

※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

1. 請解釋 SDS-PAGE 蛋白質電泳分離技術的原理及應用。(10 分)
2. 何謂 DNA fingerprint? 在昆蟲分類的實務上有何用途?(10 分)
3. 何謂單核苷酸多型性(Single Nucleotide Polymorphism, SNP), 請敘述一種檢測的方法。(10 分)
4. Structure and chemistry of nucleic acids (20%; 除非要求以英文答題, 皆可用中文或英文簡答; 若覺有需要, 可佐以簡圖回答之)
  - (1) Write down the full spelling of DNA in English. (2 分)
  - (2) What is the structural difference between DNA and RNA. (2 分)
  - (3) Please define what a gene is. (2 分)
  - (4) What is the relationship between DNA and genes. (2 分)
  - (5) What is the relationship between genome and chromosome. (2 分)
  - (6) Why high concentration of organic solvents can promote DNA denaturation? (2 分)
  - (7) Is "intron" equivalent to "intergenic sequence"? If not, make a comparison of intron and intergenic sequence. (4 分)
  - (8) Write down the full spelling of UTR in English, and briefly indicate its locations on an mRNA. (4 分)
5. DNA replication, transcription and RNA processing (22 分; 除非要求以英文回答, 皆可用中文或英文簡答; 若覺有需要, 可佐以簡圖回答之)
  - (1) What is a telomere? Is telomerase required for the replication of a circular or linear chromosomal DNA or both? Why? (6 分)
  - (2) In eukaryotes, can a fragment of naked DNA or a nucleosome or both serve as a template for transcription? Why? (4 分)
  - (3) The sequence of a region of DNA around the 5' end of a gene in E. coli is shown below. The -10 hexamer and the transcription start site are highlighted. What would be the sequence of the first 10 nucleotides of the mRNA transcribed from this gene? Write down the sequence from 5' to 3', e.g. CGGAUAAACT. (4 分)  
5' ...GCGCTTGGTATAATCGCTGGGGGTCAAAGAT...3'
  - (4) Write down the full spelling of snRNA in English and its relationship with snRNP. After that, please explain why the recognition of a particular splice site requires more than one snRNP. (6 分)
  - (5) Please define what general transcriptional factors are. (2 分)

見背面

6. Translation and gene regulation (16 分；除非要求以英文回答，皆可用中文或英文簡答；若覺有需要，可佐以簡圖回答之)
- (1) What is the function of aminoacyl-tRNA synthetase? (2 分)
  - (2) In eukaryotes, why the interaction between cap-binding translation initiation factors and the poly-A binding protein is required at the beginning of translation? (4 分)
  - (3) In *E. coli*, why the elevation of tryptophan concentration can inhibit the expression of structural genes in the tryptophan operon? (4 分)
  - (4) If the injected double stranded RNA (dsRNA) perfectly matches to the sequence of the target gene, how will the expression of the target gene be regulated? Knockdown or knockout? (6 分)
7. Molecular biology and Entomology (12 分；除非要求以英文回答，皆可用中文或英文簡答；若覺有需要，可佐以簡圖回答之)
- (1) What is the correlation between “insect molecular biology” and “insect biotechnology”? (4 分)
  - (2) How does the power of *Drosophila* molecular genetics benefit the study of other insects at molecular level? (4 分)
  - (3) Does insect pest management require knowledge and tools of molecular biology? No matter your answer is yes or no, provide your own perspective, opinion, or explanation. (4 分)

試題隨卷繳回