國立中山大學104學年度碩士暨碩士專班招生考試試題

科目名稱：生物化學【海資系碩士班甲組選考】　　題號：452006

※本科目依簡章規定「不可以」使用計算機(問答申論題)　　

I. 問答題：

(1) **Draw the structure of Ala–Glu-Gly in the ionic form. (5%)**

(2) **During the redox reaction in glycolysis, which molecules act as the oxidizing agents? Which molecules act as the reducing agents? (10%)**

(3) **How does a prokaryote execute transcription from its genomic DNA? (10%)**

(4) **Describe the Michaelis-Menten Kinetics in detail. (15%)**

(5) **Describe the procedure for ATP production from NADH during the oxidative phosphorylation and chemiosmosis-coupled electron transport to ATP synthesis. (15%)**

(6) **What is the mechanism of protein denaturation due to changes in pH? List two of the forces which stabilize tertiary structure in proteins that are affected when the pH is change. Describe why pH-change causes the protein to unfold. (15%)**

II. 將下列文章翻譯成中文，務求「信、雅、達」之原則 (30%)

Hemoglobin consists mostly of protein subunits which are folded chains of a large number of different amino acids called polypeptides. The amino acid sequence of any polypeptide created by a cell is in turn determined by the stretches of DNA called genes. There is more than one hemoglobin gene. The amino acid sequences of the globin proteins in hemoglobins usually differ between species with evolutionary distances. Even within a species, different variants of hemoglobin always exist, although one sequence is usually a "most common" one in each species. Many of these mutant forms of hemoglobin cause no disease. Some of these mutant forms of hemoglobin, however, cause a group of hereditary diseases termed the hemoglobinopathies. The best known hemoglobinopathy is sickle-cell disease, which was the first human disease whose mechanism was understood at the molecular level. A (mostly) separate set of diseases called thalassemias involves underproduction of normal and sometimes abnormal hemoglobins, through problems and mutations in globin gene regulation. All these diseases produce anemia. Variations in hemoglobin amino acid sequences may be adaptive. For example, recent studies have suggested genetic variants in deer mice that help explain how deer mice that live in the mountains are able to survive in the thin air that accompanies high altitudes. A researcher from the University of Nebraska-Lincoln found mutations in four different genes that can account for differences between deer mice that live in lowland prairies versus the mountains. After examining wild mice captured from both highlands and lowlands, it was found that: the genes of the two breeds are "virtually identical–except for those that govern the oxygen-carrying capacity of their hemoglobin". "The genetic difference enables highland mice to make more efficient use of their oxygen", since less is available at higher altitudes, such as those in the mountains. Mammoth hemoglobin featured mutations that allowed for oxygen delivery at lower temperatures, thus enabling mammoths to migrate to higher latitudes during the Pleistocene.