

國立清華大學 命題紙

99 學年度生命科學院甲組及醫學生物科技學程碩士班入學考試

科目 微生物學 科目代碼 0203、0503 共 5 頁第 1 頁 *請在【答案卷】內作答

I. Single choice (1.5 points each, total 30%)

1. Which is mismatched?
 - A. interferon alpha and beta - inhibits viral replication.
 - B. serotonin - causes smooth muscle contraction.
 - C. interleukin-2 - stimulate T cell mitosis and B cell antibody production.
 - D. prostaglandins - activate eosinophils and B cells.
 - E. tumor necrosis factor - increases chemotaxis and phagocytosis.

2. All of the following pertain to herpes simplex-1 (HSV-1) except
 - A. it causes cold sores and herpes keratitis.
 - B. it is latent in the lumbosacral spinal nerve ganglia.
 - C. it is transmitted by mucous membrane contact with lesions.
 - D. it causes herpetic whitlow in health-care workers.
 - E. it causes gingivostomatitis.

3. All of the following can be recognized by toll-like receptors except
 - A. single-stranded viral RNA.
 - B. lipopolysaccharide.
 - C. flagellin.
 - D. host cell membrane proteins.
 - E. lipoteichoic acid.

4. All the following pertain to measles (rubeola) except:
 - A. involves a fatal complication called subacute sclerosing panencephalitis (SSPE).
 - B. transmitted by direct contact with the rash.
 - C. humans are the only reservoir for the pathogen.
 - D. secondary bacterial otitis media and sinusitis occur.
 - E. dry cough, sore throat, fever, conjunctivitis are symptoms.

5. Which drug/s interfere with the action of an HIV enzyme needed for final assembly and maturation of the virus?
 - A. Reverse transcriptase inhibitors.
 - B. Protease inhibitors.
 - C. Fusion inhibitors.
 - D. Integrase inhibitors.
 - E. RNase H inhibitors.

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6. Viral capsids are generally constructed without any outside aid once the subunits have been synthesized.
This process is called
A. facilitated assembly.
B. self-assembly.
C. spontaneous maturation.
D. self-maturation.
E. Watson and Crick assembly.
7. Which of the following description is not correct?
A. Edward Jenner was the first to use a vaccination procedure to protect individuals from smallpox.
B. Joseph Lister revolutionized surgery by introducing phenol as a disinfectant.
C. Robert Koch was the first to observe and accurately describe microorganisms.
D. Louis Pasteur is the first to demonstrate that alcohol fermentation and other fermentations were the result of microbial activity and then developed a new process to preserve wine during storage.
E. Charles Chamberland developed porcelain bacterial filters which were later used in the study of tobacco mosaic disease and led to the discovery of viruses.
8. You would like to culture a bacterium that is growing in the lung of a human patient with pneumonia. Which medium might this organism have the highest probability of growing on?
A. transport media
B. tryptic soy broth medium
C. M9 chemically defined medium
D. complex medium supplemented with whole blood
E. none of the choices
9. Which of the following chemical can not be effective against spores?
A. glutaraldehyde.
B. iodine.
C. Gamma radiation.
D. autoclaving.
E. chlorine.
10. The time required to kill 90% of the microorganisms or spores in a sample at a specified temperature is the
A. thermal death time (TDT).
B. decimal reduction time (D value).
C. thermal death point (TDP).

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- D. z value
E. F value.
11. Given a log phase bacterial culture with 2×10^5 cells per ml and a generation time of 30 minutes, how long does it take the culture to reach a density of 6.4×10^6 cells per ml?
A. 1 hour 30 mins.
B. 2 hours 30 mins.
C. 3 hours 30 mins.
D. 4 hours 30 mins.
E. 5 hours 30 mins.
12. Which of the following is not true about bacterial plasmids?
A. All bacteriocin genes found so far are carried on plasmids.
B. They can replicate independently of the chromosome.
C. They are usually closed circular DNA molecules, but linear plasmids have been found.
D. They are not required for host growth and/or reproduction.
E. They can be cured by treating with acridine mutagens.
13. Which of the following is not correct about agar which is an excellent gelling agent for microbiological media?
A. It is not degraded by most microorganisms.
B. Solid agar remains solid until the temperature is raised to 80 to 90°C, and liquid agar remains liquid if the temperature is kept above 45°C.
C. Agar provides an excellent source of nutrition for a variety of different microorganisms.
D. Agar is a sulfated polymer extracted from red algae.
E. The wife of one of Koch's assistants is the first people who suggested the use of agar as a solidifying agent.
14. Which of the following statement about bacterial staining is not true?
A. In capsule stain, crystal violet is used as a primary stain
B. Acid-fast stain can be used to identify *Mycobacterium tuberculosis*, the causing agent for tuberculosis
C. In acid-fast staining, methylene blue is used as the primary stain and carbol fuchsin is used as the counterstain agent
D. Schaeffer-Fulton method is used to differentiate between spores and vegetative cells of the genera *Clostridium* and *Bacillus*
E. Because heat fixation is not required for a negative stain, the cells are not distorted by chemicals used in the staining procedure

