

Microbiology 301
Spring Quarter 2010
Second Midterm

Name _____

Version A - Make sure your name is on both the question and answer sheet. You are responsible for the correct transfer of your answers to the computer answer sheet. The exam will be returned along with an individual student score report in a room in the laboratory area (number to be announced). If you wish to have your exam returned privately, give the proctor a note to that effect.

Choose the ONE best answer.

1. Based on what you know about viruses, an antibiotic that interferes with which of the following processes could be a safe and effective anti-viral medication?
 - A. peptidoglycan synthesis
 - B. 70S ribosome function
 - C. 80S ribosome function
 - D. DNA polymerase
 - E. none of the above

2. All of the following are reasons why some phages are medically relevant EXCEPT..
 - A. they also infect eukaryotic cells.
 - B. their genome encodes toxins.
 - C. they can destroy bacterial cells.
 - D. they serve as a model for general viral replication cycles.

3. If you remove the repressor gene from lambda phage, the virus.....
 1. would always be latent.
 2. would always be lytic.
 3. could no longer be involved in generalized transduction.
 4. could no longer be involved in specialized transduction.

A. 1 B. 1, 3 C. 1, 4 D. 2, 3 E. 2, 4

4. Enveloped viruses always use which process?
 - A. entry by fusion
 - B. entry by receptor-mediated endocytosis
 - C. exit by lysis
 - D. exit by budding

5. Influenza vaccines must be changed yearly because the viral antigens change from year to year. Based on this information, which of the following is most likely true? The influenza virus...
- A. is an enveloped virus.
 - B. is a naked virus.
 - C. has a DNA genome.
 - D. has an RNA genome.
 - E. causes a persistent infection.

Use the following key to answer questions 6 through 9.

- A. Conjugation
 - B. Transduction
 - C. Transformation
 - D. all of the above
 - E. none of the above
6. Requires a phage.
7. Adding DNase to the medium prevents the process.
8. More correctly called "DNA exchange" because both cells involved acquire new genes.
9. Mechanism by which some R plasmids are typically transferred.
10. The term "core genome" refers to
- A. plasmids
 - B. genomic islands
 - C. transposons
 - D. A and C
 - E. none of the above
11. Which of the following requires an *in vitro* DNA synthesis reaction?
- A. Cloning
 - B. PCR
 - C. DNA sequencing
 - D. A and B
 - E. B and C
12. The primary role of dideoxynucleotides in a sequencing reaction is that they....
- A. can be added to the 5' end of a DNA strand.
 - B. terminate synthesis when incorporated into a growing strand of DNA.
 - C. function as a detectable label when incorporated into DNA.
 - D. function as an enzyme that cleaves DNA.
 - E. occasionally base pair with the wrong nucleotide.

13. When using the vector discussed in class, the cloned fragment is inserted into the second genetic marker and the transformants then plated on medium containing ampicillin and x-gal. What would be the result if the fragment were cloned into the selectable marker instead?
- A. Colonies of recombinants would be blue.
 - B. Colonies of recombinants would be blue, and there would be more than expected.
 - C. Colonies of recombinants would be white.
 - D. Colonies of recombinants would be white, and there would be more than expected.
 - E. No recombinant colonies would form because the cells can't grow.
14. If a 5 kb fragment of linear human DNA is transformed into an *E. coli* cell, and that cell is then allowed to multiply to a population of one billion cells, what percentage of the resulting population will likely harbor the fragment?
- A. >99%
 - B. 71 - 99%
 - C. 30 - 70%
 - D. 1 - 29%
 - E. <1%
15. DNA from a crime scene is sometimes analyzed by looking at the STR (short tandem repeat) pattern. Which method is used to do this?
- A. cloning
 - B. PCR
 - C. Ames test
 - D. DNA sequencing
 - E. restriction digesting
16. All of the following describe the microbes that support life in hydrothermal vent communities EXCEPT:
- A. prokaryotic cell structure
 - B. chemosynthesis
 - C. photosynthetic
 - D. autotrophs
 - E. chemolithotrophs
17. Based on what you know about *Bdellovibrio* species, one of the fastest swimming microbes, for which of the following could they best serve as an experimental model?
- A. growth at high temperatures (100° C)
 - B. pathogenicity of medically important bacteria
 - C. pathogenicity of microbes that infect plants
 - D. evolution of predator-prey relationships
 - E. nitrogen fixation

18. The role of sulfur in the metabolism of *Thiomargarita namibiensis* is similar to which of the following in human metabolism?

- A. sugar
- B. vitamins
- C. water
- D. O₂

19. The image below shows a "crown gall" on a plant, caused by an *Agrobacterium* species. Which of the following best describes this mass?



- A. Accumulations of nitrogen-fixing plant cells.
- B. Sites where nitrogen-fixing bacteria reside.
- C. Sites of damage caused by plant pathogens.
- D. Accumulations of pathogen-destroying plant cells.
- E. Tumors caused by plant pathogens.

20. Studies using luminescent bacteria led to the recognition that many bacteria can.....

- A. sense the density of bacterial cells in the immediate environment.
- B. produce light.
- C. use glucose as a source of energy.
- D. fix nitrogen.
- E. live as endosymbionts.

Use the following to complete statements 21 - 24 (answers can only be used once).

