

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

請將答案寫在答案卷上，並清楚標明題號。

1. A nonapeptide was determined to have the following amino acid composition: (Lys)₂, (Gly)₂, (Phe)₂, His, Leu, Met. The native peptide was incubated with 1-fluoro-2,4-dinitrobenzene (FDNB) and then hydrolyzed; 2,4-dinitrophenylhistidine was identified by HPLC. When the native peptide was exposed to cyanogen bromide (CNBr), an octapeptide and free glycine were recovered. Incubation of the native peptide with trypsin gave a pentapeptide, a tripeptide, and free Lys. 2,4-Dinitrophenyl-histidine was recovered from the pentapeptide, and 2,4-dinitrophenylphenylalanine was recovered from the tripeptide. Digestion with the enzyme pepsin produced a dipeptide, a tripeptide, and a tetrapeptide. The tetrapeptide was composed of (Lys)₂, Phe, and Gly. What is the native sequence of this peptide? Account for your answer. (15%)

2. The following T_m (melting point) data were obtained for double-stranded DNA in 10 mM phosphate buffer containing 1 mM of EDTA. (10%)

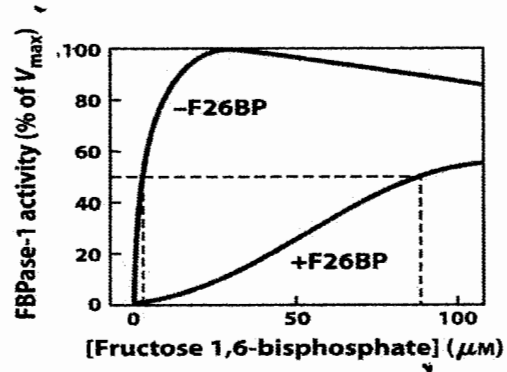
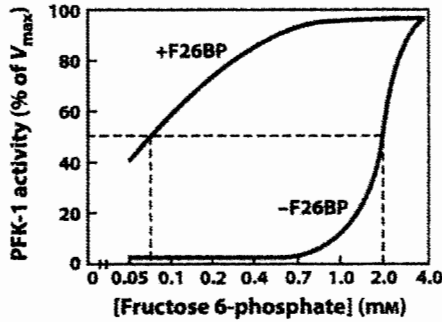
| Sample | % (G + C) | T_m (°C) |
|--------|-----------|------------|
| A | 70 | 78.5 |
| B | 52.5 | 71.2 |
| C | 37.5 | 66.5 |
| Z | ? | 73.3 |

- a). Calculate the % (G + C) content of sample Z.
 b). Derive an equation relating the % (G + C) content to the T_m for the above conditions.
3. The following data were recorded for an enzyme-catalyzed reactions $S \rightarrow P$. (15%)

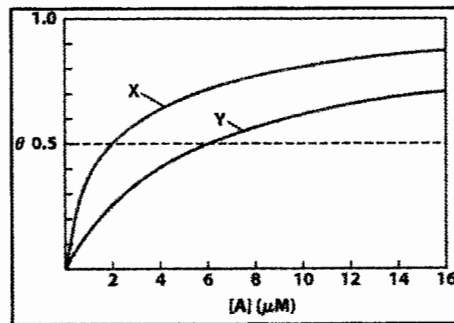
| [S] (M) | v (nmole \times liter ⁻¹ \times min ⁻¹) |
|-----------------------|--|
| 6.25×10^{-6} | 15.00 |
| 7.50×10^{-5} | 56.25 |
| 1.00×10^{-4} | 60.00 |
| 1.00×10^{-3} | 74.90 |
| 1.00×10^{-2} | 75.00 |

- a). Estimate v_{max} and K_m
 b). What would v be at $[S] = 2.5 \times 10^{-5} M$ and at $[S] = 5.0 \times 10^{-5} M$?
 c). What would v be at $[S] = 5.0 \times 10^{-5} M$ if the enzyme concentration were doubled?

4. Based on the plots shown below, Please explain the role of Fructose 2,6-bisphosphaten(F26BP) in regulation of glycolysis and gluconeogenesis. PFK-1 stands phosphofructokinase-1. FBPase-1 stands fructose 1,6-bisphosphates. (10%)



5. Two proteins, X and Y, bind to the same ligand, A, with the binding curves shown below. What is the dissociation constant, K_d , for each protein? Which protein (X or Y) has a greater affinity for ligand A? θ = binding sites occupied/total binding sites. (10%)



6. Please describe the metabolic process for how glucose being metabolized into energy (ATP) via glycolytic pathway, citric acid cycle and oxidative phosphorylation. (15%)
7. Please show how many moles of ATP is produced from palmitate (a saturated fatty acid with 16 carbons). Account for your answer. (15%)
8. Normal human blood plasma contains all the amino acids required for the synthesis of body proteins, but not in equal concentrations. Alanine and glutamine are present in much higher concentrations than any other amino acids. Suggest why. (10%)