

※ 考生請注意：本試題 可 不可 使用計算機

1. Explain what and why is the sickle cell anemia. (5%)
2. (a) What is the effect of pH on the binding of oxygen to hemoglobin (the Bohr Effect)? (b) Briefly describe the mechanism of this effect. (c) What are other factors contributing to a similar effect? (10%)
3. What is the role of ATP and ATP hydrolysis in the cycle of actin-myosin association and disassociation that leads to muscle contraction? (10%)
4. There are three stages of cellular respiration/catabolism, including the acetyl-CoA production, the acetyl-CoA oxidation, and the ATP production. According to the first law of thermodynamics, i.e., energy cannot be created or destroyed, only converted from one form to another. Please describe in detail about the forms of energy change during the catabolism of Glucose to ATP at these stages. (15%)
5. The citric acid cycle is frequently described as the major pathway of aerobic catabolism, which means that it is an oxygen-dependent degradative process. However, none of the reactions of the cycle directly involves oxygen as a reactant. Why is the pathway oxygen-dependent? (5%)
6. What is the chemiosmotic theory? (5%)
7. Inhibitors of purine and pyrimidine nucleotide metabolism take many forms. 5-Fluorouracil, methotrexate and azaserine are used in chemotherapy for cancer patients. How do these three inhibitors differ in their action? (15%)
8. Cells from a patient with familial hypercholesterolemia (FH) and cells from an individual without that disease were incubated with LDL particles containing radioactively labeled cholesterol. After incubation, the incubation medium was removed and the radioactivity of the cells measured. The cells were treated to remove any bound material and lysed, and internal cholesterol content was measured. Results are given below. What mutation of the gene for the LDL receptor protein could account for the results? Please explain the mechanism in detail. (15%)

Cell Type	Radioactivity of Cell	Cholesterol Content
Normal	3000 cpm/mg cells	Low
FH	3000 cpm/mg cells	High

9. An inability to generate tetrahydrobiopterin would have what specific effects on the metabolism of phenylalanine, tyrosine, and tryptophan? (10%)
10. Please give a detail description about tumor suppressor gene. (10%)