國立臺北科技大學102學年度碩士班招生考試

系所組別：3713 有機高分子研究所甲組

第二節　生物化學　試題（選考）

注意事項：

1. 本試題共 16 題，配分共 100 分。
2. 試題 1-5，每題 10 分共 50 分。試題 6-15，每題 4 分共 40 分。第 16 題10分。
3. 第 16 題，請將答案依序寫在同一大題欄位內。
4. 請標明大題、子題編號作答，不必抄題。
5. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. What is the concept of "induced fit" as it applies to antigen-antibody binding?

2. An enzyme can catalyze a reaction with either of two substrates, S_1 or S_2. The K_m for S_1 was found to be 2.0 mM, and the K_m, for S_2 was found to be 20 mM. A student determined that the V_{max} was the same for the two substrates. Unfortunately, he lost the page of his notebook and needed to know the value of V_{max}. He carried out two reactions: one with 0.1 mM S_1, the other with 0.1 mM S_2. Unfortunately, he forgot to label which reaction tube contained which substrate. Determine the value of V_{max} from the results he obtained:

Tube number	Rate of formation of product
1	0.5
2	4.8

3. Explain why extraction of lipids from tissues requires organic solvents.

4. What are two mechanisms by which "chaperone" proteins assist in the correct folding of polypeptides?

5. Why does lowering the ionic strength of a solution of double-stranded DNA permit the DNA to denature more readily (for example, to denature at a lower temperature than at a higher ionic strength).

6. The major reason that antiparallel -stranded protein structures are more stable than parallel -stranded structures is that the latter:
   A) are in a slightly less extended configuration than antiparallel strands.
   B) do not have as many disulfide crosslinks between adjacent strands.
   C) do not stack in sheets as well as antiparallel strands.
   D) have fewer lateral hydrogen bonds than antiparallel strands.
   E) have weaker hydrogen bonds laterally between adjacent strands.

7. Amino acid residues commonly found in the middle of turn are:
   A)Ala and Gly.
   B)hydrophobic.
   C)Pro and Gly.
   D)those with ionized R-groups.

8. A sequence of amino acids in a certain protein is found to be -Ser-Gly-Pro-Gly-. The sequence is most probably part of a(n):
   A) antiparallel sheet.
   B) parallel sheet.
   C) helix.
   D) sheet.
   E) turn.

9. The three-dimensional conformation of a protein may be strongly influenced by amino acid residues that are very far apart in sequence. This relationship is in contrast to secondary structure, where the amino acid residues are:
   A)always side by side.
   B)generally near each other in sequence.
   C)invariably restricted to about 7 of the 20 standard amino acids.
   D)often on different polypeptide strands.
   E)usually near the polypeptide chain's amino terminus or carboxyl terminus.

10. An allosteric interaction between a ligand and a protein is one in which:
    A) binding of a molecule to a binding site affects binding of additional molecules to the same site.
    B) binding of a molecule to a binding site affects binding properties of another site on the protein.
    C) binding of the ligand to the protein is covalent.
    D) multiple molecules of the same ligand can bind to the same binding site.
    E) two different ligands can bind to the same binding site.

注意：背面尚有試題

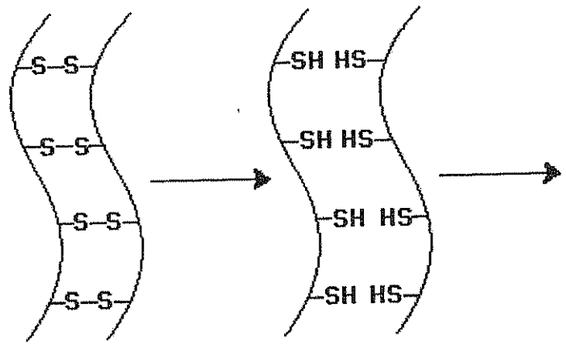
11. In hemoglobin, the transition from T state to R state (low to high affinity) is triggered by:
A) Fe^{2+} binding.
B) heme binding.
C) oxygen binding.
D) subunit association.
E) subunit dissociation.

12. Which of the following is *not* correct concerning 2,3-bisphosphoglycerate (BPG)?
A) It binds at a distance from the heme groups of hemoglobin.
B) It binds with lower affinity to fetal hemoglobin than to adult hemoglobin.
C) It increases the affinity of hemoglobin for oxygen.
D) It is an allosteric modulator.
E) It is normally found associated with the hemoglobin extracted from red blood cells.

13. Which of the following is *not* correct concerning cooperative binding of a ligand to a protein?
A) It is usually a form of allosteric interaction.
B) It is usually associated with proteins with multiple subunits.
C) It rarely occurs in enzymes.
D) It results in a nonlinear Hill Plot.
E) It results in a sigmoidal binding curve.

14. The amino acid substitution of Val for Glu in Hemoglobin S results in aggregation of the protein because of _____ interactions between molecules.
A) covalent
B) disulfide
C) hydrogen bonding
D) hydrophobic
E) ionic

15. The α-keratin chains indicated by the diagram below have undergone one chemical step. To alter the shape of the α-keratin chains—as in hair waving—what subsequent steps are required?



A)Chemical oxidation and then shape remodeling
B)Chemical reduction and then chemical oxidation
C)Chemical reduction and then shape remodeling
D)Shape remodeling and then chemical oxidation
E)Shape remodeling and then chemical reduction

16. Match these molecules with their biological roles.

(a) glycogen	__ viscosity, lubrication of extracellular secretions
(b) starch	__ carbohydrate storage in plants
(c) trehalose	__ transport/storage in insects
(d) chitin	__ exoskeleton of insects
(e) cellulose	__ structural component of bacterial cell wall
(f) peptidoglycan	__ structural component of plant cell walls
(g) hyaluronate	__ extracellular matrix of animal tissues
(h) proteoglycan	__ carbohydrate storage in animal liver
(i) DNA	__ a group of naturally occurring molecules of membrane
(j) lipid	__ a molecule encoding the genetic instructions