

华中农业大学二〇一〇年硕士研究生入学考试
试 题 纸

课程名称：614 微生物学

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注意：所有答案必须写在答题本上，不得写在试题纸上，否则无效。

一. 判断与改错题（如有错误需改正，共 40 分，每题 1.0 分）

1. Eukaryotic membranes can be differentiated from prokaryotic membranes because eukaryotic membranes contain fatty acids as part of the lipid component of the membrane. ()
2. The membrane of a cell is able to differentiate molecules that enter or exit the cell and act as a semitransparent barrier. ()
3. The mechanism of group translocation transports molecules without chemical alteration. ()
4. Lysozyme and penicillin have activity against the cell wall. Lysozyme breaks the structure of teichoic acid and penicillin prevents its formation. ()
5. A capsule can be differentiated from a slime layers since the capsule is made up of complex carbohydrates and the slime layer contains proteins. ()
6. Lipopolysaccharides are present in both gram-positive and gram-negative bacterial cell walls. ()
7. Flagella of bacteria are composed of protein subunits called flagellin; eukaryotic flagella are composed of subunits called tubulin. ()
8. Endospores are multilayered structures that provide protection from environmental stress and are composed of peptidoglycan and calcium dipicolonate. ()
9. Gram-positive bacteria can be differentiated from Gram-negative bacteria since the peptidoglycan layer of later comprises 50% of the cell wall. ()
10. Bacterial genes are considered haploid. Extrachromosomal elements that can be exchanged between bacteria are called plasmids. ()
11. Extrachromosomal elements are known to contain genetic information including that for nitrogen fixation. ()
12. The technique of replica plating is often used to detect nutritional mutations. Microorganisms that grow on complete media but fail to grow on minimal media are called auxotrophs. ()

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13. UV light induces mutations by causing links between thymidine molecules on the same DNA chain. ()
14. After infection of a cell by the HIV virus, a DNA copy of the viral genome may be inserted in the host chromosome. This is an example of homologous recombination. ()
15. Viruses that are capable of inserting their genome into the host chromosome are called temperate viruses. ()
16. Isolation of recombinant DNA requires the use of specific enzymes that cut the DNA at specific sequences. These enzymes are called recombination enzymes. ()
17. The gene for lactose utilization was inserted next to the gene under study and the new construct was transferred to a new host. The lactose gene was used as a reporter gene. ()
18. During exponential phase of bacterial growth, there is an increase in cell size but not in cell number. ()
19. The generation time for bacteria is determined by measuring the time it takes to double the number of bacteria from log phase to the end of stationary phase. ()
20. Bacteria that grow at low nutrient concentrations are referred to as oligotrophs. ()
21. In times of nutrient deficiencies, the bacteria *Clostridium* produce spores until conditions are permissive for vegetative growth. ()
22. Halophiles are classified as organisms that require sugar for growth. ()
23. Chemicals used on the body to control microorganisms are called antibiotics. ()
24. An autoclave is an apparatus that is used to sterilize various materials. The appropriate condition for sterilizing contaminated material is by 15 min at 121°C at 15 psi. ()
25. Penicillins are effective against bacterial cells in stationary phase. ()

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26. A group of microorganisms coexisting together in a given location is referred to as a community. ()
27. The rhizosphere effect is an example of synergism. And lichens are symbiotic relationship between fungi and algae. ()
28. Bacteria *Pseudomonas* species are capable of fixing nitrogen. ()
29. The greenhouse effect is due to excess production of CO₂ by burning of fossil fuels. ()
30. Nitrification is a process that converts atmospheric nitrogen to nitrite. ()
31. Desulfurization of sulfur under aerobic conditions results in the formation of hydrogen sulfide. ()
32. Fermentation is a process carried out by microorganisms that converts organic compounds to usable products. ()
33. How is the pH controlled in a fermentation reaction, by adding acids to maintain a low pH needed for fermentation? ()
34. The accumulation of penicillin occurs at log phase of the growth cycle of the fungi. ()
35. The BOD is a measure of water quality that measures the level of oxygen consumption in the water. ()
36. The use of genetically altered bacteria in bioremediation to clean up oil spills is enhanced by providing which of the following: oxygen and nitrogen. ()
37. Methanogens produce methane from decomposition of wastes under aerobic conditions. ()
38. Ascomycetes can be differentiated from zygomycetes since the ascomycetes have aseptated hyphae. ()
39. Asexual fungal spores that are formed from fragmented hyphae are called sporangiospores. ()