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15. Which is not true for the following antibacterial drugs?
- A. Penicillins contain a beta-lactam ring and can inhibit bacterial protein synthesis
 - B. Tetracyclins bind to the small ribosomal subunit and inhibit bacterial protein synthesis
 - C. Rifampin can inhibit bacterial DNA-dependent RNA polymerase
 - D. The minimal inhibitory concentration (MIC) is the lowest concentration of a drug which can kill a bacterial pathogen
 - E. Many penicillin-resistant bacteria produce beta-lactamase that hydrolyzes a bond in the beta-lactam ring of penicillin and inactivates the antibiotic
16. Which is true for the following statements related to the *Archaea*?
- A. The *Archaea* contain complex internal membranous organelles
 - B. The *Archaea* lack polycistronic mRNA
 - C. The *Archaea* lack chlorophyll-based photosynthesis
 - D. The *Archaea* have mRNA splicing, capping and poly A tailing
 - E. The methanogenic archaea can use methane as an energy source
17. Which of the following is not true for photosynthetic bacteria?
- A. The purple bacteria is one of the three groups of gram-negative photosynthetic bacteria
 - B. The cyanobacteria have both photosystems I and II and use water as an electron donor
 - C. The green sulfur bacteria use hydrogen sulfide, sulfur and hydrogen as their electron donor in their photosynthesis
 - D. The green photosynthetic bacteria can carry out oxygenic photosynthesis
 - E. The bacteriochlorophyll pigments of green bacteria enable them to live in deeper areas of aquatic habitats
18. Which one of the followings is not a characteristic of bacterial exotoxins?
- A. Most of exotoxins are heat sensitive
 - B. Exotoxins are usually excreted outside the living bacteria
 - C. Exotoxins are produced by both gram-positive and gram-negative bacteria
 - D. Exotoxins can cause fever of the host
 - E. Proteins are the major chemical compositions of exotoxins
19. Which one of the followings is not a known adherence factor that can help bacterial pathogen to attach to and colonize host cells or tissues?
- A. Teichoic and lipoteichoic acids
 - B. Pili
 - C. S layer and Slime layer
 - D. Fimbriae
 - E. Lipopolysaccharide

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20. Which is not true for the *Fungi*?

- A. A yeast is a unicellular fungus that contains a single nucleus and reproduces either asexually or sexually
- B. A fungus is a eukaryotic, spore-forming organism and contains chlorophyll
- C. Fungi are important decomposers that break down organic material, commonly living on animals, humans and plants
- D. Fungi exist mainly as filamentous hyphae; a mass of hyphae is called a mycelium
- E. Plants are particularly vulnerable to fungal infections due to fungi can invade leaves through their stomates

II. Term description and short answer (14%)

- 1. Adjuvants (3%)
- 2. Photolithotrophic autotroph (3%)
- 3. Metagenomics (4 %)
- 4. Antibacterial drugs can be either bactericidal or bacteriostatic. Please explain what the differences between bactericidal and bacteriostatic are? (4 %)

III. Long answers (56%)

- 1. What are the subunit vaccines? (Please also describe at least two examples in detail) (8%)
- 2. Please describe the properties of great DNA vaccine expression vector candidate? (5%)
- 3. Please describe the possible lead compounds or drugs in anti-influenza virus infection. (Including describe the potential anti-viral mechanism) (8%) (At least 4 compounds and/or drugs)
- 4. (a) Describe the Gram stain procedure and explain how it works. (4 %) (b) What step in the procedure of Gram stain could be omitted without losing the ability to distinguish between gram-positive and gram-negative bacteria? Why? (3%) Compare and contrast the cell walls of Gram-positive bacteria and Gram-negative bacteria. (4 %)
- 5. Under what circumstances would it be desirable to prepare specimens for the transmission electron microscopy (TEM) by use of Negative staining? Shadowing? Freeze-etching? (9%)
- 6. Antibiotic resistance of bacteria is a serious problem in hospitals. Please describe any three possible mechanisms that bacteria acquire drug resistance. (6 %) Also, please describe how resistance can spread within a bacterial population. (3 %).
- 7. To use bacteria as biopesticides has been a long-term interest in the bioindustry. *Bacillus thuringiensis* is most widely used. Please explain the mode of action of the *B. thuringiensis* toxin that can kill insect pests. (6 %)