- A. the detection of invading microbes by pathogen-associated molecular patterns
- B. a cytokine
- C. lysozyme
- D. the first-line defenses
- E. the complement system

21. Removing the toll-like receptors interferes with.....

22. Mud wrestling in a sawdust-containing mixture damages.....

23. Opsonization by a component of innate immunity requires.....

24. An innate defense of tears and saliva is.....

25. Which of the following about innate immunity is FALSE?
- A. During phagocytosis, digestion of microbes occurs once a phagosome forms.
 - B. Macrophages can become activated.
 - C. Pro-inflammatory cytokines stimulate inflammation.
 - D. During inflammation, small blood vessels dilate.
 - E. Apoptosis does not trigger inflammation
26. The term epitope is most similar in meaning to which of the following?
- A. antigen
 - B. antigenic determinant
 - C. B cell receptor
 - D. T cell receptor
 - E. toll-like receptor
27. Comparing the heavy chains and the light chains of antibody molecules....
- A. There are twice as many heavy chains as light chains per antibody molecule.
 - B. The heavy chain is in the variable region and the light chain is in the constant region.
 - C. The heavy chain is in the constant region and the light chain is in the variable region.
 - D. The heavy chains have many more "variable" amino acids than the light chains do.
 - E. The heavy chains have many more "constant" amino acids than the light chains do.
28. If your cellular immune response were compromised, which of the following would happen?
- A. your immune system would lose all "memory"
 - B. your macrophages could no longer engulf antigens
 - C. your neutrophils could no longer engulf antigens
 - D. you would be more susceptible to viral infections
 - E. your dendritic cells could no longer present antigen

Use the following to answer questions 29 and 30 (answers can be used more than once)

- A. IgA
 - B. IgG
 - C. IgM
 - D. IgD
 - E. IgE
29. Class with the longest half-life
30. Protects a 9-month old breast-fed infant.
31. Which statement about naïve CD4+ T cells is TRUE? They....
- A. reside in secondary lymphoid organs and recognize antigen presented in MHC Class I.
 - B. circulate throughout the body and recognize antigen presented in MHC Class I.
 - C. reside in secondary lymphoid organs and recognize antigen presented in MHC Class II.
 - D. circulate throughout the body and recognize antigen presented in MHC Class II.

32. If an epithelial cell presents a peptide from a bacterial pathogen in MHC Class I molecules to a T cell, which of the following will result?
- A. A T cell will instruct the epithelial cell to undergo apoptosis.
 - B. A T cell will instruct the epithelial cell to become activated.
 - C. The epithelial cell will instruct a T cell to undergo apoptosis.
 - D. The epithelial cell will instruct a T cell to become activated.
33. If a dendritic cell presents a peptide from a bacterial pathogen in MHC Class II molecules to a T cell, which of the following will result?
- A. The T cell will instruct the dendritic cell to undergo apoptosis.
 - B. The T cell will instruct the dendritic cell to become activated.
 - C. The dendritic cell will instruct the T cell to undergo apoptosis.
 - D. The dendritic cell will instruct the T cell to become activated.
34. T-independent antigens....
- A. are generally proteins.
 - B. are the most common type of antigen.
 - C. stimulate primarily an IgE response.
 - D. are poorly immunogenic in young children.
35. If you inherited identical MHC molecules from both your mother and your father, which characteristics of the genes would no longer be relevant?
- 1. polymorphic
 - 2. polygenic
 - 3. co-dominant
- A. 1, 2 B. 2, 3 C. 1, 3 D. 1, 2, 3
36. Which set of terms reflects the most severe situations?
- A. infection, subclinical, viremia
 - B. colonization, localized, pathogen
 - C. infection, disseminated, septicemia,
 - D. colonization, subclinical, bacteremia
 - E. infection, localized, opportunist
37. A pathogen that colonizes a mucosal surface might "want" to avoid which of the following?
- A. IgA
 - B. IgM
 - C. IgG
 - D. IgD
 - E. IgE

38. If you remove the "A" component of an AB toxin, what will be the effect? The molecule will no longer.....
- A. be toxic
 - B. be antigenic
 - C. bind to a host cell
 - D. be a part of the LPS molecule
 - E. be a safe vaccine
39. If all the following were heated before injecting them into a mouse, which one would likely still cause disease?
- A. botulinum toxin
 - B. tetanus toxin
 - C. diphtheria toxin
 - D. endotoxin
40. The inflammatory response...
- A. can help clear an infection.
 - B. can damage host tissues.
 - C. A and B
41. Vaccinations provide....
- A. natural active immunity
 - B. artificial active immunity
 - C. natural passive immunity
 - D. artificial passive immunity
42. To be protected against tetanus, a booster vaccine is needed once every 10 years. Based on this information, and your knowledge about the disease, which is the best conclusion? The vaccine....
- A. is a toxoid
 - B. contains endotoxin
 - C. contains attenuated viruses
 - D. contains attenuated bacteria
 - E. is a T-independent antigen
43. The smallpox vaccine appears to have given lifelong immunity. Based on this information, which is the best conclusion? It...
- A. is made of smallpox viral subunits.
 - B. contains endotoxin.
 - C. is made of inactivated viruses
 - D. is made of attenuated viruses.
 - E. is a T independent antigen

44. Which of the following would be most important in establishing herd immunity?
- A. inoculating a herd of sheep with tetanus vaccine.
 - B. inoculating people with tetanus vaccine.
 - C. inoculating sheepdogs with measles vaccine.
 - D. inoculating people with measles vaccine.
45. Which of the following immunology-based tests is easily done in microtiter plates?
- A. agglutination
 - B. fluorescent antibody tests
 - C. ELISA
 - D. Western blot