

國立中央大學八十七學年度碩士班研究生入學試題卷

所別： 生命科學研究所

不分組 科目：

微生物學

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A. 單擇題：(每題 2 分，答案紙上請註明題號)

1. Suppose you Gram-stained a sample from one colony and observed a field of red and blue cocci. Adjacent cells were not always the same color. You could most confidently conclude that you have
 - a. made a mistake in staining
 - b. a mixed culture
 - c. old cells
 - d. none of the above
2. Which of the following pairs is mismatched?
 - a. chemotherapy - treatment of disease
 - b. pathogen - disease causing
 - c. normal flora - harmful
 - d. penicillin - antibiotic
3. Which of the following statement is true?
 - a. endospores are for reproduction
 - b. endospores are easily stained in a Gram stain
 - c. endospores allow a cell to survive environmental changes
 - d. a cell produces one endospore and keeps growing
4. Which of the following organelles most closely resembles a procaryotic cell?
 - a. nucleus
 - b. Mitochondria
 - c. Golgi body
 - d. vacuole
5. Which of the following best described what happens when a Gram-positive cell is placed in distilled water and penicillin?
 - a. no change will result; the solution is isotonic
 - b. water will move out of the cell
 - c. water will move into the cell
 - d. the cell will undergo osmotic lysis
6. Which organism is not correctly matched to its energy source?
 - a. photoheterotroph - light
 - b. photoautotroph - CO_2
 - c. chemoautotroph - Fe^{2+}
 - d. chemoheterotroph - glucose
7. The term facultative anaerobe refers to an organism that
 - a. does not use oxygen but tolerates it
 - b. is killed by oxygen
 - c. uses oxygen or grows without oxygen
 - d. prefers to grow without oxygen
8. Which of the following temperatures would kill a mesophile?
 - a. -50°C
 - b. 0°C
 - c. 37°C
 - d. 60°C
9. Which group of microorganisms is most likely to spoil a freshwater trout preserved with salt?
 - a. psychrophiles
 - b. thermophiles
 - c. halophiles
 - d. anaerobes
10. Three cells with generation time of 30 minutes are inoculated into a culture medium. How many cells are there after 5 hours?
 - a. 3×2^{10}
 - b. 1024
 - c. 48
 - d. 243
11. Place the following surfactants in order from the most effective to the least effective antimicrobial activity: 1: soap; 2: anionic detergent; 3: cationic detergent
 - a. 3,2,1
 - b. 1,2,3
 - c. 1,3,2
 - d. 2,3,1
12. Which of the following best defines a strain?
 - a. a population of cells with similar characteristics
 - b. a group of or organisms with a limited geographical distribution
 - c. a pure culture
 - d. a group of cells all derived from a single parent
13. A spectrophotometer measures the _____ of a culture
 - a. dry weight
 - b. pH
 - c. temperature
 - d. turbidity
14. The initial step of infection for Human immunodeficiency virus is to
 - a. bind to a CD4 receptor
 - b. enter the circulatory-lymphatic system
 - c. kill T4 lymphocytes
 - d. transcribe DNA from RNA
15. A lichen is a mutualism association between a
 - a. fungus and alga
 - b. fungus and protozoan
 - c. protozoa and bacterium
 - d. protozoan and virus

B. 複選題：(答案紙上請註明題號)

16. Which of the following is a fermented product? (2 points)
 - a. red wine
 - b. beer
 - c. brandy
 - d. coca cola
17. Please indicate the order of redox potential of the following items from low to high: (3 points)
 NO_3^- , O_2 , CO_2 , SO_4^{2-}
18. Which one of the following is not used in the taxonomic identification? (2 points)
 - a. fatty acid composition
 - b. growth substrate
 - c. growth pH
 - d. DNA composition
 - e. none of the above

注：背面有試題

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19. The modern comparison of 16S ribosomal RNA sequence has defined all life into three different domains: (6 points)
1): _____, 2): _____, and 3): _____.
20. Which of the following bacteria can be found in human intestinal tract? (2 points)
a. *Escherichia coli* b. *Pseudomonas aeruginosa*
c. *Methanotrix* d. *Salmonella typhi*
21. Which of the following compounds cannot be removed using a biological wastewater treatment process? (2 points)
a. heavy metal b. nitrate c. benzene d. paper e. none of the above
22. What is the meaning of -troph used in the word "autotroph?" (2 points)

23. Nitrification is usually an oxidative/reductive process from _____ through _____ and finally to _____. This process is mostly performed by the bacteria, _____ and _____. (5 points)
24. What kind of bacteria is not expected to be found in a hot spring? (2 points)
a. methanogenic bacteria b. sulfate-reducing bacteria
c. thermotroph d. nitrogen fixing bacteria
25. In a Winogradsky column, what is the right order of the following bacteria from the top to the bottom of the column? 1. Algae; 2. Green sulfur bacteria; 3. Purple bacteria; 4. Sulfate-reducing bacteria (2 points)
a. 1, 2, 3, 4 b. 2, 3, 4, 1 c. 1, 3, 2, 4 d. 1, 3, 4, 2
26. What is the normal setting used in the autoclave process (e.g., pressure and temperature)? (2 points)

27. What is the name of organisms involved in the production of yogurt and cheese? (2 points)

28. What kind of the following organisms is involved in the production of bread? (2 points)
a. bacteria b. algae c. fungi d. yeast
29. Please write the complete English name for the following term: (5 points)
a. DNA: _____ b. ATP: _____
c. UV light: _____ d. ELISA: _____
e. PCR: _____
30. Which of the following disease is not caused by virus? (2 points)
a. HIV b. hepatitis B c. flu d. food poison

C. 問答題 :

1. Please describe the major scientific contribution from the following scientists: (5 points each)
(1) Melvin Calvin (1940's)
(2) Alfred Hershey and Martha Chase (1952)
(3) Peter Mitchell (1970's)
2. You desire to isolate microorganisms, which degrade polychlorinated biphenyl, by enrichment cultivation. Which experiments would favor your attempts? (5 points)
3. Please define the meaning of "niche" used in the study of microbial ecology. (4 points)
4. Please balance the following oxidation/reduction equation. (5 points)

