中國醫藥大學九十七學年度研究所碩士班暨碩士在職專班入學招生考試試題

所別：基礎醫學研究所

科目：生物化學

考生注意：答案必須寫在答案卷上，否則不予計分。

**Part I：**

1、請說明 Fructose 2.6-biphosphate 在醣類代謝調控的角色（5%）？

2、請說明 Pyruvate dehydrogenase complex 的組成及功能（5%）？

3、請舉出兩個分別需經磷酸化及去磷酸化的 transcriptional factors 並比較其進出核之機轉（10%）！

4、請說明 TATA box 及 Basal transcriptional complex 的組成及功能（5%）？

**Part II：**

5、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. Why?(8 分)

6、Mismatch repair removes replication errors by excising incorrect bases. There is no DNA damage or modified bases present. How does the cell distinguish the newly synthesized strand and preserve the correct parental DNA strand?(5 分)

7、Prepare a table that lists the names and the functions of the precursors, enzymes, and other proteins needed during DNA replication in E. coli. (12 分)

**Part III：**

8、The steady-state kinetics of an enzyme are studied in the absence and presence of an inhibitor. The initial rate is given as a function of substrate concentration in the table below. (15 points)

| | V ($mmolL^{-1}min^{-1}$) | |
|---|---|---|
| [S] (mmol/L) | No inhibitor | Inhibitor |
| 1.25 | 1.72 | 0.98 |
| 1.67 | 2.04 | 1.17 |
| 2.50 | 2.63 | 1.47 |
| 5.00 | 3.33 | 1.96 |
| 10.00 | 4.17 | 2.38 |

(1) What kind of inhibition is involved?

(2) Determine Vmax and $K_M$ in the absence and presence of inhibitor.

9、A *lac* operon containing one mutation was cloned into a plasmid, which was introduced by transformation into a bacterium containing a wild-type *lac* operon. The three genes of the chromosomal operon were rendered non-inducible in the presence of the plasmid. (10 points)

(1) What kind of mutation in the plasmid operon could have this effect?

(2) Suppose the result of transformation was to cause the three plasmid *lac* genes to be expressed constitutively, at a high level. What type of plasmid gene mutation could have this result?

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**Part IV：**

10、A. Please list and describe three chromatographic methods in protein purification. (6 pts)

B. You are going to isolate Protein A that binds very specifically to the peptide sequence DVLMIYFF. However, in your protein sample, there is also a contaminant (污染物) Protein B that binds tightly to the related sequence EVLMIYFF. Unfortunately you don't have an antibody. Please describe what approach would you use to effectively purify Protein A and how dose it work? Why don't you choose the other chromatographic methods to purify Protein A? (7 pts)

DVLMIYFF Asp-Val-Leu-Met-Ile-Tyr-Phe-Phe

EVLMIYFF Glu-Val-Leu-Met-Ile-Tyr-Phe-Phe

11、A. What are the two critical hormones that signal for glycogen breakdown? (2pts)

B. One of the hormones from question A is secreted by the adrenal gland. Please describe how this hormone initiate glycogen breakdown in muscle? (Describe the series of signal transduction events.) (5pts)

12、Please describe the signal transduction events in the rod cells that lead to the detection of light. (5 pts)