

國立中央大學97學年度碩士班考試入學試題卷

所別：生命科學系碩士班 分子與細胞生物組(一般生) 科目：生物化學 共 3 頁 第 1 頁

(學位在職生)

*請在試卷答案卷(卡)內作答

一. 單選題(每題 2 分; 共 80 分)

- Which of the following organisms has the **smallest** genome in size? (a) *Saccharomyces cerevisiae* (b) Bacteriophage ϕ X174 (c) *Aspergillus niger* (d) *Drosophila melanogaster* (e) *Homo sapiens* (f) *E. coli*.
- α helix of a polypeptide has a rise of (a) 0.10 (b) 0.15 (c) 0.34 (d) 0.54 (e) 1 (f) 3.2 nm/residue.
- Which of the following descriptions about Hb (hemoglobin) is **incorrect**? (a) One Hb can bind 4 O_2 molecules (b) HbA has an $\alpha_2\beta_2$ structure (c) HbF has an $\alpha_2\gamma_2$ structure (d) HbF has a higher affinity for BPG than does HbA (e) CO_2 reduces the binding affinity of Hb for O_2 (f) Low pH enhances the efficiency of O_2 unloading from Hb.
- Which of the following descriptions about the Michaelis-Menten rate equation is **incorrect**? (a) K_M measures the substrate concentration at which the reaction rate is $V_{max}/2$ (b) k_{cat} is the turnover number that measures the rate of the catalytic process (c) The ratio k_{cat}/K_M is a convenient measure of enzyme efficiency (d) $k_{cat} = V_{max}/K_M$ (e) A competitive inhibitor increases the apparent K_M (f) A noncompetitive inhibitor reduces the apparent V_{max} .
- Which of the following dyes is most commonly used in staining DNA on an agarose gel? (a) bromophenol blue (b) EtBr (c) ninhydrin reagent (d) CNBr (e) Silver stain (f) BUdR.
- A DNA segment of 1,000 base pairs in the B form. What is its approximate molecular weight? (a) 3.3 (b) 6.5 (c) 33 (d) 65 (e) 330 (f) 650 kD.
- Which of the following α -amino acids lacks an asymmetric α -carbon? (a) Phe (b) Tyr (c) Gly (d) Glu (e) Ala (f) Arg.
- Which of the following compounds has the highest molecular weight? (a) thymidine (b) AMP (c) tryptophan (d) arginine (e) fructose (f) uracil.
- Which of the following descriptions regarding disaccharide is **incorrect**? (a) Sucrose is α -D-glucopyranosyl (1 \rightarrow 2) β -D-fructofuranoside (b) Maltose has an α (1 \rightarrow 4) linkage (c) Cellobiose is β -D-glucopyranosyl (1 \rightarrow 4) β -D-glucopyranose (d) Lactose is β -D-galactopyranosyl (1 \rightarrow 4) β -D-glucopyranose (e) The glucose moiety in lactose exists only in β configuration in solution (f) Sucrose has no reducing end.
- Which of the following restriction endonucleases is an isoschizomer of BglII (AGATCT)? (a) EcoRI (GAATTC) (b) XbaI (TCTAGA) (c) BamHI (GGATCC) (d) SalI (GTCGAC) (e) EagI (CGGCCG) (f) none of the above.
- Which scientist made a significant contribution to the technology of polymerase chain reaction? (a) K. B. Mullis (b) J. D. Watson and H. C. Crick (c) A. D. Hershey and M. Chase (d) S. B. Prusiner (e) G. N. Ramachandran (f) M. Meselson and F. Stahl.
- Detergents denature proteins by disrupting which of the following? (a) Hydrogen bonds (b) Disulfide bridges (c) Hydrophobic interactions (d) Salt bridges (e) Covalent bonds (f) Both "a" and "b" are correct.
- How many different tRNA species are expected to exist in *E. coli*? (a) ~ 5 (b) ~ 10 (c) ~ 20 (d) ~ 40 (e) ~ 80 (f) ~ 160 .
- A glycosidic bond is chemically an (a) Ether (b) Ester (c) Amide (d) Aldehyde (e) Ketone (f) Carbamate.
- A membrane's fluidity is largely determined by its percentage of (a) Phosphatidyl choline (b) Phosphatidylethanolamine (c) Fatty acids (d) Cholesterol (e) Unsaturated fatty acids (f) Waxes.
- Anti-codon loops are found in (a) mRNA (b) rRNA (c) tRNA (d) hnRNA (e) snRNA (f) dsRNA.
- Which of the following bond-pairs within a peptide backbone show free rotation around both bonds? (a) N- C_α and N-C (b) C_α -C and N- C_α (c) C=O and N-C (d) C=O and N- C_α (e) N-C and C_α -C (f) None of the above.
- The Watson-Crick base pairing scheme for an A-T base pair includes (a) a hydrogen bond between a keto oxygen and an extracyclic amino group (b) a hydrogen bond between two ring nitrogen atoms (c) an ionic bond between the positively charged adenine amino group and a negatively polarized keto group (d) hydrophobic interaction (e) both "a" and "b" (f) all of the above.

