國立清華大學 105 學年度碩士班考試入學試題

系所班組別：生命科學院甲組、醫學生物科技學程

考試科目（代碼）：微生物學(0403、0703)

　　*請在【答案卷】作答

Part 1 單選題

1. Which bacterium is well known for its ability to transfer DNA into plant and is commonly used as a tool in plant genetic engineering? (1.5%)
   A. *Schizosaccharomyces pombe*
   B. *Acinetobacter baumannii*
   C. *Pseudomonas putida*
   D. *Agrobacterium tumefaciens*
   E. *Streptomyces coelicolor*

2. Which of the following is true for antimicrobial chemotherapy? (1.5%)
   A. The therapeutic index (IT) is defined as the smallest concentration of drug to inhibit bacterial growth.
   B. Tetracyclines can inhibit protein synthesis on ribosomes.
   C. Penicillins are antibiotics that can interfere with bacterial DNA synthesis.
   D. R factors are bacterial transpons that code for antibiotic resistance.
   E. Bacteriostatic is used to describe an agent that can kill bacteria.

3. Which is correct for the characteristic of bacterial endotoxins? (1.5%)
   A. Bacterial endotoxins are small proteins.
   B. Endotoxins usually do not cause fever in the body.
   C. Bacterial exdotoxins are usually released from cell wall during lysis.
   D. Endotoxins can be converted to toxoid.
   E. Most endotoxins are heat sensitive at 60℃.

4. Which method can be used to differentiate *Staphylococcus aureus* from other staphylococci? (1.5%)
   A. The coagulase test
   B. The IMViC test
   C. The oxidase test
   D. The Etest
   E. The Kirby-Bauer test

5. Please choose one prokaryotic organism that lacks cell wall? (1.5%)
   A. *Mycobacterium*
   B. *Bacillus*
   C. mycoplasmas
   D. rickettsias
   E. *Nocardia*

6. Which microorganism below can produce a natural biopesticide? (1.5%)
   A. *Lactobacillus plantarum*
   B. *Listeria monocytogenes*
   C. *Clostridium tetani*
   D. *Bacillus thuringiensis*
   E. *Enterococcus faecalis*

7. Which of the following is correct for the Archaea? (1.5%)
   A. Membrane-enclosed nucleus with nucleolus is present in the Archae.
   B. The cell wall of the Archaea has no muramic acid.
   C. Polycistronic mRNA is absent in the Archaea.
   D. The Archaea is sensitive to chloramphenicol.
   E. The Archare contains three DNA-dependent RNA polymerases.

8. Which of the following is true for photosynthetic bacteria? (1.5%)
   A. The green nonsulfur bacteria carry out oxygenic photosynthesis.
   B. The cyanobacteria can use hydrogen as an electron donor.
   C. The purple sulfur bacteria use organic molecules as an electron donor.
   D. The green sulfur bacteria contain photosystem I and II.
   E. The cyanobacteria use chlorophyll a to absorb blue and red light and generate oxygen during photosynthesis.

9. Which of the following description is correct? (2%)

A. Joseph Lister develop and documented the first vaccination procedure against smallpox

B. Antony van Leeuwenhoek designed the first transmission electron microscope (TEM).

C. Walter Gilbert invented the term "RNA world" to describe a precellular stage in the evolution of life in which RNA was capable of storing, coping, and expressing genetic information, as well as catalyzing other chemical reactions.

D. Robert Koch developed the process of pasteurization to preserve wine during storage.

E. Louis Pasteur defined the binomial nomenclature system for naming microbes.

10. Acid-fast microorganisms such as Mycobacterium tuberculosis resist decolorization by an acid-alcohol wash because of the high concentration of _____ in their cell walls. (2%)

A. proteins

B. carbohydrates

C. nucleic acids

D. lipids

E. peptidoglycan

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11. Which of the following statements is correct for the microscopy used in microbiological studies? (2%)

A. In the Differential Interference Contrast Microscope (DIC), the object beam passes through the specimen, while the reference beam passes through a clear area of the slides. The two beams are then combined and interfere with each other to form an image.

B. By applying transmission electron microscope (TEM), a denser region in the specimen scatters less electrons and therefore appears brighter in the image.

C. In epifluorescence microscopy, the excitatory light is passed through the specimen first and then into the objective lens

D. The Bright-Field microscope produces a bright image of the object against a dark background.

E. Scanning tunneling microscope (STM) applies a sharp probe to move over the specimen surface at a constant distance can be used to study surfaces that do not conduct electricity well.

12. Which of the following best represents the order of gene transfer in an Hfr × F- mating? (2%)

A. all plasmid genes followed by some or all of the chromosome.

B. part of the chromosome followed by the plasmid followed by the rest of the chromosome.

C. the chromosome followed by the plasmid.

D. part of the plasmid followed by the chromosome followed by the rest of the plasmid.

E. the plasmid followed by the chromosome.

13. Which of the following is MOST effective against resistant endospores? (2%)

A. 70% ethanol.

B. pasteurization.

C. ethylene oxide.

D. autoclaving.

E. glutaraldehyde.

14. Which of these methods can be used to determine the number of viable microorganisms in a sample? (2%)

A. light scattering in a spectrophotometer.

B. counting a known volume of cells in a hemocytometer.

C. measuring total cell mass.

D. counting with a Coulter counter.

E. measuring colony forming units per ml.

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Part 2 簡答題

1. balanced growth in bacteria (2%)
2. zoonoses (2%)
3. methylotroph (2%)
4. the full name of AIDS (2%)
5. Superantigens (2%)
6. Decimal reduction time (3%)
7. Quorum sensing (3%)
8. Middle East respiratory syndrome virus (3%)
9. Acquired immune response (2%)

Part 3 問答題

1. Multilocus sequence typing (MLST) can be used to differentiate microbial isolates at the strain and species levels. Please briefly explain how MLST works. (4%)
2. Nitrification is important in the nitrogen cycle in soil by some bacteria and archaea. Please describe the two major steps of nitrification? (5%) Which of the following bacteria is involved in the first and which is involved in the second step of the process? *Nitrobacter* and *Nitrosomonas*. (2%)
3. Compare and contrast the cell walls of Gram-positive bacteria and Gram-negative bacteria in details. (8%)
4. What is the difference between an ABC transporter (ATP-binding cassette transporter) and a porin protein in terms of function and cellular location? (7%)
5. What strategies did use to develop the Dengue virus vaccine ? (4%)
6. Please describe the structure and infection mechanism of rotavirus. (4%)
7. Which virus (es) may be utilized in cancer therapy? Why? (4%)
8. Please describe the sources and functions of interferon. (5%)
9. Please describe viral evasion strategies in host immune system. (4%)
10. What is naked DNA vaccine? (4%)
11. Please describe the hepatitis B virus genome. (4%)