國立嘉義大學九十六學年度
生化科技學系碩士班招生考試試題

科目：生物化學

1. 從鵝肝中所分離得到的一個未知物質，已知只含有碳、氫、氧。此未知物原本為 0.423 克，在含有過量氧氣的環境中進行完全燃燒後，產生 0.620 克的二氧化碳與 0.254 克的水。請問：此未知物質很可能是哪一類的化合物？其簡單分子式為何？ (10 分)
2. 請比較葡萄糖溶液 10 mM 與 5% 何者濃度較高？ (10 分)
3. What classes of enzymes perform the following transformations? (6分)

   (a) oxidation-reduction reactions: (b) transfer of functional groups:

   (c) hydrolysis reactions: (d) addition to double bonds:

   (e) isomerization reactions: (f) formation of bonds with ATP cleavage:
4. Answer the following questions concerning the TCA cycle: (14分)

   (a) Write the name of the enzyme responsible for the following TCA cycle reaction. (2分)

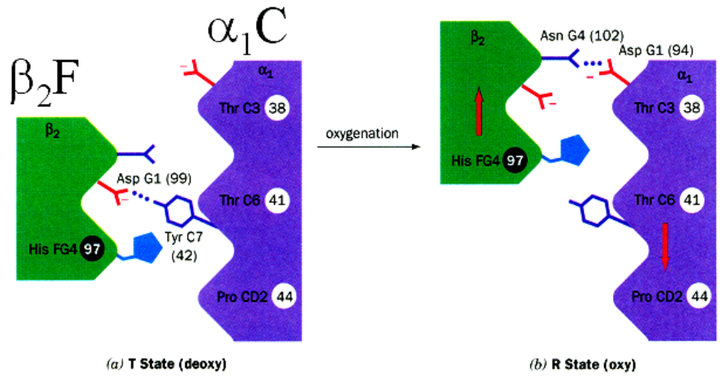
   (b) What type of reaction (of the six that we studied) does this represent? (1分)

   (c) Name the enzymes that catalyze the step(s) in the TCA cycle where NADH is made. (6分)

   (d) Name the enzymes that catalyze the step(s) in the TCA cycle where ATP is made. (1分)

   (e) Name the enzymes that catalyze the step(s) in the TCA cycle where decarboxylation occurs. (4分)
5. Is the p50 higher or lower than normal in (a) hemoglobin Yakima and (10 分) (b) hemoglobin Kansas? (10 分) Explain.

   Yakima Asp(99) β → His Kansas Asn(102)β → Thr



(a) T State (deoxy) (b) R State (oxy)

6. (a) Give a sterol hormone that is derived from cholesterol. (2 分) (b) Which enzyme catalyzes the rate limiting step of cholesterol biosynthesis? (2 分) (c) Continue the question (b), what would be the effect of insulin of the activity of this enzyme (stimulation or inhibition)? (2 分) (d) The genes involved in biosynthesis of cholesterol is mainly regulated by a SREBP protein, briefly describe the mechanism of the regulation. (4 分) (e) Give one example (just the name) of (i) peptide hormone (ii) catecholamine hormone. (2 分) (f) Briefly describe the general mechanism of metabolic regulation triggered by steroid hormones. (4 分) (g) The regulatory effects of epinephrine are very similar to that of glucagon, what are the two major effects that are specific to epinephrine, not glucagon? (4 分)
7. Answer the (A) and (B) questions (A: 12 分, B: 8 分)

   (A) A biochemist is attempting to separate a DNA-binding protein (protein X) from other proteins in a solution. Only three other proteins (A, B, and C) are present. The proteins have the following properties:

	pI (isoelectric point)	Size M_r	Bind to DNA?
protein A	7.4	82,000	yes
protein B	3.8	21,500	yes
protein C	7.9	23,000	no
protein X	7.8	22,000	yes

   What type of protein separation techniques might she use to separate?

   (a) protein X from protein A? (b) protein X from protein B? (c) protein X from protein C?

   (B) The following reagents are often used in protein chemistry. Match the reagent with the purpose for which it is best suited. Some answers may be used more than once or not at all; more than one reagent may be suitable for a given purpose. (Select the appropriate answer(s) for the questions of I, II and III)

   (a) CNBr (cyanogen bromide) (e) β-mercaptoethanol

   (b) Edman reagent (phenylisothiocyanate) (f) chymotrypsin

   (c) Sanger reagent (FDNB) (g) trypsin

   (d) dithiothreitol

   I. ___ cleavage of peptide bonds on the carboxyl side of Met.

   II. ___ breakage of disulfide (—S—S—) bonds. (2 answers)

   III. ___ determination of the amino acid sequence of a peptide.