

臺灣綜合大學系統 112 學年度學士班轉學生聯合招生考試試題

科目名稱	生物化學	類組代碼	C07
		科目碼	C0701
※本項考試依簡章規定所有考科均「不可」使用計算機。		本科試題共計 5 頁	
<p>A. Multiple choice question (50%, 2% each; one correct answer only) 請於答案卡上作答，否則不予計分。</p> <p>1. Which of the following is not reducing sugar? A) Fructose B) Glucose C) Glyceraldehyde D) Ribose E) Trehalose</p> <p>2. The reference compound for naming D and L isomers of sugars is: A) fructose. B) glucose. C) sucrose. D) ribose. E) glyceraldehyde.</p> <p>3. The alkaline hydrolysis of RNA does not produce: A) 2' -CMP. B) 2' ,3' -cGMP. C) 2' - AMP. D) 3' ,5' -cAMP. E) 3' -UMP.</p> <p>4. Chargaff's rules state that in typical DNA: A) A = G. B) A = C. C) A = U. D) T + C = G + A. E) T + G = C + A.</p> <p>5. The conversion of 1 mol of fructose 1,6-bisphosphate to 2 mol of pyruvate by the glycolytic pathway results in a net formation of: A) 1 mol of NAD⁺ and 2 mol of ATP. B) 1 mol of NADH and 1 mol of ATP. C) 2 mol of NADH and 4 mol of ATP. D) 2 mol of NADH and 2 mol of ATP. E) 2 mol of NAD⁺ and 4 mol of ATP.</p> <p>6. Which of the following substrates <i>cannot</i> contribute to net gluconeogenesis in mammalian liver? A) Lysine B) glutamate C) alanine D) pyruvate E) α-ketoglutarate</p>			

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<p>7. Of the 20 standard amino acids, only _____ is not optically active. The reason is that its side chain _____.</p> <p>A) alanine; is a simple methyl group B) glycine; is a hydrogen atom C) glycine; is unbranched D) lysine; contains only nitrogen E) proline; forms a covalent bond with the amino group</p>			
<p>8. Two amino acids of the standard 20 contain sulfur atoms. they are</p> <p>(A) cysteine and serine (B) cysteine and threonine (C) methionine and cysteine (D) methionine and serine (E) threonine and serine</p>			
<p>9. Which of the following statements about aromatic amino acids is correct?</p> <p>A) All are strongly hydrophilic. B) Histidine's ring structure results in its being categorized as aromatic or basic, depending on pH. C) On a molar basis, tryptophan absorbs more ultraviolet light than tyrosine. D) The major contribution to the characteristic absorption of light at 280 nm by proteins is the phenylalanine R group. E) The presence of a ring structure in its R group determines whether or not an amino acid is aromatic.</p>			
<p>10. The formation of a peptide bond between two amino acids is an example of a(n) _____ reaction.</p> <p>A) cleavage B) condensation C) group transfer D) isomerization E) oxidation reduction</p>			
<p>11. Prosthetic groups in the class of proteins known as glycoproteins are composed of :</p> <p>A) carbohydrates B) flavin nucleotides C) lipids D) Metals E) phosphates</p>			
<p>12. All of the following are considered "weak" interactions in proteins, except :</p> <p>(A) hydrogen bonds (B) hydrophobic interactions (C) ionic bonds (D) peptide bonds (E) van der Waals forces</p>			

