

大葉大學 100 學年度 研究所碩士班 招生考試試題紙					
系所別	組別	考試科目	考試日期	節次	備註
生物科技暨資源學院		生物化學	3月26日	第1,2節	共2頁 P1

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

I. Simple Choice (70%, 2% each)

- The formation of a peptide bond between two amino acids is an example of a(n) _____ reaction
(A) cleavage (B) condensation (C) group transfer (D) isomerization.
- Which one of the following amino acid residue can form disulfide bond in a protein? (A) Ser (B) Cys (C) Met (D) Thr
- Which of the following has the greatest absorbance at 280 nm (A_{280})?
(A) Arg-Arg-Lys-Phe-Thr-Ser-Tyr (B) Cys-Gly-Arg-Lys-Leu-Met-Met-Cys
(C) Tyr-Asp-Tyr-Gly-Phe-Tyr-Trp (D) Asn-Thr-Tyr-Ser-Glu-Asp-Cys
- Which property of proteins is utilized in gel filtration purification?
(A) net charge (B) size (C) hydrophilic or hydrophobic nature (D) UV absorption.
- The amino acid glycine has two pKa values, 2.4 and 9.8. The effective buffer pH ranges for glycine are most likely
(A) 1.4 to 3.4 and 8.8 to 10.8 (B) 6.0 and 7.0 (C) 2.4 to 9.8 (D) 1.0 to 1.2 and 11.0 to 12.0
- Titration of **valine** by a strong base, for example NaOH, results in two pKa. The titration reaction occurring at **pK₂** (**pK₂=9.62**) is:
(A) $-\text{COOH} + \text{OH}^- \rightarrow -\text{COO}^- + \text{H}_2\text{O}$ (B) $-\text{COOH} + -\text{NH}_2 \rightarrow -\text{COO}^- + -\text{NH}_3^+$
(C) $-\text{NH}_3^+ + \text{OH}^- \rightarrow -\text{NH}_2 + \text{H}_2\text{O}$ (D) $-\text{NH}_2^+ + \text{OH}^- \rightarrow -\text{NH}^- + \text{H}_2\text{O}$
- The term specific activity differs from the term activity in that specific activity :
(A) is measured only under optimal conditions (B) is the activity (enzyme units) in a milligram of protein.
(C) is the activity (enzyme units) of a specific protein (D) refer to protein other than enzymes.
- α -helices are stabilized by which of the force?
(A) hydrophobic interaction (B) vanderwall force
(C) hydrogen bonds between the (CO) and the (NH) units in the peptide backbone
(D) hydrogen bonding between the R groups
- The three-dimensional structure of a protein is determined primarily by
(A) noncovalent interaction with lipids, which provide a folding framework. (B) noncovalent interaction with nucleic acids.
(C) the order of sequence of amino acids in the protein. (D) the number of amino acids in the protein
- Which of the following statements is **false**?
(A) Collagen is a protein in which the polypeptides are mainly in the α -helix conformation.
(B) Disulfide linkages are important for keratin structure.
(C) Gly residues are particularly abundant in collagen.
(D) Silk fibroin is a protein in which the polypeptide is almost entirely in the β conformation.
- A prosthetic group of a protein is a non-protein structure that is:
(A) a ligand of the protein. (B) a part of the secondary structure of the protein.
(C) a substrate of the protein. (D) permanently associated with the protein.
- What can cause the increase of O₂ affinity of hemoglobin?
(A) A pH increase from pH7.2 to pH7.4 in blood plasma.
(B) An increase in the partial pressure of CO₂ in the lungs from 2 to 6 kPa.
(C) An increase in the 2,3-bisphosphoglycerate level to high altitude.
(D) A decrease in the partial pressure of O₂ in blood plasma.
- Which sugar is a non-reducing sugar? (A) lactose (B) maltose (C) sucrose (D) glucose
- The main structural difference between cellulose and starch is
(A) sugar composition (B) stereochemical glycosidic bond (C) different length of polymer (D) different branched polymer.
- Which of the following monosaccharides is not an aldose? (A) erythrose (B) fructose (C) glucose (D) ribose.
- Epimers are
(A) stereoisomers that differ from each other in their configuration at two or more carbon atoms.
(B) stereoisomers that differ from each other in their configuration at a single carbon atom.
(C) the α and β forms of cyclic sugars.
(D) two related compounds, pyran and furan.

