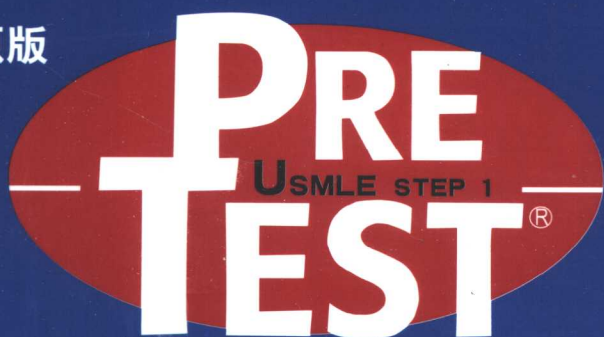


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Microbiology

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Tenth Edition

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Microbiology

PreTest® Self-Assessment and Review

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Introduction

Each *PreTest® Self-Assessment and Review* allows medical students to comprehensively and conveniently assess and review their knowledge of a particular basic science, in this instance microbiology. The 500 questions parallel the format and degree of difficulty of the questions found in the United States Medical Licensing Examination (USMLE) Step 1. Practicing physicians who want to hone their skills before USMLE Step 3 or recertification may find this to be a good beginning in their review process.

Each question is accompanied by an answer, a paragraph explanation, and a specific page reference to an appropriate textbook or journal article. A bibliography listing sources can be found following the last chapter of this text.

An effective way to use this *PreTest®* is to allow yourself one minute to answer each question in a given chapter. As you proceed, indicate your answer beside each question. By following this suggestion, you approximate the time limits imposed by the Step 1 exam.

After you finish going through the questions in the section, spend as much time as you need verifying your answers and carefully reading the explanations provided. Pay special attention to the explanations for the questions you answered incorrectly—but read *every* explanation. The authors of this material have designed the explanations to reinforce and supplement the information tested by the questions. If you feel you need further information about the material covered, consult and study the references indicated.

The High-Yield Facts added for this edition are provided to facilitate rapid review of microbiology. It is anticipated that the reader will use the High-Yield Facts as a “memory jog” before proceeding through the questions.

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High-Yield Facts in Microbiology

- Detection of HIV RNA by nucleic acid amplification of the viral load is the best predictor of “progression to AIDS.” (Virology)
- HIV RNA PCR and sequencing of the amplified products may be used to monitor resistance to anti-HIV drugs. HIV patients with total CD4 lymphocyte counts of less than 200 CD4 cells/ μ L are susceptible to opportunistic infections such as those caused by *Cryptococcus*, *Mycobacterium*, and *Pneumocystis*. (Virology)
- *Cyclospora* is an ooidian parasite similar to *Cryptosporidium*. It causes food-borne diarrheal illness and has been associated with contaminated berries. (Parasitology)
- *Giardia*, a large flagellate with both cyst and trophozoite forms, is the most common parasitic disease in the United States. The disease is characterized by diarrhea, cramping, and fever. (Parasitology)
- Enterohemorrhagic *E. coli* causes bloody diarrhea and hemolytic uremic syndrome. The mode of action is production of Shiga-like toxin by *E. coli*. (Bacteriology)
- Vancomycin-resistant enterococci, methicillin-resistant *Staphylococcus aureus* (MRSA), and vancomycin-indeterminate *S. aureus* (VISA) are among the most feared nosocomial pathogens. A recently introduced antibiotic, quinapristin-delfapristin, effectively treats vancomycin-resistant enterococci or the few vancomycin-indeterminate MRSAs that have occurred. (Bacteriology)
- Following an upsurge of tuberculosis in the early 1990s, cases of *Mycobacterium tuberculosis* infection have remained static. *M. tuberculosis* causes initial primary pulmonary infection as well as a chronic disease characterized by hemoptysis, loss of weight, and fever. (Bacteriology)
- Penicillin-resistant pneumococci (*Streptococcus pneumoniae*) may account for up to 40% of isolates of *S. pneumoniae*. Third- or fourth-generation cephalosporins may be used as alternative treatment as well as vancomycin and rifampin. (Bacteriology)

