
- c. Two to three sets per 24 hours are usually sufficient to diagnose bacteremia.
- d. One specimen per 24 hours is sufficient to diagnose bacteremia.

14. Prompt delivery of specimens for microbiology is essential for accurate culture workup. Which of the following is not a consequence of delay in specimen delivery?

- a. Normal flora may overgrow pathogen.
- b. Fastidious organisms may no longer be viable.
- c. Swabs may dry out, resulting in loss of pathogens

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- d. Normal flora may no longer be isolated.
15. Optimal collection time to diagnose gastrointestinal infection caused by bacterial or viral pathogens is:
- a. Anytime during the course of the illness
 - b. During the acute stage of the illness
 - c. During the convalescent stage of the illness
 - d. Through collection of serum to identify type-specific antibodies
16. Which of the following is not considered to be a sterile site?
- a. Blood
 - b. Urinary bladder
 - c. Spinal fluid
 - d. Oral cavity
17. An abdominal abscess specimen received in the laboratory produced abundant growth when grown anaerobically but produced no growth when the culture plates were incubated aerobically. This culture contains:
- a. An obligate aerobe
 - b. An obligate anaerobe
 - c. A facultative anaerobe
 - d. None of the above
18. The optimal time to collect blood cultures is:
- a. Shortly before the fever spikes
 - b. While the fever spikes
 - c. Shortly after the fever spikes
 - d. No more than one set daily
19. Most pathogenic bacteria prefer an incubation temperature of:
- a. 30°C to 32°C
 - b. 33°C to 35°C
 - c. 35°C to 37°C
 - d. 42°C to 45°C
20. Those bacteria that prefer growth under increased CO₂ are known as:
- a. Mesophiles
 - b. Microaerophiles
 - c. Capnophilic
 - d. Facultative anaerobes
21. Which of the following should be monitored as part of the quality-control program in the microbiology laboratory?
- a. Temperature of incubators and refrigerators
 - b. Plating media with known positive and negative controls
 - c. Oxygen content and CO₂ content of incubators
 - d. All the above
22. The catalase test is useful in differentiation of:
- a. *E. coli* from other Enterobacteriaceae
 - b. β -hemolytic streptococcus
 - c. Differentiation of *Staphylococcus* from *Streptococcus*
 - d. Identification of *Staphylococcus aureus*

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Match the direct method of examination with its purpose:

1. Iodine mount
2. Nigrosin
3. Potassium hydroxide preparation
4. Hanging drop

- a. Motility
- b. Fungal elements
- c. Parasitic nuclei
- d. Capsules

MULTIPLE CHOICE

5. The oil-immersion objective provides a total specimen magnification of:

- a. 10X
- b. 100X
- c. 450X
- d. 1,000X

6. The higher the numerical aperture, the lower the resolving power of the microscope.

- a. True
- b. False

7. The function of the _____ is to gather and focus light rays on the specimen.

- a. Objective
- b. Iris diaphragm
- c. Condenser
- d. Ocular

8. Darkfield microscopy is most often used to study:

- a. Fungi
- b. Mycobacteria
- c. Parasitic nuclei
- d. Spirochetes

9. The typical morphology of Staphylococcus is:

- a. Cocci in chains
- b. Cocci in clusters
- c. Filamentous bacilli
- d. Coccibacilli

10. In the Gram stain technique, Gram's iodine functions as the:

- a. Primary stain
- b. Mordant
- c. Decolorizer
- d. Counterstain

11. Gram-positive bacteria stain blue to purple.

- a. True
- b. False

12. The dye used to stain Mycobacterium is:

- a. Methylene blue
- b. Crystal violet
- c. Carbol-fuchsin
- d. Iodine

13. Which of the following is not used to stain fungal mycelium?

- a. Calcofluor white
- b. Lactophenol cotton blue
- c. Carbol-fuchsin
- d. Periodic acid-Schiff

