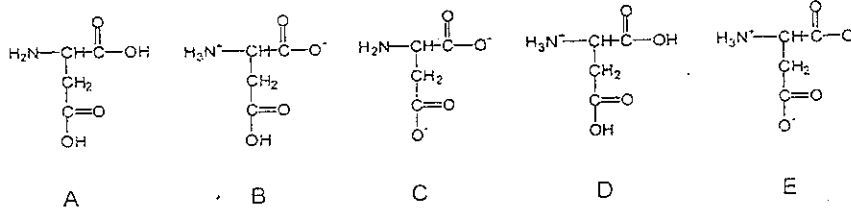


I. 單選題 (2% each, total 40%)

- Which amino acids would most likely reside in the membrane-anchoring domain of a membrane embedded protein?
 - Isoleucine, valine and phenylalanine
 - Phenylalanine, valine, and aspartate
 - Leucine, threonine, and lysine
 - Lysine, arginine and histidine
 - All of the above
- A substrate S can be degraded by two different isozymes (#1 and #2), both obeying Michaelis-Menten kinetics. The K_m for isozyme #1 is 0.1 mM and the corresponding value for isozyme #2 is 10 mM. Both isozymes have the same V_{max} . If $[S] = 5 \text{ mM}$, which of the following statements is correct?
 - Isozyme #1 will degrade S faster than isozyme #2.
 - Isozyme #2 will degrade S faster than isozyme #1.
 - Isozyme #1 will degrade S at a rate equal to half of its maximal velocity.
 - Isozyme #2 will degrade S at a rate equal to half of its maximal velocity.
 - Isozyme #2 will degrade S at its maximal velocity.

- Which of the following represents the predominant ionic species of aspartate at pH 11?



- The sequence of letters 'WYQN' will represent
 - Tryptophan, tyrosine, glutamic acid, asparagine
 - Tryptophan, tyrosine, glutamine, asparagine
 - Tryptophan, glutamine, tryptophan, asparagine
 - Glutamine, tyrosine, tryptophan, aspartic acid
- Hydrogen bonds in α -helices are
 - more numerous than van der Waals interactions
 - not present at Phe residues
 - analogous to the steps in a spiral staircase
 - roughly parallel to the helix axis
- Which reagent is best suited for cleavage of peptide bonds on the carboxyl side of methionines
 - Chymotrypsin
 - Phenyl isothiocyanate
 - CNBr
 - Trypsin
- Given a unireactant enzyme reaction where a plot of $1/v$ versus $1/[S]$ gives a straight line. It was found in three additional experiments each using a different inhibitor concentration that the lines were parallel. This is an example of:
 - competitive inhibition.
 - uncompetitive inhibition.
 - mixed inhibition.
 - a ping-pong reaction

8. The role of Asp 102 and His 57 during trypsin catalysis is to
- A) neutralize the charge on the other's side chain
 - B) keep the specificity pocket open
 - C) function as a proton shuttle
 - D) clamp the substrate into the active site
9. Gel-filtration chromatography separates on the basis of
- A) size and shape using porous beads packed in a column
 - B) size using porous beads packed in a column
 - C) shape using porous beads packed in a column
 - D) none of the above
10. The conformational changes of hemoglobin from the T to the R state is initiated by
- A) binding of oxygen to the heme
 - B) movement of the proximal histidine towards the heme
 - C) movement of the F-helix, which contains the proximal His
 - D) reorganization of protein-protein contacts between the individual subunits
11. The Hill coefficient (n_H) for myoglobin is ____; whereas n_H is about ____ for hemoglobin.
- A) 2.8; 1.0
 - B) 1.0; 2.8
 - C) 1.0; 4.0
 - D) 4.0; 1.0
 - E) None of the above choices are correct.
12. In hemoglobin, allosteric effects occur
- A) only in humans
 - B) for maintaining Fe in the Fe^{2+} state
 - C) to minimize oxygen delivery to the tissues
 - D) to maximize oxygen delivery to the tissues
13. The K_m is:
- A) The time for half of the substrate to be converted to product.
 - B) The time for all of the substrate to be converted to product.
 - C) The [S] that gives half of the maximum reaction rate.
 - D) The [S] that gives the maximum reaction rate.
 - E) The [P] that is produced when the enzyme is saturated with the substrate.
14. In isoelectric focusing, proteins are separated on the basis of their
- A) relative content of positively charged residue only
 - B) relative content of negatively charged residue only
 - C) relative content of positively and negatively charged residue.
 - D) size
15. Proteins are separated in an SDS-PAGE experiment on the basis of their
- A) positively charged side chains
 - B) molecular weight
 - C) negatively charged side chains
 - D) different isoelectric points
16. The three-dimensional structure of an enzyme in complex with its substrate was determined by X-ray crystallography. The structure revealed that a methionine residue in the active site of the enzyme is in close proximity to an isoleucine residue on a substrate. Which of the following would be the **predominant** interaction between these two amino acids?
- A) covalent bond
 - B) disulfide bond
 - C) hydrogen bond
 - D) ionic interaction
 - E) hydrophobic interaction

17. The pK_a of an amino acid's ionizable group can vary significantly in a protein:
- A) because hydrophobic residues are present in a protein
 - B) because neighboring functional groups can affect the stability of the ionized form.
 - C) because proteins are in aqueous solutions.
 - D) All of the above
18. Two types of β -pleated sheets can be called:
- A) parallel and antiparallel
 - B) left-handed and right-handed
 - C) Φ and Ψ
 - D) α and β
 - E) None of the Above
19. In the equation, $A = \epsilon bc$, what quantity is represented by " ϵ "?
- A) Absorbivity
 - B) Molar absorbivity
 - C) Path length
 - D) None of these
20. The pH of a solution is determined by
- A) concentration of salt
 - B) relative concentration of acids and bases
 - C) dielectric constant of the medium
 - D) environmental effect.

II. 問答題(60%)

1. What sequences are required in an expression vector (for use with *E. coli*), but are not essential in a cloning plasmid? (8%)
2. Describe two major routes to produce NADPH in mammals. (6%)
3. What is the chemiosmotic model, proposed by Peter Michell, for ATP synthesis in oxidative phosphorylation? (5%)
4. Gluconeogenesis and glycolysis are not identical pathways running in opposite directions, although they do share several steps; 7 of the 10 enzymatic reactions of gluconeogenesis are the reverse of glycolytic reactions. List the three bypass reactions that are used in gluconeogenesis, but not used in glycolysis. (6%)
5. Briefly outline the steps of fatty acid β -oxidation. (6%)
6. List the five coenzymes that are required for the oxidative decarboxylation of pyruvate and α -ketoglutarate. (5%)
7. Why is it important to recycle NADH produced during glycolysis to NAD^+ ? (6%)
8. In type I diabetes mellitus, glucose uptake into myocytes and adipocytes is failed. Why? (6%)
9. The citric acid cycle begins with the condensation of acetyl-CoA with oxaloacetate. Describe three possible sources for the acetyl-CoA. (6%)
10. What is the function of the acidic environment in the stomach? (6%)