

國立成功大學

112學年度碩士班招生考試試題

編 號： 258

系 所： 生物化學暨分子生物學研究所

科 目： 生物化學

日 期： 0207

節 次： 第 1 節

備 註： 不可使用計算機

※ 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。

一、簡答題 (18 分，題分如題標示)

1. Name five amino acid residues that can form hydrogen bonds with others. (5 pts)
2. Protein A binds to ligand X cooperatively with a modeled Hill coefficient of 1.5. By adding compound Y, an overall “right shift” of X-binding curve of protein A was observed. According to the information, answer the following questions:
 - a) Draw or describe the shape of X-binding curve of protein A. (2 pts)
 - b) Describe the effect of adding compound Y. (3 pts)
3. How competitive inhibitor affects enzyme catalysis? (2 pts) Why transient state analogues are generally more ideal competitive inhibitors than substrate analogues? (3 pts)
4. Please describe how Sanger sequencing works in sufficient detail. (3 pts)

二、問答題 (82 分，題分如題標示)

5. A 20-year-old man suffering from Lesch-Nyhan syndrome and multiple myeloma signed an informed consent to donate his blood to a research institute. However, when a laboratory technician tried to isolate myeloma cells from this patient's peripheral blood, he mixed up the cells with a previously established myeloma cell line obtained from another patient who was not a Lesch-Nyhan syndrome patient.
 - (A) If you are the technician, how do you remove the contaminated cells and establish the new patient's myeloma cell line? (5 pts)
 - (B) If the new myeloma cell line is successfully established, what are the potential applications in biomedicine? (please describe in detail) (7 pts)
6. Please describe in sufficient detail of how tetrahydrofolate (THF) and its derivatives contribute the associated carbon units to biosynthesis. (10 pts)
7. Explain why the following events (each of them) could destabilize α helix structure:
 - a). The presence of glycine in α helices. (3 pts)
 - b). The presence of proline in α helices. (3 pts)
 - c). Tyrosine and tryptophan respectively at residue position i and $i+4$ of a α helix. (4 pts)

8. Please describe the “reciprocal regulation” of glycolysis and gluconeogenesis by the hormone, glucagon, through the modulation of fructose-2,6-bisphosphate concentration in cytosol. (10%)
9. Please describe the regulation of glycogenolysis and glycogenesis by the hormone, insulin, through modulation of the phosphorylation state of glycogen phosphorylase and glycogen synthase by protein phosphatase 1 (PP1). (10%)
10. Please name the enzymes that are involved in the production of NADH in the citric acid cycle, and how these enzymes are regulated. (10%)
11. Uncoupling compounds, such as carbonylcyanide-p-trifluoromethoxyphenylhydrazone (FCCP), can disrupt the proton-motive force across the inner membrane of mitochondria. Please describe in detail about the mode of action of FCCP, and the consequence of cells treated by FCCP (10%)
12. Dietary deficiency of niacin (vitamin B3) causes Pellagra in humans. Please describe why niacin and its derivatives are so important in the general oxidation and reduction reactions in metabolism? (10%)