

系所組別：藥理學研究所

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**Part I：問答題 50 分**

1. Both pig and cow insulins are used in the treatment of human diabetics. Based on the knowledge of protein chemistry, please give a brief explanation why the frequency of a serious immunological response to pig and cow insulin is small? (5%)
2. The structure of adenylate cyclase is similar to the structures of some type of DNA polymerases, suggesting that these enzymes derived from a common ancestor. Compare the reactions catalyzed by these two enzymes. In what ways are they similar? (5%)
3. Nerve growth factor (NGF) binds to a protein tyrosine kinase receptors. The amount of diacylglycerol in the plasma membrane increases in cells expressing this receptor when treated with NGF. Propose a simple signaling pathway and identify the isoform of any participating enzymes. Would you expect the concentrations of any other common second messengers to increase on NGF treatment? (10%)
4. Please write down the metabolic reactions in glycolysis. What will happen on energy generation in a cell when glycolysis proceeds in the presence of arsenate? (10%)
5. If for some reasons, you are on diet for reducing your body fat. A) How would lack of carbohydrates affect your ability to utilize fats? B) What would your breath smell like? (10%)
6. Degradation signals are commonly located in protein regions that also facilitate protein-protein interactions. Explain why this coexistence of two functions in the same domain might be useful. (10%)

Part II：50 分

一、選擇題：25 分（單選 2 分、複選 3 分；複選題有加註；作答時請標示題號）

1. Which of the following DNA sequence can be expressed into protein? (2%)
(A) satellite DNA
(B) rRNA gene
(C) telomere sequence

(背面仍有題目,請繼續作答)

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- (D) housekeeping gene
(E) pseudogene
(F) Alu element。
2. (複選) Which of the following cell cycle phases contain 4N genome? (3%)
(A) G₀ (B) G₁ (C) S (D) G₂ (E) M。
3. How many possible open reading frames are in a double-stranded DNA? (2%)
(A) 1 (B) 3 (C) 6。
4. In the wild-type E.coli, the mismatch $\begin{array}{c} \text{CH}^3 \\ | \\ -\text{G}- \\ | \\ -\text{T}- \end{array}$ will be repaired to (A) -A- (B) -G-
-T- -C-。 (2%)
5. (複選) Which of the following amino acids can be phosphorylated in eukaryotic protein? (3%)
(A) Serine (B) Proline (C) Threonine (D) Tyrosine (E) Tryptophan。
6. What is the correct step for a protein to be exocytose secreted? (2%)
(A) ER → Cis Golgi → Trans Golgi
(B) Cis Golgi → Traus Golgi → ER
(C) ER → Trans Golgi → Cis Golgi (ER=endoplasmic reticulum)
7. Where is to cellular location for the following reaction to take place? (A) Nucleoplasm
(B) Nucleolar (C) cytoplasm? (Please write your answer referring to A, B, and C described above to the following questions.)
7-1. ribosome assemble (2%)
7-2. tRNA processing (2%)
7-3. mRNA processing (2%)
7-4. translation (2%)
8. (複選) What ARE TRUE for a mature mRNA of eukaryote cells? (3%)
(A) contains 5' CAP
(B) longer than the pre-mRNA
(C) contains poly A tail
(D) contains intron。

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二、問答題：25 分

1. Please describe how a cell regulates the synthesis of purines and pyrimidines to achieve equal molar ratio of each nucleotide. (4%)
2. (A) What is the role of telomerase in a normal cell? (B) How it is deregulated in a cancer cell? (C) Can it be a target for anti-cancer treatment (please give the rationale to your answer)? (9%)
3. After getting sequence information of a DNA fragment, how will you perform experiment for the following questions? (In your answer, please also briefly describe the experimental procedure of at least one experiment for each question.)
 - (1) Amplification of this DNA fragment? (3%)
 - (2) Check whether this DNA fragment can be expressed into RNA? (3%)
 - (3) Expression of this DNA into a protein? (3%)
 - (4) Check whether this DNA fragment contains promoter activity? (3%)