

※ 請於試卷上「非選擇題作答區」內依序作答，並應註明作答之部分及其題號。

一、第一部份考題（共 35 分）

1. 選擇題（請註明題號）（每題 2 分）

- (1) Amoebas and bacteria are grouped into different domains because
 - a. amoebas eat bacteria
 - b. bacteria are made of cells
 - c. bacterial cells lack of a nucleus
 - d. bacteria decompose amoebas
 - e. amoebas are photosynthetic
- (2) DNA fingerprints used as evidence in a murder trial look something like supermarket bar codes. The pattern of bars in a DNA fingerprint shows
 - a. the order of bases in a particular gene.
 - b. the presence of various-sized fragments from chopped-up DNA.
 - c. the presence of dominant or recessive alleles for particular traits.
 - d. the order of genes along particular chromosomes.
 - e. the exact location of a specific gene in a genomic library.
- (3) The nucleotide sequence of a DNA codon is TGA. A messenger RNA molecule with a complementary codon is transcribed from the DNA. In the process of protein synthesis, a transfer RNA pairs with the mRNA codon. What is the nucleotide sequence of the tRNA anticodon?
 - a. CAT
 - b. CAU
 - c. UGA
 - d. CUT
 - e. GTT
- (4) Which of the following methods of gene regulation do eukaryotes and prokaryotes have in common?
 - a. elaborate packing of DNA in chromosomes
 - b. activator and repressor proteins, which attach to DNA
 - c. the addition of a cap and tail to mRNA after transcription
 - d. *lac* and *trp* operon
 - e. the removal of noncoding portions of RNA
- (5) A molecular biologist measured the amount of DNA in cells growing in the laboratory and found that the quantity of DNA in a cell doubles
 - a. between prophase and anaphase of mitosis.
 - b. during the M phase of the cell cycle.
 - c. between prophase I and prophase II of meiosis.
 - d. between anaphase and telophase of mitosis.
 - e. between the G1 and G2 phases of the cell cycle.

見背面

2. 解釋名詞：(每題 2 分)

- a、Nucleolus
- b、Alternative RNA splicing
- c、Facilitated diffusion
- d、Chemiosmosis
- e、Microarray

3. Most cells are microscopic. However, bacterial cells tend to have higher surface-to-volume ratio than human cells. Please explain the physiological importance and outcome for this feature observed in microorganisms. (4 分)

4. Eukaryotic cells contain a meshwork of protein fibers called cytoskeleton. What are three major types of these fibers? Please describe their structures and predominant functions in the cell. (6 分)

5. Please compare and contrast starch and cellulose, two plant polysaccharides. (5 分)

二、第二部份考題 (共 30 分)

1. (A) Please describe the three-domain classification scheme. (B) In comparing the five-kingdom classification system, which of the kingdoms fall into domain Eukarya? (16 分)
2. What benefits do fungi in lichens receive from their algal partners? (6 分)
3. How does a unicellular green alga *Chlamydomonas* differ from a photosynthetic bacterium, which is also single-celled? (8 分)

三、第三部份考題 (共 35 分)

1. The immune systems of animals and plants consist of multiple layers of defense. Please describe the defense mechanisms that humans and plants use to attack specific pathogens. The answer should include: (1) the specific mechanism in human body and (2) the specific mechanism in plants. Please focus on the "specific" instead of broad-spectrum immune responses. (10 分)
2. What are the functions of (1) ethylene and (2) indoleacetic acid in plants? (6 分)
3. What are the distinguishing features of stems, flowers, and roots in monocots and dicots? (6 分)
4. What is the mechanism associated with the regulation of stomatal opening by guard cells? (4 分)
5. List at least two factors that might have a density-dependent limiting effect on population growth. (4 分)
6. Describe what cause the individuals of a species to be spaced in a uniform or in a clumped dispersion pattern. (5 分)