

# 國立屏東教育大學 102 學年度研究所碩士班入學考試

## 生物化學 試題

(化學生物系碩士班)

※請注意：1.本試題共三頁。

2.答案須寫在答案卷上，否則不予計分。

### 一、單選題（每題 4 分，共 20 分）

1. An allosteric interaction between a ligand and a protein is one in which:  
(A) binding of the ligand to the protein is covalent.  
(B) two different ligands can bind to the same binding site.  
(C) multiple molecules of the same ligand can bind to the same binding site.  
(D) binding of a molecule to a binding site affects binding properties of another site on the protein.  
(E) binding of a molecule to a binding site affects binding of additional molecules to the same site.
2. Which of these is a general feature of the lipid bilayer in all biological membranes?  
(A) Polar, but uncharged, compounds readily diffuse across the bilayer.  
(B) The polar head groups face inward toward the inside of the bilayer.  
(C) Individual lipid molecules are free to diffuse laterally in the surface of the bilayer.  
(D) The bilayer is stabilized by covalent bonds between neighboring phospholipid molecules.  
(E) Individual lipid molecules in one face (monolayer) of the bilayer readily diffuse (flip-flop) to the other monolayer.
3. The synthesis of glycogen, starch, and sucrose all:  
(A) use a sugar nucleotide as substrate.  
(B) use glucose-6-phosphate as substrate.  
(C) take place in liver and muscle of mammals.  
(D) use glucose 1-phosphate as the only substrate.  
(E) involve addition of a sugar residue at the reducing end of the growing polymer.
4. Which one of the following statements about eukaryotic RNA polymerases is correct?  
(A) Only eukaryotic RNA polymerase I recognizes prokaryotic promoters.  
(B) Only eukaryotic RNA polymerase II recognizes prokaryotic promoters.  
(C) Only eukaryotic RNA polymerase III recognizes prokaryotic promoters.  
(D) All three eukaryotic RNA polymerases recognize the same promoters as prokaryotic polymerases.  
(E) None of the eukaryotic RNA polymerases recognizes prokaryotic promoters.

5. Steroid hormones are carried on specific carrier proteins because the hormones:
- (A) cannot find their target cells without them.
  - (B) are too unstable to survive in the blood on their own.
  - (C) need them in order to pass through the plasma membrane.
  - (D) cannot dissolve readily in the blood because they are too hydrophobic.
  - (E) require subsequent binding to specific receptor proteins in the nucleus.

## 二、問答題（共 80 分）

1. Degradation of amino acids yields compounds that are common intermediates in the major metabolic pathways. Explain the distinction between glucogenic and ketogenic amino acids in terms of their metabolic fates. (10%)
2. The synthesis of fatty acids and their breakdown by  $\beta$ -oxidation occur by separate pathways. Compare the two paths by filling in the blanks below. (Some blanks may require more than one answer.) (10%)

	Synthesis	oxidation
Activating group	_____	_____
Electron carrier coenzyme(s)	_____	_____
Basic units added or removed	_____	_____
Cellular location of process	_____	_____

3. The following reagents are often used in protein chemistry. Match the reagent with the purpose for which it is best suited. Some answers may be used more than once or not at all; more than one reagent may be suitable for a given purpose. (10%)
- (a) CNBr (cyanogen bromide)
  - (b) Edman reagent (phenylisothiocyanate)
  - (c) FDNB
  - (d) dithiothreitol
  - (e) performic acid
  - (f) chymotrypsin
  - (g) trypsin
- \_\_\_ hydrolysis of peptide bonds on the carboxyl side of Lys and Arg
  - \_\_\_ cleavage of peptide bonds on the carboxyl side of Met
  - \_\_\_ breakage of disulfide (—S—S—) bonds
  - \_\_\_ determination of the amino acid sequence of a peptide
  - \_\_\_ determining the amino-terminal amino acid in a polypeptide
4. When 10  $\mu\text{g}$  of an enzyme of Mr 50,000 is added to a solution containing its substrate at a concentration one hundred times the  $K_m$ , it catalyzes the conversion of 75  $\mu\text{mol}$  of substrate into product in 3 min. What is the enzyme's turnover number ? (15%)
5. Explain how the effects of sickle cell disease demonstrate that hemoglobin undergoes a conformational change upon releasing oxygen. (15%)

6. Describe qualitatively how the  $T_m$  for a double-stranded DNA depends on its nucleotide composition. (10%)
7. What is an amphipathic compound? Explain how such compounds contribute to the structure of biological membranes. (10%)