

系所組別： 口腔醫學研究所甲組

考試科目： 生物化學

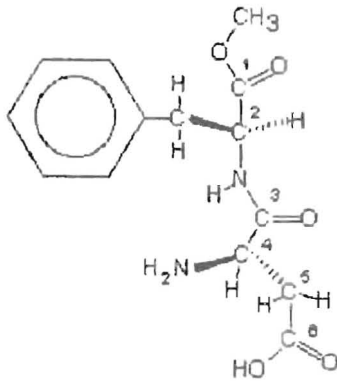
考試日期：0220，節次：2

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一、 選擇題，每題 3 分，共 60 分，所有考題務必在答案卷上作答。

1. Which of the following best illustrates hydrophobic forces that stabilize the conformation of some proteins?
- the formation of  $\beta$ -pleated sheets.
  - the formation of  $\alpha$ -helices.
  - the unfolding of proteins at low pH.
  - heat denaturation of globular proteins.
  - clustering of nonpolar amino acid side chains in the interior of globular proteins.

Use this structure and the numbering system to answer questions 2-4



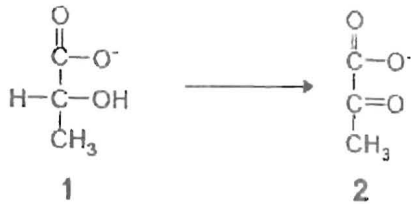
2. Which numbered carbon is directly linked in a peptide bond?
- 1
  - 2
  - 3
  - 4
  - 5
3. This molecule, containing naturally occurring amino acids, is in which optical configuration?
- D, D
  - D, L
  - L, D
  - L, L
4. At pH 10 (common pH of soda) what would be the charge of this molecule?
- +2
  - +1
  - 0
  - 1
  - 2

(背面仍有題目,請繼續作答)

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5. In the reaction drawn above, what has happened to molecule 1 to convert it to molecule 2?
- Phosphorylation
  - Oxidation
  - Dehydration
  - Isomerization
  - Reduction
6. For the reaction drawn above, what type of enzyme would carry out this reaction?
- Dehydrogenase
  - Kinase
  - Hydrolase
  - Isomerase
  - Epimerase
7. A common practice of competitive short-distance runners is to breathe rapidly and deeply for about half a minute before running in a 100-meter dash. The purpose of this hyperventilation is to achieve:
- Metabolic Acidosis
  - Metabolic Alkalosis
  - Respiratory Acidosis
  - Respiratory Alkalosis
  - Acid-base Normalcy
8. 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.
9. Following a carbohydrate rich meal, which of the following would correctly describe the metabolic state of your cells?
- The pyruvate dehydrogenase (PDH) complex would be phosphorylated and inactive
  - Glycogen phosphorylase would be phosphorylated and inactive
  - Fructose 2,6-bisphosphate will be increased and fructose 1,6-bisphosphatase (FBP1) will be inactive
  - Pyruvate carboxylase will be active
  - The TCA (tricarboxylic acid cycle) enzyme malate dehydrogenase will favor the production of malate

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10. One enzyme of the glycolytic pathway is regulated by feed forward activation. Which of the following pairs listed below gives the correct enzyme and the regulatory intermediate?

Enzyme	Intermediate
A) phosphofructokinase	glucose 6-phosphate
B) hexokinase	2-phosphoglycerate
C) pyruvate kinase	fructose 1,6-bisphosphate
D) phosphoglycerate kinase	fructose 2,6-bisphosphate
E) glyceraldehyde 3-phosphate dehydrogenase	fructose 6-phosphate

11. A red blood cell (RBC) requires a constant supply of NADPH and energy from the glucose entering the cell. Which of the following lists three enzymes necessary to meet the RBC's needs?