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40. Fungi are considered heterotrophic because they obtain nutrition through adsorption. ()

二. 填空题 (共 10 分, 每题 1.0 分)

1. All fungi are _____, requiring _____ for energy and carbon. Fungi are _____ or facultatively _____.
2. Actinomycetes are _____ bacteria. The best-known genus of actinomycetes is _____.
3. A gel-like region between the outer surface of the cytoplasmic membrane and the inner surface of the _____ layer of gram-negative bacteria is called _____.
4. Enrichment culture is a method for isolating microorganisms from nature using specific _____ and incubation conditions.
5. Chemotaxis means the movement of an organism _____ or _____ a chemical gradient.
6. Anaerobic catabolism in which an organic compound serves as both an _____ donor and an _____ and in which ATP is produced by substrate-level phosphorylation is a process called _____.
7. Pili function to join bacterial cells prior to _____ from one cell to another. For this reason, they are sometimes also called sex pili.
8. _____ are microorganisms that obtain their energy to synthesize organic compounds from light.
9. A medium where the ingredients are known is called a _____ medium.
10. The portion of the mycelium concerned with obtaining nutrients is called the _____ mycelium; the portion concerned with reproduction is the _____ or _____ mycelium.

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三. 连线题 (共 15 分)

Matching 1 (5.0 分)

- | | |
|---|--------------------|
| 1. Primary stain for gram stain | a. Mordant |
| 2. Stains <i>Bacillus</i> cell | b. Carbohl fuchsin |
| 3. Used to fix stain | c. Alcohol |
| 4. Decolorizer | d. Safranin |
| 5. Spore stain | e. Positive stain |
| 6. Acid-fast stain | f. Malachite green |
| 7. Gram- bacteria take up this counterstain | g. Crystal violet |
| 8. Stains background | h. Negative stain |

Matching 2 (3.0 分)

- | | |
|-------|--------------------------------|
| 1. C | a. cell enlargement |
| 2. M | b. condensation of chromosomes |
| 3. G1 | c. replication of the genome |
| 4. G2 | d. separation of chromosomes |
| 5. S | e. cell division |

Matching 3 (5.0 分)

- | | |
|--------------------------|--------------------------|
| 1. f plasmid | a. thymine dimer |
| 2. r plasmid | b. Northern blot |
| 3. transition mutation | c. no complementation |
| 4. transversion mutation | d. break DNA |
| 5. trans | e. Southern blot |
| 6. cis | f. purine for purine |
| 7. x-rays | g. purine for pyrimidine |
| 8. UV | h. mating |
| 9. RNA | i. complementation |
| 10. DNA | j. antibiotic resistance |

Matching 4 (2.0 分)

- | | |
|---|-----------------|
| 1. Media used to inhibit growth of unwanted organisms | a. Enrichment |
| 2. Media where all components are not known | b. Selective |
| 3. Media used to contrast organisms on same plate | c. Differential |
| 4. Media used to enhance growth | d. Complex |

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四. 各词解释（共 25 分，每题 2.5 分）

1. Aseptic technique
2. Ammonification
3. Group translocation
4. Peptidoglycan
5. Defined medium
6. Anaerobe
7. Exponential growth
8. Provirus (prophage)
9. Virulent virus
10. Transposon

五. 问答题（共 60 分，每题 12 分）（提示：回答问题时，陈述 + 图示效果会更好）

1. 陈述（1）微生物培养基的类型和培养基配制原则，（2）细菌生长曲线及其各阶段的特点（3）环境中营养物质进入微生物细胞的主要方式。
2. 陈述（1）病毒粒子的基本结构和化学组成，（2）噬菌体的生活周期和（3）亚病毒的类型和特点。
3. 陈述（1） G^+ 和 G^- 细菌细胞壁的结构和功能，（2）Gram Staining 的原理和基本操作步骤，（3）细菌芽孢抗性机制及芽孢形成过程。
4. 陈述（1）原核微生物的基因重组的主要方式，（2）基因工程菌构建原理及基本操作步骤。
5. 根据你掌握的微生物学知识，请展望微生物在（1）污染环境修复中的作用，（2）新的生物质能源的开发和（3）绿色（环保）农业的建立中的应用潜力。