請依題號順序於答案卷上作答，未依題序作答不予計分。
※ 請勿在本試題紙上作答，否則不予計分。

I. True or False (1 point each, 1-20)

1. ( ) Beta-pleated sheets have more elasticity than alpha-helices.
2. ( ) Proteases generally belong to the class of enzymes known as hydrolases.
3. ( ) The coenzyme nicotinamide dinucleotide (NAD^+ is generally involved in transfers of 3 electrons.
4. ( ) Enzyme assistance of intracellular protein folding is known as esterase.
5. ( ) Hydrophobic groups are more likely to be found in the surface of a protein.
6. ( ) If a hemoglobin mutation in located on the subunit interface of the beta-subunit, the protein is likely to have most effective allosteric signaling or aggregation problems.
7. ( ) Serine is the most likely target for covalent modification in an enzyme that is regulated by a specific protein kinase/protein phosphatase pair.
8. ( ) Hydrogen bond is noncovalent bond that is mainly responsible for stabilizing secondary structures in proteins.
9. ( ) α-D glucose is the anomer of β-D Galactose.
10. ( ) Valine and lysine are the only exclusively ketogenic amino acids.
11. ( ) Free ribosomes and membrane-bound ribosomes are identical in ribosomal protein composition.
12. ( ) Docking of a transport vesicle on its target membrane and fusion of the two membranes are two distinct and separable processes.
13. ( ) Endocrine signaling does not require specific receptors.
14. ( ) Km = [S] when 1/v = 1/[S].
15. ( ) Competitive inhibition is defined by changes in K_m and V_{max}.
16. ( ) Nuclear receptors utilize small peptide hormones as ligands.
17. ( ) All the molecules that enter early endosomes ultimately reach late endosomes where they become mixed with newly synthesized acid hydrolyases and end up in lysosomes.

(背面仍有題目,請繼續作答)

18. ( ) Different signaling pathways coexist in the same cell, but they are completely independent of each other.

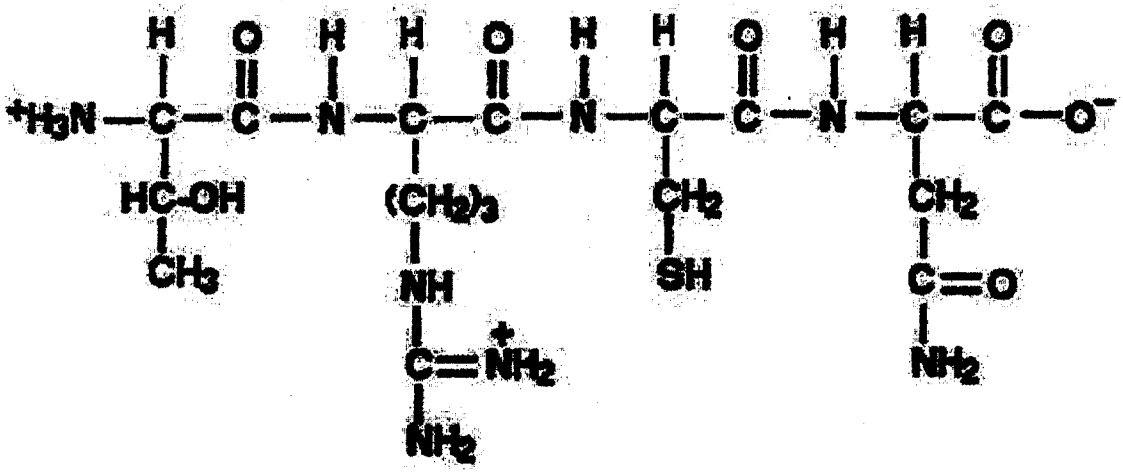
19. ( ) Albumin binds free fatty acids for transport through the blood stream.

20. ( ) Vitamin B_{12} contains copper.

