

國立清華大學 命題 紙

97 學年度__生命科學院、生命科學院醫學生物科技學程__系(所)__甲__組碩士班入學考試
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 (單選題, 1.5 point each, Total 30%)

1. Tears protect the eyes by
 - A. Flushing and lysozyme
 - B. Inflammation
 - C. Vasodilation
 - D. Stimulating opsonization
 - E. Flushing and lysozyme and vasodilation
2. Which of the following is not normally capable of virus neutralization?
 - A. IgA
 - B. IgD
 - C. IgG
 - D. IgM
 - E. All of above
3. Human cancer causing viruses most often have a _____ genome.
 - A. ssDNA
 - B. dsDNA
 - C. ssRNA
 - D. dsRNA
 - E. Prion
4. 0.2 mls of a 10^{-4} dilution of a virus preparation yields 90 plaques. What is the number of PFU per ml in the undiluted virus preparation?
 - A. 9.0×10^5
 - B. 4.5×10^6
 - C. 4.5×10^7
 - D. 9.0×10^6
 - E. 1.2×10^6
5. Most drugs used to slow the progress of AIDS fall into which of the following categories?
 - A. Reverse transcriptase and protease inhibitors
 - B. Topoisomerase inhibitors
 - C. RNA polymerase II inhibitors
 - D. Protein synthesis inhibitors
 - E. Cell attachment inhibitors

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6. Negri bodies are produced within _____ in rabies infected humans.
- A. Skeletal muscle
 - B. Connective tissue
 - C. Brain neurons
 - D. Bats
 - E. All of the choices
7. Which of the following is generally not true of animal viruses?
- A. The host range may be restricted to a single species
 - B. The host range may cross species barriers within a single kingdom
 - C. The host range may cross kingdom barriers
 - D. The host range may be restricted to certain tissue types within a species
 - E. All of the choices
8. If the decolorizer is not left on long enough in the Gram-staining procedure, gram-positive organisms will be stained _____ and gram-negative organisms will be stained _____.
- A. purple; pink
 - B. purple; colorless
 - C. pink; pink
 - D. purple; purple
 - E. pink; colorless
9. Development of drug resistance is not discouraged by
- A. using drugs appropriate for the infectious agent being treated
 - B. use of two drugs simultaneously with the hope that each will prevent the emergence of resistance to the other
 - C. use of a high enough concentration of the drug to destroy any spontaneous resistant mutants that might arise
 - D. avoidance of indiscriminate use of drugs
 - E. both A and B
10. A feature unique to some archaeal plasma membranes is that they may
- A. consist of a lipid bilayer that lacks integral membrane proteins
 - B. consist of a lipid monolayer
 - C. contain sterols such as cholesterol
 - D. consist of a lipid bilayer with embedded proteins
 - E. none of the above

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11. Which of the following best represents the order of gene transfer in an Hfr \times F⁻ mating?

- A. part of the plasmid followed by the chromosome followed by the rest of the plasmid.
- B. all plasmid genes followed by some or all of the chromosome.
- C. part of the chromosome followed by the plasmid followed by the rest of the chromosome.
- D. the chromosome followed by the plasmid.
- E. the plasmid followed by the chromosome.

12. Which of the following is MOST effective against resistant endospores?

- A. 70% ethanol.
- B. glutaraldehyde.
- C. pasteurization.
- D. ethylene oxide.
- E. autoclaving.

13. Given a log phase bacterial culture with 10^6 cells per ml and a generation time of 30 minutes, how long does it take the culture to reach a density of 6.4×10^7 cells per ml?

- A. 1 hour.
- B. 2 hours.
- C. 3 hours.
- D. 4 hours.
- E. 5 hours.

14. Mannitol salt agar (MSA) only allows the growth of halophiles; nonhalophiles will not grow. Among the halophiles, mannitol fermenters will produce acid that turns the pH indicator yellow; mannitol nonfermenters leave the medium red. Onto MSA you inoculate a halophilic mannitol fermenter and a halophilic mannitol nonfermenter. In this case, the medium is acting as (a) _____ medium(s).

- A. selective.
- B. differential.
- C. enrichment.
- D. selective and differential.
- E. selective and enrichment.

