

考生注意事項：所有考題務必在答案卷上作答。凡在問題卷上作答者無效。

一、選擇題(均為單選，每題1分，答錯倒扣0.25分)

1. Which of the following is NOT needed in the biosynthesis of heme?

- A. ALA synthase
- B. Glycine
- C. Alanine
- D. Succinyl CoA
- E. Pyridoxal phosphate

2. Iron overload:

- A. occurs in a deficiency of ferroxidase I.
- B. might be caused by the ingestion of iron chelators.
- C. occurs in patients with gastrointestinal bleeding.
- D. might be caused by the ingestion of large amounts of iron along with alcohol.
- E. would be accompanied by an increase in total serum transferrin.

3. Cyclic AMP

- A. is synthesized in vivo from ATP by soluble, cytoplasmic adenylate cyclase.
- B. can cause the activation or deactivation of specific proteins by stimulation their phosphorylation.
- C. binds the catalytic subunit of the hormone receptor.
- D. levels are decreased by inhibiting the cyclic AMP phosphodiesterase.
- E. activates protein kinase A by binding the catalytic subunit of the kinase.

4. Plasma  $Ca^{2+}$

- A. is directly proportional to plasma phosphate concentration.
- B. decreases in response to calcitonin secretion.
- C. is deposited in bone under the influence of vitamin D.
- D. is mostly bound to plasma proteins.
- E. decreases in response to parathyroid hormone (PTH).

5. The mediation of a hormonal signal by cAMP is an example of

- A. negative feedback.
- B. endocytosis.
- C. exocytosis.
- D. transduction.
- E. steroidogenesis.

二、選擇題(每題2分，答錯倒扣0.5分)

Answer questions 6-7 according to the following key.

- A. If 1, 2 and 3 are correct
- B. If 1 and 3 are correct
- C. If 2 and 4 are correct
- D. If only 4 is correct
- E. If all are correct

6. Glycogen

- 1. contains  $\beta$ -[1--6] glycosidic linkages.
- 2. is composed entirely of glucosyl residues.
- 3. contains  $\beta$ -[1--4] glycosidic linkages.
- 4. contains  $\alpha$ -[1--4] glycosidic linkages.

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7. Both electrons and protons are involved in the reduction of

1. FMN.
2. cytochrome a
3. coenzyme Q.
4. FeS.

三簡答題

8.(4%) What are the chemical properties of proteoglycans? Give an example of proteoglycans.

9. (6%) Draw the mitochondrial electron transport chain. What are the effects of A. cyanide and B. antimycin A on the oxidation-reduction states of each electron carrier component in respiring mitochondria.

10. (6%) Give the following data:

	$E_o'$ (voets)
NADH/NAD <sup>+</sup>	-0.32
$\frac{1}{2}O_2/H_2O$	+0.82
ADP+Pi ---> ATP	$\Delta G^{\circ} = +7.3$ kcal/mole

Calculate the  $\Delta G^{\circ}$  and the percentage efficiency of energy conservation in ATP during the transfer of a pair of electrons from the NADH/NAD<sup>+</sup> couple to molecule oxygen by intact mitochondria. ( $F=23.062$  kcal/V.mol)

11. (5%) The following reagents are often used in protein chemistry:

CNBr	Dansyl chloride
Fluorescamine	Guanidinium chloride
$\beta$ -Mercaptoethanol	Ninhydrin
Trypsin	Phenylisothiocyanate
Performic acid	6 N HCl
Chymotrypsin	None of the above

Which one is the best suited for accomplishing each of the following tasks?

- a. Cleavage of peptide bonds on the carboxyl side of methionines.
- b. Hydrolysis of peptide bonds on the amino side of lysine and arginine residues.
- c. Reversible denaturation of a protein.
- d. Identification of the amino-terminal residue of a peptide.
- e. Cleavage of disulfide bonds in proteins by oxidation.

12. (2%) What is the ratio of base to acid at pH 5,6 and 7 for an acid with a pK of 6?

13. (3%) Ethyleneimine reacts with cysteine side chains in proteins to form S-aminoethyl derivatives.

- a. The peptide bonds on the carboxyl side of these modified cysteine residues are susceptible to hydrolysis by which enzyme?
- b. Why?

14. (4%) A drop of a solution containing a mixture of glycine, phenylalanine, aspartic acid, glutamic acid, lysine and arginine was placed in the center of a paper strip and dried. The paper was moistened with a buffer of pH6.0 and an electric current was applied to the ends of the strip.

- a. Which amino acid(s) moved toward the anode?
- b. Which amino acid(s) moved to the cathode?

15. (6%) Name three factors which would affect the oxygen saturation curve of hemoglobin. Indicate in each case whether the curve will be shifted to the right or left. Explain your answers briefly.

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16. (5%) Explain the difference in melting points between oleic acid (cis- $\Delta^9$ -Octadecenoate) and stearic acid (n-Octadecanoate).
17. (5%) What is the major component of membrane? By what nature it forms bilayered?
18. (5%) Match the lipoproteins with which each of the following lipids is carried.
- A. Dietary triacylglycerols.  
B. Endogenous triacylglycerols.  
C. Endogenous cholesterol esters.
- HDL \_\_\_\_\_
- LDL \_\_\_\_\_
- IDL \_\_\_\_\_
- VLDL \_\_\_\_\_
- Chylomicron \_\_\_\_\_
19. (2%) Order the DNA molecules shown below from highest to lowest melting temperature. In each case only one of the complementary strand is given.
1. ATATATATGCCG    2. AGGAGGAGGAGG    3. GCAGATAATTAT    4. ATTATAATGAT
20. (2%) What is defining feature of a plasmid?
21. (3%) a. What is the role of DNA methylases in bacteria?  
b. Suggest why methylation might be expected to occur near the replication fork.
22. (5%) The following hypothetical RNA is a primary precursor transcript made in a eukaryotic nucleus, and its synthesis is inhibited by low levels of  $\alpha$ -amanitin.
- 5'-pppAUUAUGCCGAUAAGGUAAGUA-(N<sub>50</sub>)-AUCUCCCU  
GCAGGGCGUAACCAUAAACGACGACGACGUCCC-3'-OH
- Indicate the final processed RNA found in the cytoplasm, and point out important features.
23. (5%) Explain the strategy of chain-terminator(enzymatic) method in the sequencing of DNA. Use template  
3'-CCGGTAGCAACTTTF5' as an example.
24. (3%) Give an example, briefly describe constitutive mutant and superrepressed mutant.
25. (5%) Give diagrammatic outlines of ping-pong mechanism and sequence ordered mechanism and brief discussion the differences between these two enzyme catalytic mechanisms.
26. (5%) Draw the active site structure of serine proteases. And briefly describe the function of each amino acid in enzyme catalytic reaction.
27. (5%) Describe the relationship between Michaelis-Menten constant  $K_m$  and dissociation constant ( $K_d$ ) for the enzyme-substrate complex.
28. (5%) Describe major functions of vitamin C in mammals.