

國立清華大學 命題 紙

九十二學年度 生命科學 系(所) 甲 組碩士班研究生招生考試

科目 微生物學 科號 0804 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

I. 填充題 (33%)

1. Wild-type strains are parent organisms from which _____ arise.
2. Phage that enter host bacteria and take up residence as prophage are called temperate phage, and the process by which temperate phages establish themselves as a prophages is called _____.
3. _____ plasmid of *Agrobacterium tumefaciens* carries the genes required for the formation of crown gall tumors.
4. Within the overall soil habitat, there is one region that where there are especially complex microbial interactions. This is the region, called the _____, in which there are plant roots.
5. _____ are microorganisms that grow near and even below 0°C, the freezing point of water.
6. _____ is the process of removing or destroying all living forms.
7. Thymine and other pyrimidine dimers induced by far-UV irradiation can be severed apart by an enzyme, photolyase, that is induced by near-UV and visible light. This repair process is called _____.
8. In Gram-negative bacterial cells, the rigid layer between the outer membrane and the cytoplasmic membrane gives the wall its strength and is responsible for the cell's shape. It is made of a unique molecule called _____ or murein, that is found only in bacteria.
9. _____ media are those contain chemicals that encourage only certain type of microorganisms to grow.
10. _____ break down complex carbohydrates and are used mainly in the baking and alcohol fermentation industry.
11. The *lac* promoter contain a short sequence of nucleotides that bind a small protein called the catabolite activator protein, or CAP. RNA polymerase attaches to the *lac* promoter only if _____ is attached to it.
12. Molecules that are resistant to biodegradation are said to be _____.
13. _____ is a freeze-drying technique in which viable microorganisms are suspended in a protective organic medium, such as 0.5 M glycerol or serum album, placed in a glass vial, frozen quickly in a dry-ice-alcohol bath, and then desiccated under high vacuum while in the frozen state.
14. Molecules such as lactose that act to reverse operon _____ and turn transcription and protein synthesis "ON" are called inducers.
15. If foreign DNA is taken up and not destroyed, then it may be incorporated into the bacterium's DNA by a process called _____.
16. Hemolytic uremic syndrome (HUS) is a life-threatening disease of the kidneys caused by toxins produced by *Escherichia coli* _____.
17. In the microbiology laboratory, moist-heat sterilization is accomplished in an _____.
18. The D value is the decimal reduction time – the time it takes to kill _____ of the microbes in a suspension at a particular temperature.
19. The period of time when the size of the bacterial population increases most rapidly and the metabolic activity of the bacteria is at its peak is the _____ phase.

20. In bacteria, the electron transport system is located in the _____ membrane.
21. The acellular viral particle is called the virion. All virions have a nucleocapsid containing either DNA or _____ surrounded by a protective protein coat called a capsid.
22. The presence of some microorganisms is so well correlated with particular type of pollution that it serves as a standard _____ of the pollution.

II. 問答題

1. 舉二實例說明微生物在農業上的應用(6%)
2. 舉二實例說明微生物在環保工業上的應用(6%)
3. 舉例說明微生物在奈米科技上的可能應用(6%)
4. Dr. Meng-Yun Chou has isolated a tetracycline resistant enteric bacterial strain from chickens. Please help her **design experiments** to answer the following questions. (30%)
 - (a) How to determine the minimal inhibitory concentration of this bacterial strain to tetracycline?
 - (b) Can the tetracycline resistance be transmitted into a human pathogen such as *Escherichia coli*?
 - (c) Is the gene responsible for tetracycline resistance located on a plasmid?
 - (d) If yes, how big is the plasmid?
 - (e) How to clone the tetracycline resistance gene?
 - (f) How to determine the nucleotide sequence of the tetracycline resistance gene?
 - (g) Is the tetracycline resistance gene similar to other genes that have been characterized before?
 - (h) How many copy of the tetracycline resistance gene is present in the bacterial genome?
 - (i) Is the expression of this tetracycline resistance gene induced by tetracycline?
 - (j) Can the tetracycline resistant bacterium swim?
5. Hong Kong government has just announced that the recent outbreaks of severe acute respiratory syndrome (SARS) are likely to be caused by a new variant of Paramyxovirus. However, the Center for Disease Control and Prevention of the USA claimed it is a novel Coronavirus. Here are the questions: (15%)
 - (k) What are the major differences between these two virus groups?
 - (l) How are you going to solve the dispute experimentally?
 - (m) What should be done to reduce the infection rate nationwide?
 - (n) If you were assigned to design a kit for rapid diagnosis of this SARS, what components would you include in the kit?
 - (o) There are over a hundred viruses that may cause disease similar to SARS. What procedures would you take to identify the etiology of a new infectious disease?
6. Professor Shao-Ying Lee has collected 50 fungal isolates from soils that can produce a compound with an anti-*E. coli* activity. In order to reduce future workload, Professor Lee needs to determine rapidly that whether these anti-*E. coli* compounds are identical. What is the best way to do this? (4%)