

科目：生物化學

適用：應化系

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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一、單選題：(48% total, 4% each)

1. What is the complementary nucleic acid sequence for the DNA sequence 5'-GAC TAC GTT AGC-3'?
  - A) 3'-GAC TAC GTT AGC-5'                      B) 3'-TCA GCA TGG TTA-5'
  - C) 3'-CGA GTG CAT TAG-5'                      D) 3'-CTG ATG CAA TCG-5'
  - E) 3'-GCG AAG GGG CTG-5'
2. Which of the following statements are true about starch?
  - I. The monomer is glucose.
  - II. The monomers are fructose and glucose.
  - III. It is a condensation polymer.
  - IV. It is an addition polymer.
  - V. It is the main carbohydrate reservoir in animals.
  - VI. It is the main carbohydrate reservoir in plants.
  - A) I, III, IV, V                      B) I, III, VI                      C) I, IV, V                      D) II, IV, VI                      E) none of these
3. When heat is added to proteins, the hydrogen bonding in the secondary structure breaks apart. What are the algebraic signs of  $\Delta H$  and  $\Delta S$  for the denaturation process?
  - A) Both  $\Delta H$  and  $\Delta S$  are positive.                      B) Both  $\Delta H$  and  $\Delta S$  are negative.
  - C)  $\Delta H$  is positive and  $\Delta S$  is negative.                      D)  $\Delta H$  is positive and  $\Delta S$  is 0.
  - E)  $\Delta H$  is negative and  $\Delta S$  is positive.
4. Which statement is true?
  - A) Nucleic acids are made of nucleotides joined together with amide bonds.
  - B) Fats are polymers composed of monomers called monosaccharides.
  - C) Messenger RNA can be found in both the nucleus and the cytoplasm of each cell.
  - D) all of these                      E) none of these
5. Enzymes are catalysts. They increase the rate of chemical reactions by:
  - A) raising the activation energy                      B) stabilizing the product
  - C) temporarily increasing the temperature                      D) covalently binding the substrate
  - E) stabilizing the transition state
6. Allosteric enzymes are large, oligomeric proteins that have catalytic sites for binding substrates and regulatory sites that bind effectors. The separate oligomers influence one another; they work cooperatively. This is evidenced by the characteristic rate curves for allosteric enzymes which have:

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- A) concerted kinetics  
C) Michaelis-Menten kinetics  
E) sigmoidal kinetics
- B) hyperbolic kinetics  
D) regulatory kinetics
7. The levels of  $\text{Na}^+$  and  $\text{K}^+$  in a cell are maintained by the  $\text{Na}^+-\text{K}^+$  ATPase pump. This pump:  
A) creates ATP  
B) pumps  $\text{K}^+$  and  $\text{Na}^+$  in  
C) is an example of active transport across a membrane.  
D) requires light absorption  
E) Is an example of symport.
8. Polymerase chain reaction (PCR)  
A) amplifies all DNA  
B) requires ddNTPs  
C) takes several days to complete  
D) extends DNA off the 3' end of the primers  
E) requires RNA primers just like DNA polymerase
9. The most commonly transferred group in biochemistry is:  
A) phosphoryl group  
B) methyl group  
C) aldehyde
10. Which of the following statements is not true of glycolysis?  
A) Glucose is transformed into pyruvate.  
B) It requires  $\text{O}_2$  and the final product is  $\text{CO}_2$ .  
C) It takes place mainly in cytoplasm.  
D) It can take place by anaerobic metabolism.  
E) It is utilized by both aerobic and anaerobic organisms.
11. For entry into the citric acid cycle, pyruvate must first be converted to acetyl CoA by the pyruvate dehydrogenase complex. This multienzyme complex has three cofactors. All of the following are advantages of a multienzyme complex except:  
A) Increased efficiency  
B) Concentration of catalysis in one location  
C) Protection of intermediates  
D) Prevents unwanted side reactions  
E) No need for pyruvate to enter mitochondria
12. What is the role of tetrahydrofolate and S-adenosyl methione?  
A) The transfer of electrons.  
B) The transfer one-carbon units.  
C) Both act as reductants.  
D) They are important in feedback inhibition.  
E) They provide the "R" group for methionine.

二、簡答題：(52%)

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1. Differentiate between the followings: (40% total, 8% each)

- (a) primary, secondary and tertiary structure of proteins.
- (b) competitive and noncompetitive inhibition
- (c) cofactors, coenzymes and prosthetic groups
- (d) DNA -directed and RNA-directed DNA polymerases.
- (e) transcription and translation

2. The following reagents are useful for characterizing proteins. Describe how each can be used and what information is obtained. ( 12% total, 4% each)

(a) 6 M HCl

(b) Trypsin

(c) SDS

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