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<p>13. Pauling and Corey's studies of the peptide bond showed that:</p> <p>A) at pH 7, many different peptide bond conformations are equally probable. B) peptide bonds are essentially planar, with no rotation about the C—N axis. C) peptide bonds in proteins are unusual, and unlike those in small model compounds. D) peptide bond structure is extraordinarily complex. E) primary structure of all proteins is similar, although the secondary and tertiary structure may differ greatly.</p> <p>14. In hemoglobin, the transition from T state to R state (low to high affinity) is triggered by:</p> <p>A) Fe²⁺ binding. B) heme binding. C) oxygen binding. D) subunit association. E) subunit dissociation.</p> <p>15. The predominant structural feature in myosin molecules is:</p> <p>A) a β structure. B) an α helix. C) the Fab domain. D) the light chain. E) the meromyosin domain.</p> <p>16. The interactions of ligands with proteins:</p> <p>A) are relatively nonspecific. B) are relatively rare in biological systems. C) are usually irreversible. D) are usually transient. E) usually result in the inactivation of the proteins.</p> <p>17. Amino acid residues commonly found in the middle of β turn are:</p> <p>A) Ala and Gly. B) hydrophobic. C) Pro and Gly. D) those with ionized R-groups. E) two Cys.</p> <p>18. Which one of the following statements is true of enzyme catalysts?</p> <p>A) Their catalytic activity is independent of pH. B) They are generally equally active on D and L isomers of a given substrate. C) They can increase the equilibrium constant for a given reaction by a thousand fold or more. D) They can increase the reaction rate for a given reaction by a thousand fold or more. E) They must be at the same concentration as their substrate to be effective.</p> <p>19. The steady state assumption, as applied to enzyme kinetics, implies:</p> <p>A) $K_m = K_s$. B) the enzyme is regulated. C) the ES complex is formed and broken down at equivalent rates. D) the K_m is equivalent to the cellular substrate concentration. E) the maximum velocity occurs when the enzyme is saturated.</p>			

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<p>20. The standard free-energy changes for the reactions below are given. Phosphocreatine \rightarrow creatine + Pi $\Delta G'^{\circ} = -43.0$ kJ/mol ATP \rightarrow ADP + Pi $\Delta G'^{\circ} = -30.5$ kJ/mol What is the overall $\Delta G'^{\circ}$ for the following reaction? Phosphocreatine + ADP \rightarrow creatine + ATP A) -73.5 kJ/mol B) -12.5 kJ/mol C) $+12.5$ kJ/mol D) $+73.5$ kJ/mol E) $\Delta G'^{\circ}$ cannot be calculated without K_{eq}'.</p> <p>21. The rate of oxidative phosphorylation in mitochondria is controlled primarily by: A) feedback inhibition by CO₂. B) the availability of NADH from the TCA cycle. C) the concentration of citrate (or) the glycerol-3-phosphate shuttle. D) the mass-action ratio of the ATD-ADP system. E) the presence of thermogenin.</p> <p>22. The three-dimensional structure of a protein is determined primarily by: A) electrostatic guidance from nucleic acid structure. B) how many amino acids are in the protein. C) hydrophobic interaction with lipids that provide a folding framework. D) modification during interactions with ribosomes. E) the sequence of amino acids in the protein.</p> <p>23. Which of the following is <i>not true</i> of the reaction producing malonyl-CoA during fatty acid synthesis? A) It is stimulated by citrate. B) It requires acyl carrier protein (ACP). C) It requires CO₂ (or bicarbonate). D) One mole of ATP is converted to ADP + Pi for each malonyl-CoA synthesized. E) The cofactor is biotin.</p> <p>24. One amino acid directly involved in the purine biosynthetic pathway is: A) alanine. B) aspartate. C) glutamate. D) leucine. E) tryptophan</p> <p>25. When blood glucose is abnormally high, the pancreas releases: A) epinephrine. B) glucagon. C) glucose. D) insulin. E) trypsin.</p>			

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<p>B. Assay Questions (50%): 請於答案卷上作答，否則不予計分。</p> <ol style="list-style-type: none"> 1. Explain why less ATP is made from the re-oxidation of FADH₂ as compared to NADH in oxidative phosphorylation. (5%) 2. The citric acid cycle begins with the condensation of acetyl-CoA with oxaloacetate. Describe three possible sources for the acetyl-CoA. (6%) 3. Describe the structural differences between amylose and cellulose. (5%) 4. Draw the resonance structure of a peptide bond (3%), and explain why there is no rotation around the C-N bond (peptide bond). (2%) 5. What is the yield of ATP when each of the following substrates is completely oxidized to CO₂ by a mammalian cell homogenate? (a) pyruvate (2%) (b) glucose (2%) 6. Based on the structure to explain why FASI (fatty acid synthase type I system) and FASII (fatty acid synthase type II system) produce the different products. (5%) 7. Why is it important to recycle NADH produced during glycolysis to NAD⁺? (5%) 8. Adenosine deaminase deficiency leads to severe immunodeficiency disease. Why? (5%) 9. The high levels of cellular cholesterol in the liver can inhibit the expression of LDL receptor. Why? (5%) 10. Give 5 amino acids that their side-chains are hydrophobic. (5%) 			