15. Which of the following statement is not true for methane-oxidizing bacteria?

- A. They use methane as a source of both energy and carbon
- B. They first oxidize methane to methanol by methane monooxygenase
- C. The methanol is then oxidized for formaldehyde by methane dioxygenase
- D. Formaldehyde can be assimilated into cell material
- E. One of the two pathways that facilitates formaldehyde assimilation involves the formation of serine

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16. Which is true for the comparison of bacteria, archaea and eucarya?

- A. The Archaea contains membrane-enclosed nucleus with nucleolus
- B. The Archaea contains three DNA-dependent RNA polymerases
- C. The Bacteria show the sensitivity to rifampicin, while the Archaea and Eucarya are insensitive to rifampicin
- D. Polycistronic mRNA is present in the Bacteria, but not in the Archaea and Eucarya
- E. mRNA splicing, capping and poly A tailing are shown in the Bacteria

17. Bacteria can be beneficial or harmful to the humans. Which of the following description is not true?

- A. *Bacillus anthracis*: the causing agent of anthrax
- B. *Helicobacter pylori*: the causing agent of gastritis and peptic ulcer disease
- C. Mycoplasmas strain gram-negative because they lack cell walls and cannot synthesize peptidoglycan precursors
- D. *Streptomyces* are important for the production of many useful antibiotics
- E. *Lactobacillus* are useful for wine making

18. Which of the following description is not true?

- A. The type III secretion system (TTSS) enables gram (-) bacteria to secrete and inject virulence proteins into the cytoplasm of eukaryotic host cells
- B. Lipopolysaccharide (LPS) of gram (-) bacteria is called an endotoxin
- C. Hemolysins are classified into one type of exotoxins and can disrupt plasma membranes of host cells
- D. Tetracyclines are family of antibiotics, which are inhibitors of bacterial cell wall synthesis
- E. The genes for bacterial drug resistance may be found on chromosome, R-plasmid or transposons

19. Which of the following description is not true?

- A. *Legionella pneumophila* can cause Legionnaire's disease
- B. A multidrug-resistance strains of tuberculosis (MDR-TB) is defined as *Mycobacterium tuberculosis* that is resistant to isoniazid and rifampin, with or without resistance to other drugs
- C. Toxic shock syndrome (TSS) is a staphylococcal disease with potentially serious consequence
- D. Food-borne botulism is caused by an exotoxin produced by *Vibrio cholerae*
- E. Slime produced by some Staphylococci allows these bacteria to adhere to surfaces such as medical devices

20. Human diseases can also caused by fungi and protists. Which is not true:

- A. The diseases caused by fungi are known as mycoses
- B. Medical mycology is the discipline that study the fungi that causes human diseases
- C. Oral candidiasis is common in newborns and is caused by *Cryptococcus neoformans*
- D. *Plasmodium* is the causing agent of malaria
- E. Fungal and protist diseases can be transmitted by direct contact or through food and water

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II. Term description (解釋名詞, 3 points each, Total 18%)

1. RNA-dependent DNA polymerase
2. Slow virus infections
3. Chemoorganotrophic heterotrophy
4. Acid-fast staining
5. Opportunistic pathogen
6. Pathogenicity islands

III. Long answers (問答題, Total 52%)

1. Please make 5 RNA virus family examples and 4 DNA virus family examples. (9%)
2. If you have one specimen containing virus, how do you prove it is RNA virus or DNA virus? Please describe the experimental protocols. (8%)
3. Describe how the bacterial genome can be mapped using Hfr conjugation, transformation, generalized transduction, and specialized transduction. Include both a description of each technique and any assumptions underlying its use. (10 分)
4. What is quorum sensing? Describe how it occurs and briefly discuss its importance to microorganisms. (7 分)
5. Intoxications are diseases that result from a specific toxin produced by bacteria. Exotoxins and endotoxins are the two main groups of toxins produced by bacteria. Please compare the primary characteristics (such as: chemical composition, production by gram negative or positive bacteria, cause fever or not, heat stability, location, and any others) of these two groups. (10%)
6. Bacterial virulence is often measured experimentally by determining the lethal dose 50 (LD_{50}).
(A) Please explain what the LD_{50} means. (5%)
(B) Different doses of a specific bacterial pathogen are introduced into host animals in an experiment and the LD_{50} are measured. The results show that the LD_{50} for strain A is 30 and for strain is 50. Please compare the virulence between the strains A and B (3%).