

國立清華大學 101 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)

共__7__頁，第__1__頁 *請在【答案卷】作答

I. Single choice (2 points/each)

1. _____ is defined as the presence of virus in the bloodstream.
 - A. anemia
 - B. viremia
 - C. hemovirales
 - D. leukemia
 - E. All of the above

2. Which of the following is not protected by IgA?
 - A. Skin
 - B. Gastrointestinal tract
 - C. Respiratory tract
 - D. Urogenital tract
 - E. All of the above

3. Which virus' infectious process is epitomized by latency?
 - A. HIV
 - B. Measles
 - C. Herpes
 - D. Pox
 - E. All of the above

4. Which type of vaccine is not appropriate to give to immunocompromised individuals?
 - A. live attenuated viruses
 - B. recombinant subunit vaccines
 - C. peptide vaccines
 - D. killed or inactivated viruses
 - E. All of the above can be used in anyone.

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共__7__頁，第__2__頁 *請在【答案卷】作答

5. What substances are generally defined as fever inducers?
- A. Interleukins
 - B. Cytokines
 - C. Pyrogens
 - D. Interferons
 - E. All of the above
6. Which of these agents does not cause opportunistic infection typically associated with AIDS?
- A. *Pneumocystis carinii*
 - B. Measles
 - C. *Candida albicans*
 - D. Hepatitis viruses
 - E. All of the above
7. Which of the following is a traditional vaccine type?
- A. Peptides
 - B. Attenuated viruses
 - C. Reassortment viruses
 - D. Naked DNA
 - E. All of the above
8. If the decolorizer is left on too long in the Gram-staining procedure, Gram-positive organisms will be stained _____ and Gram-negative organisms will be stained _____.
- A. purple; purple
 - B. purple; colorless
 - C. purple; pink
 - D. pink; pink
 - E. colorless; purple

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9. Mannitol salt agar (MSA) only allows the growth of halophiles. Among the halophiles, mannitol fermenters release acid that turns the pH indicator yellow; mannitol nonfermenters leave the medium red. Onto MSA you inoculate a halophilic mannitol nonfermenter and a nonhalophilic mannitol nonfermenter. Here the medium acts as a _____ medium.
- A. selective
 - B. general purpose
 - C. differential
 - D. enrichment
 - E. both selective and differential
10. Which of the following description about bacterial inclusion bodies is correct?
- A. Carboxysomes contain the enzyme ribulose-1,5,-bisphosphate carboxylase which is used for N_2 fixation.
 - B. Cyanophycin granules are composed of large polypeptides containing about equal quantities of lysine and glutamic acid.
 - C. Glycogen granules are enclosed by a double-layered lipid membrane and can be seen only with the electron microscope.
 - D. Magnetosomes are used for buoyancy.
 - E. Polymers of β -hydroxybutyrate can be observed in a light microscopy after Sudan black staining.
11. Which of the following is true about bacteria?
- A. Bacteria have a membrane-bound structure called nucleoid.
 - B. The membranes in bacteria contain cholesterol.
 - C. The size of a bacterial ribosome is 70S.
 - D. Some of bacteria have a tubulin-like protein called MreB which plays an important role in cytokinesis.
 - E. Some of bacteria have fimbriae for mating (conjugation).

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12. When bacterial genes are transferred to another bacterium by a virus, it is called _____.
- A. conjugation.
 - B. transduction.
 - C. transfection.
 - D. transformation.
 - E. translocation.
13. _____ are strains that are unable to grow on a minimal medium that supports growth of the wild type strain but are able to grow on the minimal medium if one or more nutritional supplements are added.
- A. Autotrophs.
 - B. Auxotrophs.
 - C. Prototrophs.
 - D. Minitrophs.
 - E. Heterotrophs.
14. All of the following statements are true except:
- A. When the cell wall is removed from a Gram-negative bacterium, the resulting form is called a spheroplast.
 - B. When the cell wall is removed from a Gram-positive bacterium, the resulting form is called a protoplast.
 - C. The time required to kill 90% of the microorganisms or spores in a sample at a specified temperature is the thermal death time (TDT).
 - D. Bacteriostatic agents can inhibit bacterial growth but does not kill bacteria.
 - E. Pasteurization is not a method of heat sterilization.
15. Which of the following statement regarding the *Archaea* is not true?
- A. The *Archaea* do not contain muramic acid in their cell wall
 - B. Chlorophyll-based photosynthesis is absent in the *Archaea*
 - C. *Halobacterium salinarium* is an archaeon and produces bacteriorhodopsin that can trap light energy without the presence of chlorophyll