II. Question with brief answer. (21-26)

21. The structure of a tetrapeptide is shown below in the form that would predominate at **pH 7.0**.

<作答前 請先將下圖描繪於答案卷上>



a. What is the sequence of the peptide? (Use full names, 3-letter, and 1-letter abbreviations.) (6 points)

b. Label the **N-terminal** and **C-terminal** ends of the peptide individually. (4 points)

c. With **labeled** arrows ( ), indicate (6 points)

c-1) one peptide bond (label **only** one)

c-2) bonds whose rotations change the (phi) and (psi) angles. **Label only 1 bond as (phi) and 1 bond as (psi).**

d. Circle **6 atoms** that are coplanar (all 6 atoms in the same plane). Circle only **ONE** group of 6 atoms; you have several correct choices. **Do NOT include any R group (side chain) atoms.** (4 points)

22. The bicarbonate ion can be converted to CO_2 and water in acidic solution by the catalytic action of carbonic anhydrase. For this reaction, $K_m = 2.6 \times 10^{-2}$ M and $V_{max} = 0.4$ moles/min at 1 mM enzyme concentration.

    a. Sketch the expected Michaelis-Menten plot for this reaction. Label the axes and indicate K_m and V_{max} on the plot. (5 points)
    b. Sketch the expected Lineweaver-Burke plot. Again, label the axes and indicate K_m and V_{max} on the plot. (5 points)

23. Answer below questions.

    a. When glucose labeled with ^{14}C at C1 is incubated with cell–free extracts capable of glycolysis, where does the label appear in pyruvate? Please draw the labeled ^{14}C in pyruvate. (3 points)
    b. Consider the fate of pyruvate labeled with in each of the following positions: carbon 1 (methyl), carbon 2 (carbonyl), and carbon 3 (carboxyl). Predict the fate of each labeled carbon during one run of the citric acid cycle. (3 points)
    c. Which carbon or carbons of glucose, if metabolized via glycolysis and the citric acid cycle, would be the most rapidly lost as CO_2? (3 points)

24. How does the inhibition of HMG-CoA reductase affect lipid metabolism (3 point)? A cholesterol lowering drug is named Statin. How does Statin affect lipid metabolism? (2 points)

25. For each cycle turn how many NADH, $FADH_2$, and GTP does the citric acid cycle produce (2 points)? Also, pleases briefly describe how does the acetyl CoA enter the pathway (3 points).

26. Why is more energy available from oxidation of stored fatty acids than from oxidation of an equivalent weight of carbohydrates? Please write down its reason. (3 points)

III. Choose the best answer (2 points each) **and give an explanation** (3 points each).

27. The most important positive allosteric effector of glycolysis in the liver is

    a. citrate.
    b. AMP.
    c. fructose 2,6-bisphosphate.
    d. glucose 6-phosphate.
    e. ATP.

（背面仍有題目，請繼續作答）

Answer: ( )

Explanation:

28. The net ATP production from lactate fermentation of glucose is

a. 4.
b. 20.
c. 2.
d. 8.
e. 10.

Answer: ( )

Explanation:

29. Each cycle of β-oxidation in the degradation of palmitate yields. Briefly explain the β-oxidation.

a. 1 NADH, 1 $FADH_2$
b. 2 NADH and 2 $FADH_2$
c. 1 ATP and 1 GTP
d. 1 NAD^+
e. 2 $FADH_2$

Answer: ( )

Explanation:

30. Which one of the following substances can only participate in the electron transfer reactions involving the transfer of a single electron? Please briefly explain the respiratory electron-transport chain.

a. NAD^+
b. Cytochrome *c*
c. Coenzyme Q
d. FAD
e. NADH

Answer: ( )

Explanation:

IV. Choose the best answer. (2 points each)

31. Which of the following enzymes is NOT a part of the urea cycle?

a. arginase
b. ornithine transcarbamoylase
c. argininosuccinyl synthetase
d. ornithine decarboxylase
e. carbamoyl phosphate synthetase I

32. The product of glycolysis may be either lactate or pyruvate, depending on

a. the rate of glycolysis.
b. oxygen availability.
c. the mitochondrial supply of NADH.
d. the presence of pyruvate dehydrogenase.
e. ATP availability.

33. Which one of the following statements is true?

a. Oxidative phosphorylation occurs on the outer mitochondrial membrane.
b. Cristae are found on the outer mitochondrial membrane.
c. The TCA cycle occurs mainly in the mitochondrial matrix.
d. The glycolysis occurs mainly in the mitochondrial matrix.
e. The mitochondrial ATP synthetase is located on the outer membrane, and releases ATP into the cytosol.

34. The effect of a high carbohydrate diet on the intracellular levels of the fatty acid synthase complex is believed to be mediated by:

a. increased degradation of fatty acid synthase.
b. feedback inhibition.
c. a cAMP-mediated phosphorylation/dephorylation regulatory mechanism.
d. increased synthesis of fatty acid synthase.
e. decreased synthesis of fatty acid synthase.