- *Ehrlichia*, a recently emerging tick-borne pathogen, is transmitted by *Ixodes scapularis*, the same tick that transmits the Lyme disease bacterium. *Ehrlichia* is also transmitted by the Lone Star tick, *Amblyomma americanum*. (*Chlamydia*, *Rickettsia*)
- Eastern equine encephalitis may be transmitted to humans by the bite of a mosquito, particularly in the northeastern United States. (Virology)
- Transfusion-associated babesiosis is a growing problem, particularly in the immunosuppressed or patients without a spleen. Tick-borne babesiosis caused by the same tick that transmits Lyme disease is an emerging infection. (Parasitology)
- Dengue fever, a viral illness transmitted by the *Aedes* mosquito, is prevalent in epidemic proportions in both the Caribbean and Southeast Asia. (Virology)
- There are five major classes of immunoglobulin: IgG, IgM, IgA, IgD, IgE. These immunoglobulins are distinguished by differences in the C regions of each individual H chain. These differences are function-related. (Immunology)
- Peptidoglycans are unique to prokaryotic organisms. They consist of a glycan backbone of muramic acid and glucosamine as well as cross-linked peptides. The enzymes responsible for cross-linking (transpeptidases) are the targets for β -lactam antibiotics. (Physiology)
- Genetic exchange in microorganisms occurs by several mechanisms, including transformation, transduction, conjugation, and transposition. These processes are the basis for gene cloning in microorganisms. (Physiology)
- Virulence factors in bacteria include adherence factors, invasins, capsules, endotoxin, and exotoxin. Such factors enable microorganisms to invade the host, cause disease, and resist host defense mechanisms. (Physiology)
- Sites of action of antimicrobial agents include cell-wall synthesis, cell membrane integrity, DNA replication, protein synthesis, DNA-dependent RNA polymerase, and folic acid metabolism. (Physiology)
- *Staphylococcus aureus* expresses two types of superantigens: enterotoxin (responsible for staphylococcal food poisoning) and toxic shock toxin. (Bacteriology)

- Free radicals of oxygen (superoxides) kill anaerobic bacteria exposed to air. Superoxide dismutase is a potent bacterial antioxidant. The presence of peroxidases in bacteria are protective. (Physiology)
- *Campylobacter* and *Helicobacter* are both helical-shaped bacteria. *Helicobacter* is known to play a role in the pathogenesis of peptic ulcer disease, while *Campylobacter* causes a food-borne gastrointestinal illness, most commonly from undercooked meat. Both bacteria are susceptible to antibiotics such as tetracycline. *Helicobacter* may be treated with Pepto-Bismol, metronidazole, and amoxicillin. (Bacteriology)
- The agents of bovine spongiform encephalopathy (Mad Cow Disease), scrapies, and new-variant Creutzfeldt-Jakob disease in humans are *prions* or amyloid fibrils. Also included are prions that cause chronic wasting disease (CWD) in elk and deer, although these agents of CWD have not been shown to be transmissible to either cattle or humans. These self-replicating proteins are resistant to heat and chemical agents. (Virology)
- Prior to 1999, West Nile virus, an arbovirus with serological cross-reactivity to St. Louis encephalitis virus was not seen in the United States. However, during 1999 and 2000, a large number of birds were infected with West Nile virus, as well as a few humans, some of whom died. (Virology)
- The genotype of hepatitis C is important in predicting the response of this virus to therapy with interferon and ribavirin as well as the required length of treatment. (Virology)

Virology

Questions

DIRECTIONS: Each question below contains five suggested responses. Please choose the **one best** response to each question.

1. An HIV-positive patient asks you if you can tell him the chances of him progressing to symptomatic AIDS. Which one of the following tests would be most useful?
 - a. CD4 lymphocyte count
 - b. HIV antibody test
 - c. HIV RT PCR
 - d. Neopterin
 - e. HIV p24 antigen

2. Which of the following viruses causes an acute febrile rash and produces disease in immunocompetent children but has been associated with transient aplastic crises in persons with sickle cell disease?
 - a. Rubeola
 - b. Varicella-zoster
 - c. Parvovirus
 - d. Rubella
 - e. Herpes simplex

3. Infection with herpes simplex virus, a common human pathogen, is best described by which of the following statements?
 - a. The CNS and visceral organs are usually involved
 - b. It rarely recurs in a host who has a high antibody titer
 - c. It can be reactivated by emotional disturbances or prolonged exposure to sunlight
 - d. Initial infection usually occurs by intestinal absorption of the virus
 - e. Infection with type 1 virus is most common

4. The latest and most effective therapy for AIDS patients includes azidothymidine (AZT), dideoxyinosine (DDI), and saquinavir or similar agents. Use of these three drugs would inhibit which of the following viral processes?

- a. RNase, DNase
- b. gp120 formation
- c. p24 antibody expression
- d. All membrane synthesis
- e. Reverse transcriptase, protease

5. An HIV-positive patient prior to being treated with AZT, DDI, and saquinavir has a CD4 lymphocyte count and an HIV RNA viral load test done. Results are as follows:

CD4: 50 CD4 lymphocytes per microliter

HIV RNA: 750,000 copies per ml

Which of the following statements best describes the above patient?

- a. This patient is no longer in danger of opportunistic infection
- b. The 5-year prognosis is excellent
- c. The patient's HIV screening test is most likely negative
- d. The patient is not infectious
- e. The viral load of 750,000 copies per ml suggests that the patient will respond to triple therapy

6. This HIV-positive patient with a viral load of 750,000 copies of HIV RNA/ml and a total CD4 count of 50 is at an increased risk for a number of infectious diseases. For which of the following diseases is the patient at no more added risk than an immunocompetent host?

