

※ 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。

1. The growing understanding of how proteins fold allows researchers to make predictions about protein structure based on primary amino acid sequence data.

1 2 3 4 5 6 7 8 9 10  
Ile-Ala-His-Thr-Tyr-Gly-Pro-Phe-Glu-Ala-

11 12 13 14 15 16 17 18 19 20  
Ala-Met-Cys-Lys-Trp-Glu-Ala-Gln-Pro-Asp-

21 22 23 24 25 26 27 28  
Gly-Met-Glu-Cys-Ala-Phe-His-Arg

- (a) In the amino acid sequence above, where would you predict that bends or  $\beta$ - turns would occur? (3%)
- (b) Where might intrachain disulfide cross-linkages be formed? (3%)
- (c) Assuming that this sequence is part of a larger globular protein, indicate the probable location (the external surface or interior of the protein) of the following amino acid residues: Asp, Ile, Thr, Ala, Gln, Lys. Explain your reasoning. (4%)

2. Protein A has a binding site for ligand X with a  $K_d$  of  $10^{-6}$  M. Protein B has a binding site for ligand X with a  $K_d$  of  $10^{-9}$  M. Which protein has a higher affinity for ligand X? Explain your reasoning. Convert the  $K_d$  to  $K_a$  for both proteins. (10%)

3. Although graphical methods are available for accurate determination of the  $V_{max}$  and  $K_m$  of an enzyme-catalyzed reaction, sometimes these quantities can be quickly estimated by inspecting values of  $V_0$  at increasing  $[S]$ . Estimate the  $V_{max}$  and  $K_m$  of the enzyme-catalyzed reaction for which the following data were obtained. (14%)

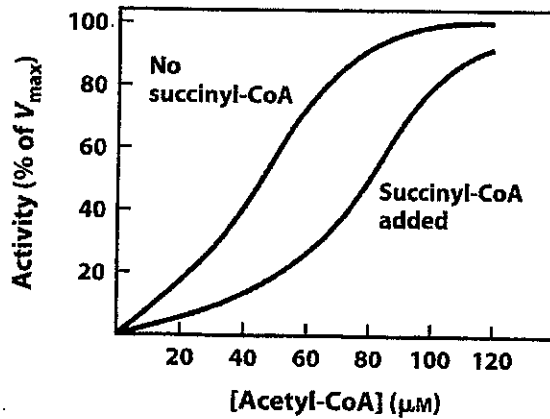
[S] (M)	$V_0$ ( $\mu$ M/min)
$2.5 \times 10^{-6}$	28
$4.0 \times 10^{-6}$	40
$1.0 \times 10^{-5}$	70
$2.0 \times 10^{-5}$	95
$4.0 \times 10^{-5}$	112
$1.0 \times 10^{-4}$	128
$2.0 \times 10^{-3}$	139
$1.0 \times 10^{-2}$	140

4. Please show how the ATPs are generated by metabolizing the glucose. And totally how many moles of ATP are produced for metabolizing 1 mole of glucose under aerobic condition? (12%)

5. Please show how fructose-2,6-bisphosphate in regulation of glycolysis and gluconeogenesis. (12%)

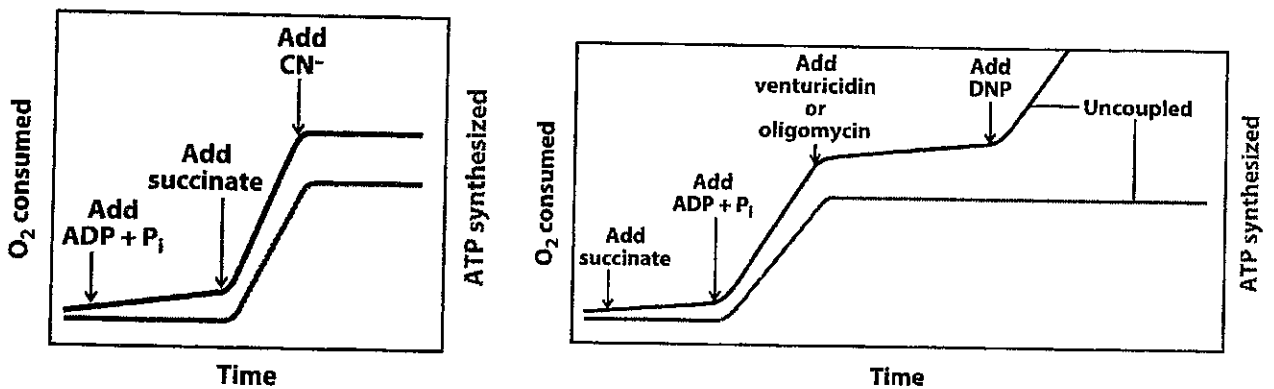
6. Please show how the fatty acid is metabolized and biosynthesized. (12%)

7. In the presence of saturating amounts of oxaloacetate, the activity of citrate synthase from pig heart tissue shows a sigmoid dependence on the concentration of acetyl-CoA, as shown in the graph. When succinyl-CoA is added, the curve shifts to the right and the sigmoid dependence is more pronounced.



On the basis of these observations, suggest how succinyl-CoA regulates the activity of citrate synthase. Why is succinyl-CoA an appropriate signal for regulation of the citric acid cycle? How does the regulation of citrate synthase control the rate of cellular respiration in pig heart tissue? (10%)

8. The following results were found in oxidative phosphorylation for generation of ATP. Please make a conclusion from these experimental observations.(10%)



9. Please show the five stages for protein biosynthesis. Be showing the essential components in each step. (10%)