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17. Aldose can form which type of cyclic structure?
 (A) Hemiacetal (B) Hemiketal (C) Both hemiacetal and hemiketal (D) Neither hemiacetal and hemiketal
18. The α and β forms of the same sugar are called (A) anomers. (B) diastereoisomers. (C) enantiomers. (D) epimers.
19. Common table sugar is (A) glucose (B) fructose (C) sucrose (D) maltose.
20. Glycolysis (A) does not require O_2 to generate energy. (B) requires O_2 to generate energy. (C) is inhibited by O_2 .
 (D) rate is increased in the presence of O_2 .
21. In humans, pyruvate can be converted to
 (A) acetyl-CoA only. (B) lactate only. (C) ethanol only. (D) acetyl-CoA and lactate.
22. Which of the following disaccharides cannot be digested by mammals? (A) cellobiose (B) sucrose (C) maltose (D) lactose
23. The most common biopolymer on earth is this carbohydrate: (A) glucose (B) cellulose (C) starch (D) chitin.
24. Monosaccharide can be oxidized enzymatically at C-6.
 (A) glucaric acid (B) uronic acid (C) glucuronic acid (D) aldaric acid
25. The committed steps of fatty acid synthesis involve the formation of :
 (A) acetyl-Co A (B) malonyl-Co A (C) mevalonate (D) acetoacetate
26. The committed steps of cholesterol biosynthesis involve the formation of :
 (A) acetyl-Co A (B) malonyl-Co A (C) mevalonate (D) isoprene
27. In the electron transport system, Fe-S center normally carries :
 (A) 1 electron and 1 proton (B) 2 electrons and 2 protons (C) 1 electron only (D) 1 proton only
28. The standard reduction potential for the half-reaction : $1/2 O_2 + 2 H^+ + 2e^- \rightarrow H_2O$ is around :
 (A) +0.8 (B) -0.4 (C) 0 (D) -0.8 V
29. Elongation of fatty acid chains occurs in : (A) nucleus (B) endoplasmic reticulum (C) mitochondria (D) lysosome
30. The fluidity of lipid side chains in the interior of a lipid bilayer is generally increased by :
 (A) a decrease in temperature (B) an increase in fatty acyl chain length
 (C) an increase in the number of double bonds in fatty acids (D) the binding of water to the fatty acyl side chains
31. Transport of fatty acids from the cytoplasm to the mitochondrial matrix requires :
 (A) ATP, coenzyme A, and hexokinase (B) ATP, carnitine, and coenzyme A
 (C) carnitine, coenzyme A, and hexokinase (D) ATP, carnitine, and pyruvate dehydrogenase
32. Which of the following compounds are not synthesized from isopentenyl pyrophosphate ?
 (A) cholesterol (B) vitamin K (C) eicosanoids (D) bile acids
33. Which of the following compounds releases the highest free energy when it undergoes hydrolysis ?
 (A) ATP (B) ADP (C) AMP (D) phosphoenolpyruvate
34. The structure of the trans-oleic acid is similar to :
 (A) cis-oleic acid (B) α -linolenic acid (C) linoleic acid (D) stearic acid
35. Which of these lipoproteins can play essential roles in the transport of dietary lipids to tissue ?
 (A) chylomicron (B) VLDL (C) IDL (D) LDL

II. Questions (30%)

1. Explain **primary**, **secondary**, **tertiary**, and **quaternary** structure of protein as well as **motif** and **domain**. (6%)
2. For a reaction that can take place with or without catalysis by an enzyme, what would be the effect of the enzyme on the (note! please indicate as "increase, decrease, or no change") (4%)
 - (1) standard free-energy change of the reaction?
 - (2) activation energy of the reaction?
 - (3) initial velocity of the reaction?
 - (4) equilibrium constant of the reaction?
3. List the reaction of glycolysis that yield ATP. (4%)
4. What are the cellular advantages of phosphorylating glucose in glycolysis? (6%)
5. Specify the biochemical reactions catalyzed by acetyl-Co A carboxylase and hormone-sensitive lipase. (5%)
6. When fatty acids are being β -oxidized to produce acetyl-Co A, in what situation, the acetyl-Co A will become ketone bodies. (5%)