

系所組別：生物化學暨分子生物學研究所甲、乙組

考試科目：生物化學

考試日期：0307，節次：1

※ 考生請注意：本試題 可 不可 使用計算機

1. Consider the dipeptide Asp-Phe and answer the following questions.
  - a. What amino acid is the N-terminus? (1%)
  - b. What amino acid is the C-terminus? (1%)
  - c. Circle all the ionizable groups in the dipeptide. (3%)
  - d. What is the net charge on the dipeptide at pH 7.0? (2%)
2. Using a line to represent the polypeptide chain, draw the following combination of secondary structure.
  - a.  $\alpha\alpha$  (1%)
  - b.  $\beta\alpha\beta$ , antiparallel (2%)
3. Buffering of blood pH (normally about pH 7.2) is critical to the health and survival of humans. Hemoglobin has some buffering capacity, in part due to the presence of a particular amino acid. Which one, and why? (3%)
4. Assume that the reaction velocity for an enzyme reaction is 15  $\mu\text{mole}/\text{min}$  when  $[S] = K_M$ . What is the  $V_{\text{max}}$  for the reaction? (2%)
5. What are enzymes which are stored in an inactive state called? (2%)
6. What type of enzymes catalyzes phosphorylation reactions? (2%)
7. Draw a graph for each of following kinetic situations. (6%)
  - a. A plot of  $v_0$  versus  $[E]$ .
  - b. A plot of  $v_0$  versus  $[S]$  for an enzyme that obeys the Michaelis-Menten equation.
  - c. A plot of  $v_0$  versus  $[S]$  for an allosteric enzyme.
8. Explain why cancer cells predominantly produce energy by glycolysis followed by lactic acid fermentation. (7%)
9. Describe the signal pathways how insulin reduce blood glucose (8%)
10. Describe the urea cycle and its function in human (10%)
11. Please describe the dominant and recessive inheritance using molecular aspects. (10%)
12. Please compare the epigenetics and classic genetics. (10%)

(背面仍有題目,請繼續作答)

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13. Mario Renato Capecchi (October 6, 1937) is an Italian-born American molecular geneticist, he is particularly well known for his pioneering work in gene targeting of the mouse embryonic stem cells. This work was accomplished through the efforts of Martin Evans and Oliver Smithies working on the knockout mice. This work was awarded 2007 Nobel Prize for medicine or physiology. Please describe the gene targeting strategy in detail from the view of nucleotide metabolism. (15%)
14. Please describe the interaction between folic acid and other metabolisms in detail, and, in particular, their applications in medicine. (15%)