

大葉大學 99 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 (中文名稱) | 考試日期 | 節次 | 備註 |
|---------|----|----------------|-------|-----|------------|
| 生物產業科技系 | 甲 | 生物化學 | 3月21日 | 第一節 | 共2頁 第1頁 |

說明 1：可否攜帶特殊作答輔助工具：否 是，考生可使用 _____ (如未註明，一律不准攜帶)

Part I: Simple-Choice Questions (3% each)

- Of the following amino acids, which side chain contain hydroxyl group? (A) alanine (B) tryptophan (C) tyrosine (D) glycine (E) cysteine
- Which of the following amino acid residues is most likely to be found on the exterior surface of a globular protein at physiological pH? (A) Asp (B) Phe (C) Ile (D) Ala (E) Met
- Amino acids are said to be amphoteric, because they can function as _____. (A) an acid or a base (B) a neutral or a charged molecule (C) a transparent or a light-absorbing compound (D) a normal or a unusual monomer in proteins (E) a polar or a nonpolar molecule
- Which of the following statements about fibrous proteins is wrong? (A) They have limited solubility in water. (B) They tend to form long fibers or sheets. (C) They have a mixture of alpha helices and beta sheets. (D) They are highly elongated proteins. (E) None of the above.
- For amino acids with neutral R groups, at any pH above the pI of the amino acid, the population of amino acids in solution will _____. (A) be neutral without any charge (B) show no net charge (C) have a net positive charge (D) have positive and negative charges in equal concentration (E) have a net negative charge
- The peptide glycylalanylasparylglycylleucine has _____. (A) two free amino groups (B) a disulfide bridge (C) four peptide bonds (D) no free carboxyl group (E) five peptide bond
- A sequence of amino acids in a certain protein is found to be -S-G-P-G-. The sequence is most likely to be a part of a(n) _____. (A) alpha helix (B) beta turn (C) parallel beta sheet (D) antiparallel beta sheet (E) random coil
- The term "specific activity" differs from the term "activity" in that specific activity _____. (A) is the activity (enzyme units) of a specific protein (B) is the activity (enzyme units) in a milligram of protein (C) is measured only under optimal conditions (D) refers only to a purified protein (E) refers to proteins other than enzyme
- In a mixture of the five proteins listed below, which should elute second in size-exclusion chromatography? (A) cytochrome c, 13 kDa (B) immunoglobulin G, 145 kDa (C) ribonuclease A, 13.7 kDa (D) RNA polymerase, 450 kDa (E) serum albumin, 68.5 kDa
- How does an enzyme's K_m compare to its affinity for substrate? (A) The greater the K_m , the higher the affinity. (B) The relationship depends on whether the enzyme is allosteric or not. (C) The lower the K_m , the higher the affinity. (D) The relationship depends on the enzyme's V_{max} . (E) The two have nothing to do with one another.
- Feedback regulation shuts down a pathway when enough of the final product accumulates. The shutdown is mediated by _____. (A) proteolytic cleavage (B) allosteric regulation (C) covalent modification (D) phosphorylation (E) synthesis control
- Which of the following monosaccharides is *not* an aldose? (A) erythrose (B) fructose (C) glucose (D) glyceraldehyde (E) ribose
- Which of the following is an epimeric pair? (A) D-glucose and D-glucosamine (B) D-glucose and D-mannose (C) D-glucose and L-glucose (D) D-lactose and D-sucrose (E) L-mannose and L-fructose
- Glycolysis is the name given to a metabolic pathway occurring in many different cell types. It consists of 11 enzymatic steps that convert glucose to lactic acid. Glycolysis is an example of: (A) aerobic metabolism. (B) anabolic metabolism. (C) a net reductive process. (D) fermentation. (E) oxidative phosphorylation.
- During strenuous exercise, the NADH formed in the glyceraldehyde 3-phosphate dehydrogenase reaction in skeletal muscle must be reoxidized to NAD^+ if glycolysis is to continue. The most important reaction involved in the reoxidation of NADH is: (A) dihydroxyacetone phosphate \rightarrow glycerol 3-phosphate