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- D. Halorhodopsin acts as a photoreceptor of *Halobacterium*
- E. Extreme halophiles are aerobic chemoheterotrophs that require at least 1.5 M NaCl for growth
16. Which of the following statement regarding bacterial toxins is not true?
- A. In AB toxins, the B subunit is responsible for the toxic effect once the toxin inside the host cell
- B. Streptolysin-O (SLO) is inactivated by O₂, but Streptolysin-O (SLO) is O₂ stable.
- C. Staphylococcal enterotoxin B (SEB) exhibits activity as a superantigen
- D. Bacterial endotoxins are weakly immunogenic, but bacterial exotoxins highly antigenic
- E. A complete zone of clearing around the bacterial colony growing on blood agar is called beta hemolysis
17. The spreading of drug-resistant pathogens is a serious threat to public health. Which of the following is not true for antimicrobial drugs and drug resistance?
- A. The quinolones are important antimicrobial agents that inhibit nucleic acid synthesis
- B. Kirby-Bauer test is often used to estimate a pathogen's susceptibility to drugs
- C. Vancomycin is a glycolpeptide antibiotic that inhibits protein synthesis and are bactericidal
- D. The genes for bacterial drug resistance may be found on the chromosome, the R plasmid or transposons
- E. Cephalosporins can inhibit the transpeptidation reaction during peptidoglycan synthesis
18. Which of the following term is not true for the source and/or reservoir of the pathogen?
- A. The reservoir is the site or natural environmental location in which the pathogen normally resides
- B. A convalescent carrier is a person who has an overt clinical case of the disease
- C. An incubatory carrier is a person who is incubating the pathogen in large numbers but is not yet ill

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- D. Zoonoses are animal diseases that can transmit to humans
E. A healthy carrier may harbor the pathogen for only a brief period and is called acute carriers
19. Which of the following is the causing agent for the histologic gastritis, peptic ulcer disease and gastric cancer?
A. *Borrelia burgdorferi*
B. *Streptococcus pyrogenes*
C. *Mycobacterium leprae*
D. *Helicobacter pylori*
E. *Bordetella pertusis*
20. Which of the following is not true for the diseases caused by fungi and protists?
A. Chagas' disease is caused by *Trypanosoma cruzi*
B. *Histoplasma capsulatum* is the causative agent of malaria
C. *Aspergillus fumigatus* can cause the very common intestinal disease called giardiasis
D. *Neurospora crassa* is an ascomycete and is a very important research tool in genetics and biochemistry
E. The major portal of entry for *Aspergillus* is the respiratory tract
21. Which of the following is not true for the fungi?
A. The spores develop within a sac at the hyphal tip are called sporangiospores
B. Most fungi are saprophytes and usually aerobic, while some yeasts are fermentative
C. Plants are particularly vulnerable to fungal diseases because fungi can invade leaves through their stomates
D. Spores produced from a vegetative mother cell by budding are called blastospores
E. When nutrients are abundant, diploid *Saccharomyces cerevisiae* cells undergo mitosis to produce four haploid cells that are bound within the ascus

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II. Terms

1. Viral envelope glycoproteins (2%)
2. Adjuvant (2%)
3. Sex pilus (2%)
4. Siderophore (2%)
5. Minimal inhibitory concentration (MIC) of an antibiotic (2%)
6. Antigenic shift of a microbial pathogen (2%)

III. Long answers

1. Please make a comparison between Th1 and Th2 cells. (7%)
2. How do the viral gene products modulate the apoptosis processes? (8%)
3. Describe in detail the composition and structure of cell walls in Gram-positive bacteria and Gram-negative bacteria (6%). Also, how do the cell walls of *Archaea* differ from those of *Bacteria*? (5%)
4. How does a continuous culture system differ from a closed culture system (i.e., a batch culture)? (4%)
5. Bacteria are important for nitrogen cycle. The anammox reaction is a recently identified form of nitrogen conversion.
 - (1) Please explain what the anammox reaction is? (5%)
 - (2) From the following list of various microbial species, please choose one of them which can facilitate the anammox reaction. (2%)
(*Nitrosomonas* spp., *Rhizobacterium* spp., *Neisseria* spp., *Thermotoga* spp., *Aquifex* spp., *Azospirillum* spp., *Vibrio* spp., *Planctomyces* spp., *Thiospirillum* spp., *Shigella* spp.)
6. Please list three common mechanisms that can allow bacteria to survive inside phagocytic cells of the host. (9%)