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MULTIPLE CHOICE

1. The automated principle that utilizes a spectrophotometer to detect changes in color is:

- a. Colorimetry
- b. Nephelometry
- c. Turbimetry
- d. Fluorometry

2. Which of the following is not a fully automated identification system for microbiology?

- a. MicroScan
- b. VITEK
- c. Enterotube
- d. Phoenix

3. Which of the following systems uses nephelometry for the identification of microorganisms?

- a. Phoenix
- b. VITEK
- c. MicroScan
- d. None of the above

4. To detect antibody production to a particular infectious agent, the acute phase specimen should be collected:

- a. When the disease is first suspected
- b. When the disease is first diagnosed
- c. While the patient is recovering
- d. While the patient is relapsing

5. An acute phase specimen for the detection of antibody to cytomegalovirus yielded a titer of 1:8. The convalescent phase specimen yielded a titer of 1:32. This is diagnostic for a current infection of cytomegalovirus.

- a. True
- b. False

6. Febrile agglutinins are an example of _____, in which bacterial antigens aggregate in the presence of the corresponding antibody.

- a. Coagglutination
- b. Direct agglutination
- c. Indirect agglutination
- d. Flocculation

7. The procedure that detects the production of antibody blocking the actions of a microorganism is:

- a. Coagglutination
- b. Counterimmunoelectrophoresis
- c. Enzyme-linked immunosorbent assay
- d. Neutralization

8. In enzyme-linked immunosorbent assay:

- a. Antibody or antigen is bound to an enzyme, which catalyzes a reaction
- b. Noncompetitive techniques can detect antigen or antibody
- c. Substrates for reaction include horseradish peroxidase and nitrophenyl phosphate
- d. All the above

9. Indirect fluorescent antibody techniques:

- a. Can detect only antigen
- b. Use both an unlabeled antibody and labeled antibody
- c. Are not very sensitive detection methods
- d. Cannot be quantitated

10. The interaction between single-stranded nucleic acid molecules to form a double-stranded molecule is known as:

- a. Blotting
- b. Hybridization
- c. Denaturation
- d. A DNA probe

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11. The molecular method that involves the synthetic amplification of a known DNA sequence using several denaturation and polymerization cycles is known as:

- a. Southern blot
- b. DNA hybridization
- c. Polymerase chain reaction
- d. DNA cloning

12. An example of a particle agglutination test is:

- a. Latex agglutination
- b. Enzyme linked immunoassay
- c. Nephelometry
- d. Double immunoelectrophoresis

13. The first step in polymerase chain reaction is:

- a. Extension of the primer
- b. Denaturation of the nucleic acid
- c. Annealing
- d. None of the above

14. Which of the following uses two or more primer pairs that amplify different targets in the same reaction mix?

- a. Nested PCR
- b. Reverse transcriptase PCR
- c. Multiplex PCR
- d. Real-time PCR

15. In _____, amplification and product detection occur in the same reaction vessel, and target nucleic acid is detected by fluorescent probes as the hybrids form.

- a. Nested PCR
- b. Reverse transcriptase PCR
- c. Multiplex PCR
- d. Real-time PCR

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Match the antibiotic with its most correct description:

1. Penicillin G
2. Ampicillin
3. Erythromycin
4. Amoxicillin/clavulanate potassium
5. Cephalothin
6. Cefotaxime
7. Tobramycin
8. Tetracycline
9. Trimethoprim/sulfamethoxazole
 - a. Extended-spectrum penicillin with no activity against β -lactamase producers
 - b. Penicillin codrug with broad-spectrum activity and resistance to β -lactamase
 - c. Third-generation cephalosporin with enhanced activity against gram-negative bacteria
 - d. Used for gram-positive infections, in particular nonenterococcal Streptococcus infections
 - e. Aminoglycoside used to treat serious gram-negative infections, including Pseudomonas
 - f. Folic acid inhibitor used to treat chronic urinary tract infections
 - g. Gram-positive spectrum, used to treat streptococcal infections in penicillin-allergic patients
 - h. First-generation cephalosporin with primarily a gram-positive spectrum
 - i. Broad-spectrum antibiotic with activity against gram-positive and gram-negative bacteria, mycoplasmas, and chlamydia

MULTIPLE CHOICE

For questions 10 to 15, mark "A" if the antimicrobial agent functions by inhibition of cell wall synthesis, and mark "B" if the agent functions by inhibition of protein synthesis:

10. Penicillin G
11. Cephalosporins
12. Ampicillin

13. Tetracycline
14. Erythromycin
15. Chloramphenicol

16. Antimicrobial agents that kill the microbe, leading to cell lysis, are categorized as:

- a. Bacteriostatic
- b. Bacteriocidal
- c. Narrow-spectrum antibiotics
- d. Super antibiotics

17. Which of the following is an antiviral agent?

- a. Amphotericin B
- b. Acyclovir
- c. Isoniazid
- d. Nystatin

18. If the interaction of two antibiotics results in activity that is significantly greater than the response from the combined action of each drug used separately, the response is termed:

- a. Autonomous
- b. Antagonistic
- c. Additive
- d. Synergistic

For questions 19 through 23, consider each of the following parameters in performing a Kirby-Bauer disk susceptibility test. Indicate if the parameter is correct (C) or incorrect (I):

19. Depth of media: 6.0 mm
20. pH of media: 7.2 to 8.4
21. Type of media: trypticase soy agar
22. Inoculum concentration: 0.5 McFarland turbidity standard
23. Incubation at 35°C at increased CO₂ for 18 to 24 hours

24. In a Kirby-Bauer disk susceptibility test, the zones of inhibition are too large. Which of the following is a possible cause of this result?

- a. Inoculum too dense

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- b. Agar depth too thick
- c. Incubation temperature too low
- d. Antibiotic not stored at proper temperature without desiccant

Use the following information for questions 25 to 27:

In a microtube (macrobroth) dilution susceptibility test, 1.0 ml of Mueller-Hinton (MH) broth is pipetted into tubes 2 through 10, tube 11, and tube 13. Two milliliters of MH broth is pipetted into tube 12; 1.0 ml of 200 mg/dl ampicillin is added to tubes 1, 2, and 13. A twofold serial dilution is performed in 1.0 ml amounts in tubes 2 through 10. The standardized inoculum is diluted 1:200, and 1.0 ml is added to tubes 1 through 11. The tubes are incubated for 20 hours at 35°C. After this time the tubes are examined for visual growth. Tubes 6 through 7 are visibly turbid, while tubes 1 through 5 show no signs of growth. Tubes 1 through 5 are plated on blood agar, incubated overnight at 35°C, and read for growth. Plates 1 through 4 show no growth, while several colonies are observed on plate 5.

25. The MIC is:

- a. 25 µg/ml
- b. 12.5 µg/ml
- c. 6.25 µg/ml
- d. 3.12 µg/ml
- e. None of the above

26. The MBC is:

- a. 25 µg/ml
- b. 12.5 µg/ml
- c. 6.25 µg/ml
- d. 3.12 µg/ml
- e. None of the above

27. Which of the following criteria must be met for the test to be valid? Antibiotic Broth Control Control

- a. Positive Negative Positive

- b. Positive Positive Negative
- c. Positive Negative Negative
- d. Negative Positive Positive

28. For antibiotics given through the intravenous route, the peak specimen should be drawn:

- a. Immediately before the next dose
- b. 30 minutes after the dose
- c. 60 minutes after the dose
- d. 90 minutes after the dose

29. The lowest amount of antibiotic that results in 99.9% in vitro killing of the organism is the:

- a. Minimal bacteriostatic concentration
- b. Serum bacteriocidal level
- c. Serum peak level
- d. Minimal bacteriocidal concentration

30. A measure of the activity of the antibiotic in the patient's own serum against an infecting organism is determined in the:

- a. Microbroth dilution susceptibility test
- b. Cefinase procedure
- c. Serum bacteriocidal test
- d. Antibigram

31. Oxacillin/methicillin resistance in *S. aureus* can be detected by all of the following except:

- a. Cefoxitin disk screen test
- b. Oxacillin agar screen
- c. Chromogenic agar
- d. D test

32. ESBLs

- a. are chromosomal mediated.
- b. are also known as AmpC resistance.
- c. confer resistance to vancomycin and penicillin.
- d. were first found in *Klebsiella* and *E. coli*.

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