- a. Pneumocystic pneumonia
- b. Mycobacterial disease
- c. Kaposi's sarcoma
- d. Pneumococcal pneumonia
- e. Herpes simplex virus

7. Infectious mononucleosis, a viral disorder that can be debilitating, is characterized by which of the following statements?

- a. It is most prevalent in children less than 14 years old
- b. It is caused by a rhabdovirus
- c. The causative pathogen is an Epstein-Barr virus
- d. Affected persons respond to treatment with the production of heterophil antibodies
- e. Ribavirin is the treatment of choice

8. A tube of monkey kidney cells is inoculated with nasopharyngeal secretions. During the next 7 days, no cytopathic effects (CPEs) are observed. On the eighth day, the tissue culture is infected accidentally with a picornavirus; nevertheless, the culture does not develop CPEs. The most likely explanation of this phenomenon is that

- a. The nasopharyngeal secretions contained hemagglutinins
- b. The nasopharyngeal secretions contained rubella virus
- c. Picornavirus does not produce CPEs
- d. Picornavirus does not replicate in monkey kidney cells
- e. Monkey kidney cells are resistant to CPEs

9. The clinical picture of arbovirus infection fits one of three categories: encephalitis, hemorrhagic fever, or fever with myalgia. One of the characteristics of arboviruses is that they

- a. Are transmitted by arthropod vectors
- b. Are usually resistant to ether
- c. Usually cause symptomatic infection in humans
- d. Are closely related to parvoviruses

10. Which one of the following statements best describes interferon's suspected mode of action in producing resistance to viral infection?

- a. It stimulates a cell-mediated immunity
- b. It stimulates humoral immunity
- c. Its direct antiviral action is related to the suppression of messenger RNA formation
- d. Its action is related to the synthesis of a protein that inhibits translation or transcription
- e. It alters the permeability of the cell membrane so that viruses cannot enter the cell

11. Coronaviruses are recognized by club-shaped surface projections that are 20 nm long and resemble solar coronas. These viruses are characterized by their ability to

- a. Infect infants more frequently than adults
- b. Cause the common cold
- c. Grow well in the usual cultured cell lines
- d. Grow profusely at 50°C
- e. Agglutinate human red blood cells

12. Delta hepatitis only occurs in patients who also have either acute or chronic infection with hepatitis B virus. The delta agent is

- a. An incomplete hepatitis B virus
- b. Related to hepatitis A virus
- c. A hepatitis B mutant
- d. An incomplete RNA virus
- e. Hepatitis C

13. Which of the following antiviral agents is a purine nucleoside analogue that has shown promise with Lassa fever, influenza A and B, and respiratory syncytial virus (RSV)?

- a. Amantadine
- b. Rimantadine
- c. Vidarabine
- d. Ribavirin
- e. Acyclovir

14. Echoviruses are cytopathogenic human viruses that mainly infect the

- a. Respiratory system
- b. Central nervous system
- c. Blood and lymphatic systems
- d. Intestinal tract
- e. Bladder and urinary tract

15. The most sensitive test for the diagnosis of herpes simplex (HSV) meningitis in a newborn infant is

- a. HSV IgG antibody
- b. HSV polymerase chain reaction (PCR)
- c. HSV culture
- d. Tzanck smear
- e. Cerebrospinal fluid (CSF) protein analysis

16. Acute hemorrhagic conjunctivitis (AHC) is a contagious ocular infection characterized by pain, swelling of the eyelids, and subconjunctival hemorrhages. AHC has been reported to be caused by which of the following viruses?

- a. Coronavirus
- b. Reovirus
- c. Rhinovirus
- d. Enterovirus
- e. Respiratory syncytial virus

17. Mumps virus accounts for 10 to 15% of all cases of aseptic meningitis in the United States. Infection with mumps virus

- a. Is apt to recur periodically in many affected persons
- b. Will usually cause mumps orchitis in postpubertal males
- c. Is maintained in a large canine reservoir
- d. Usually produces severe systemic manifestations
- e. Is preventable by immunization

18. The serum of a newborn infant reveals a 1:32 cytomegalovirus (CMV) titer. The child is clinically asymptomatic. Which of the following courses of action would be advisable?

- a. Repeat the CMV titer immediately
- b. Wait 6 months and obtain another titer on the baby
- c. Obtain a CMV titer from all siblings
- d. Obtain an anti-CMV IgM titer from the mother
- e. Obtain an anti-CMV IgM titer from the baby

19. A 3-year-old child presents at the physician's office with symptoms of coryza, conjunctivitis, low-grade fever, and Koplik's spots. The causative agent of this disease belongs to which group of viruses?

- a. Adenovirus
- b. Herpesvirus
- c. Picornavirus
- d. Orthomyxovirus
- e. Paramyxovirus