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- (B) glucose 6-phosphate → fructose 6-phosphate (C) isocitrate → α -ketoglutarate (D) oxaloacetate → malate
(E) pyruvate → lactate
16. Citrate stimulates fatty acid synthesis by (A) participating in the production of ATP. (B) participating in a pathway that ultimately produces CO₂ and NADPH in the cytosol. (C) inhibiting acetyl-CoA carboxylase. (D) providing a mechanism to transport acetyl CoA from the mitochondria to cytosol. (E) none of the above.
17. Which of the below is *not* required for the oxidative decarboxylation of pyruvate to form acetyl-CoA? (A) ATP (B) CoA-SH (C) FAD (D) Lipoic acid (E) NAD⁺
18. Which of the following is *not* true of the citric acid cycle? (A) All enzymes of the cycle are located in the cytoplasm, except succinate dehydrogenase, which is bound to the inner mitochondrial membrane. (B) In the presence of malonate, one would expect succinate to accumulate. (C) Oxaloacetate is used as a substrate but is not consumed in the cycle. (D) Succinate dehydrogenase channels electrons directly into the electron transfer chain. (E) The condensing enzyme is subject to allosteric regulation by ATP and NADH.
19. Which of the following is *not* required in the synthesis of fatty acids? (A) Acetyl-CoA (B) Biotin (C) HCO₃⁻ (CO₂) (D) Malonyl-CoA (E) NADH
20. The rate-limiting step in fatty acid synthesis is: (A) condensation of acetyl-CoA and malonyl-CoA. (B) formation of acetyl-CoA from acetate. (C) formation of malonyl-CoA from malonate and coenzyme A. (D) the reaction catalyzed by acetyl-CoA carboxylase. (E) the reduction of the acetoacetyl group to a β -hydroxybutyryl group.
21. Which of these can be synthesized by plants but *not* by humans? (A) Linoleate [18:2($\Delta^{9,12}$)] (B) Palmitate (16:0) (C) Phosphatidylcholine (D) Pyruvate (E) Stearate (18:0)
22. Uncoupling of mitochondrial oxidative phosphorylation: (A) allows continued mitochondrial ATP formation, but halts O₂ consumption. (B) halts all mitochondrial metabolism. (C) halts mitochondrial ATP formation, but allows continued O₂ consumption. (D) slows down the citric acid cycle. (E) slows the conversion of glucose to pyruvate by glycolysis.
23. The flux control coefficient for an enzyme in a multistep pathway depends on: (A) the concentration of the enzyme itself. (B) the concentration of other enzymes in the pathway. (C) the levels of regulatory molecules. (D) the amounts of substrate molecules present at each step. (E) all of the above.
24. Carnitine is: (A) a 15-carbon fatty acid. (B) an essential cofactor for the citric acid cycle. (C) essential for intracellular transport of fatty acids. (D) one of the amino acids commonly found in protein. (E) present only in carnivorous animals.
25. Complete oxidation of 1 mole of which fatty acid would yield the most ATP? (A) 16-carbon saturated fatty acid (B) 18-carbon mono-unsaturated fatty acid (C) 16-carbon mono-unsaturated fatty acid (D) 16-carbon poly-unsaturated fatty acid (E) 14-carbon saturated fatty acid

Part II: Short-Answer Questions (5% each)

- The average molecular weight of the 20 standard amino acids is 138, but biochemists use 110 when estimating the number of amino acids in a protein of known molecular weight. Why?
- Draw the general structure of an amino acid as it would be found at pH7.0.
- Briefly describe the five main classes of amino acids based on the properties of their R groups.
- What are the direct products of β -oxidation of a fully saturated, straight-chain fatty acid of 11 carbons?
- In which reaction of the citric acid cycle does substrate-level phosphorylation occur?