

## 一、蛋白結構與酵素化學

1. 試以  $\alpha$ -keratin 與  $\beta$ -keratin 為例，詳細說明  $\alpha$ -helix 與  $\beta$ -structure 在蛋白結構上之差異處。(10 分)
2. 雙基質的酵素反應(Bisubstrate enzymatic reactions)可分為 single displacement reaction 與 double displacement (ping-pong) reaction，請繪圖並配合文字敘述解釋這兩種反應機制。(15 分)

## 二、以下題目請分別標明題號，仔細作答：

## 1. 填充題，每格 1 分

- (1) The double-stranded DNA genome of plant virus X has a molecular mass of about  $1.0 \times 10^6$  kD. How many base pairs does this virus contain? \_\_\_\_\_
- (2) When DNA double helix is denatured, the absorbance at 260 nm will \_\_\_\_\_.
- (3) \_\_\_\_\_ is derived from *E. coli* DNA polymerase I, created by cleaving with a protease. It lacks the \_\_\_\_\_ activity of the parent enzyme.
- (4) Operon indicates a group of genes coordinately controlled by a(n) \_\_\_\_\_.
- (5) Shown below is the sequence of a portion of an *E. coli* gene, with the translation initiation site underlined.

5'-GTATCGTATGCATGCATCGTGAC-3'

- A. The sequence of the mRNA derived from this fragment is \_\_\_\_\_.
  - B. Base pairing between \_\_\_\_\_, which is upstream of the translation initiation site, and \_\_\_\_\_ is required for translation to start.
  - C. In eukaryotes, the start codon for translation is found by recognizing the \_\_\_\_\_ at the 5'-end, followed by \_\_\_\_\_ the mRNA in the 5' to 3' direction.
- (6) In eukaryotes, nuclear mRNA precursors are spliced via a \_\_\_\_\_ intermediate. Splicing is known to occur on a particle called a \_\_\_\_\_.
  - (7) The branched DNA structure formed by strand exchange during homologous recombination is called \_\_\_\_\_.

## 2. 問答題，每題 6 分

- (1) Diagram a typical prokaryotic promoter, and describe the process for transcription in *E. coli*.
- (2) Describe the process for elongation and termination of translation in prokaryotes.

見背面

三、

1. 試詳細寫出兩種常用來研究 metabolism pathway 之各中間產物，及其反應順序之方法及原理 (10%)。若  $A \rightarrow B$  為代謝其中之一重要反應，且需要一 enzyme 來催化其反應，如何純化此酵素(5%)?
2. 畫出下列化學結構式: (15%)
  - (1) Malonyl-CoA
  - (2) Acetyl-CoA
  - (3) Pyruvate
  - (4) Oxaloacetate
  - (5) Citrate

四、 Basic techniques for study of biochemistry (20 pts)

1. The identity of a protein is critical in biochemistry. Please explain the principles of the following methods in brief (2.5pts/each; total 10pts).
  - a. Western blotting analysis
  - b. Two dimensional gel electrophoresis
  - c. Mass spectrometry
  - d. Circular Dichroism
2. Protein expression and purification are useful for biochemistry. Please concisely explain the following various ways of chromatography. (2.5pts/each; total 10pts)
  - a. Affinity chromatography
  - b. Ion-exchange chromatography
  - c. Gel filtration
  - d. High-performance liquid chromatography (HPLC)

試題隨卷繳回