- A) Hexokinase, transketolase, fructose 1,6-bisphosphatase
- B) Glucose 6-phosphate dehydrogenase, pyruvate carboxylase, phosphoglycerate kinase
- C) Phosphoglycerate mutase, transaldolase, phosphoenolpyruvate carboxykinase
- D) Phosphoglucomutase, glucose 6-phosphate dehydrogenase, glyceraldehyde 3-phosphate dehydrogenase
- E) Glucose 6-phosphate dehydrogenase, 6-phosphogluconate dehydrogenase, phosphoglycerate kinase

12. Which of the following situations would result in an increase in ketone body synthesis?

- A) High insulin/glucagon ratio
- B) High citrate levels in the cytosol
- C) High levels of fructose 2,6-bisphosphate
- D) Low oxaloacetate levels in the mitochondria
- E) Low acetyl CoA levels in the mitochondria

13. Which of the following statements regarding both sphingomyelin and phosphatidylcholine is correct?

- A) Both are synthesized from ceramide.
- B) Both contain 2 fatty acids linked via ester bonds.
- C) Both contain choline as part of their polar headgroups.
- D) Phosphatidylcholine is a membrane lipid, but sphingomyelin is used for fuel storage.
- E) Phosphatidylcholine contains a phosphate group, but sphingomyelin does not.

14. Methotrexate and 5-fluorouracil are both used for cancer chemotherapy. What would result if both drugs were used simultaneously?

- A) The effects of the two drugs would cancel each other out.
- B) Both drugs would directly inhibit purine nucleotide biosynthesis.
- C) Both drugs would directly inhibit pyrimidine nucleotide biosynthesis.
- D) The drugs would directly block synthesis of all deoxyribonucleotides.
- E) The combined effect would be to dramatically inhibit thymidylate synthase.

15. Which of the following statements concerning receptor enzymes is correct?

- A) They contain an enzyme activity that acts upon the extracellular ligand.
- B) They contain an enzyme activity that acts upon a cytosolic substrate.
- C) They have an active site on the extracellular side of the membrane.
- D) They have a ligand-binding site on the cytosolic side of the membrane.
- E) They are not usually membrane-associated proteins.

(背面仍有題目,請繼續作答)

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16. According to the current model for HIV infection, which of the following is not involved in the process of membrane fusion?
- A) a cell surface receptor protein
  - B) a cell surface co-receptor protein
  - C) a viral glycoprotein complex
  - D) the viral chromosome
  - E) the viral envelope
17. The fluidity of a lipid bilayer will be increased by:
- A) increasing the temperature.
  - B) decreasing the temperature.
  - C) increasing the length of the alkyl chains.
  - D) decreasing the number of unsaturated positions.
  - E) increasing the number of saturated positions.
18. Double-stranded regions of RNA:
- A) do not occur.
  - B) can be observed in the laboratory, but probably have no biological relevance.
  - C) can form between two self-complementary regions of the same single strand of RNA.
  - D) have the two strands arranged in parallel (unlike those of DNA, which are antiparallel).
  - E) are less stable than double-stranded regions of DNA.
19. The type of motion least common in biological membranes is:
- A) flip-flop diffusion of phospholipid from one monolayer to the other.
  - B) lateral diffusion of individual lipid molecules within the plane of each monolayer.
  - C) lateral diffusion of membrane proteins in the bilayer.
  - D) random motion of the fatty acyl side chains in the interior of the phospholipid bilayer.
20. You attempt deletion mapping of a part of the promoter region of a particular gene. You remove a short sequence of nucleotides. Once the altered DNA is transfected into cells, the cells are able to transcribe the transfected DNA in a normal fashion. What do you conclude?
- A) The sequence that was removed is an essential part of the promoter.
  - B) The sequence that was removed is not an essential part of the promoter.
  - C) The sequence that was deleted is an important determinant of the ability to transcribe the gene.
  - D) The deleted sequence has a moderate level of importance in promoting transcription.
  - E) None of the above

二、回答下列問題，每題 10 分，共 40 分所有考題務必在答案卷上作答。

1. What is RNAi (RNA interference) and how it works?
2. Describe the necessary steps for producing a functional protein in the laboratory given its sequence.
3. Compare the two research fields referred to as "genomics" and "functional genomics" with respect to the biological information that is being targeted and the experimental techniques.
4. Describe DNA methylation and its role in transcription regulation and gene silencing.