

Part I 單選題，每題兩分 ※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. To possess optical activity, a compound must be:
 - (A) a carbohydrate.
 - (B) a hexose.
 - (C) asymmetric.
 - (D) colored.
 - (E) D-glucose.
2. A major component of RNA but not of DNA is:
 - (A) adenine.
 - (B) cytosine.
 - (C) guanine.
 - (D) thymine.
 - (E) uracil.
3. In the Watson-Crick model for the DNA double helix (B form), the A-T and G-C base pairs share which one of the following properties?
 - (A) The distance between the two glycosidic (base-sugar) bonds is the same in both base pairs, within a few tenths of an angstrom.
 - (B) The molecular weights of the two base pairs are identical.
 - (C) The number of hydrogen bonds formed between the two bases of the base pair is the same.
 - (D) The plane of neither base pair is perpendicular to the axis of the helix.
 - (E) The proton-binding groups in both base pairs are in their charged or ionized form.
4. Which of the following does *not* apply to the construction or use of a DNA library?
 - (A) Determining the location of a particular DNA sequence in a DNA library requires a suitable hybridization probe.
 - (B) Genomic libraries are better for expressing gene products than cDNA libraries.
 - (C) Many segments of DNA from a cellular genome are cloned.
 - (D) Specialized DNA libraries can be made by cloning DNA copies of mRNAs.
 - (E) The DNA copies of mRNA found in a cDNA library are made by reverse transcriptase.
5. Which vitamin is derived from cholesterol?
 - (A) A
 - (B) B₁₂
 - (C) D
 - (D) E
 - (E) K
6. The shortest α helix segment in a protein that will span a membrane bilayer has about _____ amino acid residues.
 - (A) 5
 - (B) 20
 - (C) 50
 - (D) 100
 - (E) 200

見背面

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7. Which of the following statements concerning receptor enzymes is correct?
- (A) They are not usually membrane-associated proteins.
 - (B) They contain an enzyme activity that acts upon a cytosolic substrate.
 - (C) They contain an enzyme activity that acts upon the extracellular ligand.
 - (D) They have a ligand-binding site on the cytosolic side of the membrane.
 - (E) They have an active site on the extracellular side of the membrane
8. Glycolysis is the name given to a metabolic pathway occurring in many different cell types. It consists of 11 enzymatic steps that convert glucose to lactic acid. Glycolysis is an example of:
- (A) aerobic metabolism.
 - (B) anabolic metabolism.
 - (C) a net reductive process.
 - (D) fermentation.
 - (E) oxidative phosphorylation.
9. Which one of the following enzymatic activities would be decreased by thiamine deficiency?
- (A) Fumarase
 - (B) Isocitrate dehydrogenase
 - (C) Malate dehydrogenase
 - (D) Succinate dehydrogenase
 - (E) α -Ketoglutarate dehydrogenase complex
10. Which of these is able to cross the inner mitochondrial membrane?
- (A) Acetyl-CoA
 - (B) Fatty acyl-carnitine
 - (C) Fatty acyl-CoA
 - (D) Malonyl-CoA
 - (E) None of the above can cross.

Part II 問答題，分數標示於各題 ※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

11. Please describe how PCR work and what happens if excess template DNA is used. (5%)
12. Please describe how and why the oligosaccharide chains in glycoproteins can modify the protein structure and functions. (5%).
13. The key enzyme in a metabolic pathway is usually regulated in many ways. For example, HMG-CoA reductase in the biosynthesis of cholesterol can be regulated in transcriptional levels or protein levels. Please describe these regulations in general. (10%)
14. Describe the details of the 4 general types of "signal transducers" (or receptors). The cellular locations of these transducers/receptors are related to the chemical nature, hydrophilic or hydrophobic, of the ligands or signals. Please discuss this issue. (10%)
15. Please draw the molecular structure of the pentapeptide "PNSKV" in the two-dimensional representation of Fisher projection. (5%)

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16. Some neurotransmitters or biological amines are derived from the decarboxylation of amino acids. Which amino acids are the precursors for the biosynthesis of (A) dopamine, (B) γ -aminobutyrate (GABA), (C) histamine, (D) serotonin, and (E) epinephrine. (5%)
17. Please select (pick out) the aspartic proteases and cysteine proteases, respectively, from the enzymes listed below. (5%)
(A) Alanine aminopeptidase, (B) Pepsin, (C) Caspase 1, (D) Renin, (E) Elastase, (F) Thrombin, (G) Trypsin, (H) HIV-1 protease, (I) Carboxypeptidase A, (J) Papain
18. Please describe how the muscle glycogen phosphorylase is regulated by the enzymatic cascades of reversible phosphorylation in response to the stimulation of glucagon. (5%)
19. Biochemists use equilibrium dissociation constant K_D to describe the binding affinity of a protein to its ligand and use Michaelis constant K_M to describe the binding affinity of an enzyme to its substrate. What are the definitions of K_D and K_M , respectively? (5%)
20. What are the enzymes inhibited by the medical agents or drugs listed below. (5%)
(A) Fluorouracil, (B) Methotrexate, (C) Acetaminophen, (D) Oseltamivir, (E) Nirmatrelvir in Paxlovid.
21. Please use hemoglobin as the example to describe the biochemical terms listed below. (10%)
(A) prosthetic group. (B) allosteric regulation. (C) protein quaternary structure. (D) protein isoform. (E) substrate analog inhibitor.
22. Please discuss why the deficiency or dysfunction in amino acid and sugar metabolisms may affect the *de novo* biosynthesis of purines and pyrimidines? (10%)

試題隨卷繳回