參考用

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19. Which of the following codons is not a translation termination codon? (a) UAA (b) UAG (c) UUA (d) UGA (e) amber codon (f) ochre codon.
20. There are approximately "N" genes in yeast. "N" is
(a) 60 (b) 600 (c) 6,000 (d) 60,000 (e) 600,000 (f) none of the above.
21. How many moles of ATP can be generated by the complete oxidation of 1 mole of acetyl-CoA to CO₂ and water? (a) 6 moles (b) 8 moles (c) 10 moles (d) 12 moles (e) 14 moles
22. Following a meal of coke, the major monosaccharides absorbed into the blood are (a) fructose (b) glucose (c) glucose and galactose (d) glucose and fructose (e) galactose, glucose, and fructose
23. Which of the following pairs of enzymes in glycolysis is allosterically regulated in skeletal muscle? (a) glucokinase and phosphofructokinase-1 (PFK-1) (b) hexokinase and aldolase (c) PFK-1 and 3-phosphoglycerate kinase (d) hexokinase and pyruvate kinase (e) pyruvate kinase and lactate dehydrogenase (LDH) (f) all of them
24. Muscle glycogen cannot release glucose into the blood for which of the following reasons? (a) muscle plasma membrane contain no glucose transporters (b) muscle contains no glucose-6-phosphatase (G6Pase) (c) muscle contains no α -(1,6)-glucosidase (d) muscle contains no phosphoglucomutase (e) muscle contains no α -(1,4) \rightarrow (1,4)-glucan transferase
25. Which pair of enzymes listed below is unique to gluconeogenesis? (a) pyruvate carboxylase and phosphofructokinase-1 (b) phosphoenolpyruvate carboxykinase (PEPCK) and pyruvate carboxylase (c) PEPCK and pyruvate kinase (d) 3-phosphoglycerate kinase and pyruvate carboxylase (e) fructose-bisphosphatase-1 (FBPase-1) and pyruvate dehydrogenase (f) all of them.
26. Glucose-6-phosphate dehydrogenase is (a) inhibited by NADPH (b) inhibited by NADH (c) inhibited by ATP (d) activated by fructose-2,6-bisphosphate (e) activated by AMP (f) all of them
27. What is the systematic name of 18:1 ω 9 fatty acid? (a) *n*-octadecanoic acid (b) *cis*-9-octadecenoic acid (c) *cis, cis*-9, 12-octadecadienoic acid (d) *cis*-9-hexadecenoic acid (e) *cis*-9-tetradecenoic acid.
28. How many ATPs are produced from the oxidation of 1 mole of myristic acid to CO₂? (a) 110 (b) 112 (c) 114 (d) 129 (e) 144
29. Which of the following reactions is not located in the mitochondria? (a) beta-oxidation (b) cholesterol biosynthesis (c) ketone body synthesis (d) tricarboxylic acid cycle (e) electron transport and oxidative phosphorylation.
30. Which of the following lipoproteins would account for most of the plasma cholesterol in a 28-year old healthy man who saw a physician for an annual physical examination? (a) chylomicron (b) VLDL (c) IDL (d) LDL (e) HDL
31. Aspirin inhibits the synthesis of which of the following sets of eicosanoids? (a) prostaglandin E₂ and leukotriene A₄ (b) thromboxane A₂ and leukotriene C₄ (c) prostaglandin F₂ and thromboxane A₂ (d) prostaglandin A₂ and 5-hydroperoxyeicosatetraenoic acid (5-HPETE) (e) all of them.
32. Which of the following enzymes is required for the synthesis of estradiol from testosterone? (a) squalene epoxidase (b) cyclooxygenase (c) aromatase (d) 5 α -reductase (e) 3 β -hydroxysteroid dehydrogenase
33. Which of the following enzymes is activated by cAMP-dependent phosphorylation? (a) acetyl CoA carboxylase (b) lipoprotein lipase (c) hormone-sensitive lipase (d) fatty acid synthase (e) hydroxymethylglutaryl CoA reductase
34. Which of the following compounds is the major end product of tyrosine metabolism in the adrenal medulla? (a) dopamine (b) DOPA (c) epinephrine (d) norepinephrine (e) melanin (f) all of them.
35. Which of the following pairs of enzymes participate in the major route of nitrogen transfer from amino acids to urea? (a) glutaminase and asparaginase (b) transaminases and glutamate dehydrogenase (c) glutamate dehydrogenase and glutaminase (d) transaminases and glutaminase (e) amino acid oxidases and glutamate dehydrogenase
36. Which of the following pairs of compounds participate in the transfer of methyl groups? (a) biotin and tetrahydrofolate

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- (b) methylcobalamin and formyl-THF (c) 5-methyl-THF and S-adenosylmethionine (SAM) (d) SAM and folic acid (e) tetrahydrobiopterin and methylcobalamin
37. Which of the following compounds is a degradation product of heme? (a) aminolevulinic acid (b) bile salts (c) biliverdin (d) porphobilinogen (e) glycine (f) all of them
38. Which of the following compounds has the greatest effect on the rate-limiting step in purine nucleotide synthesis?(a) ribose-1-phosphate (b) AMP (c) phosphoribosylpyrophosphate (PRPP) (d) ADP (e) aspartate
39. Which of the following statements is incorrect? (a) Alanine, isoleucine, and serine can serve as precursors for gluconeogenesis (b) Leucine, isoleucine, and phenylalanine can serve as precursors for ketogenesis (c) Glycine, proline, and valine can serve as precursors for gluconeogenesis (d) Leucine, isoleucine, and tyrosine can serve as precursors for gluconeogenesis and ketogenesis (e) all of them
40. The Western blotting method is originally used for the measure of(a) DNA (b) RNA (c) protein (d) lipid (e) carbohydrates

二、簡答題(共 20 分)

1. Explain how a protein level can be detected by the enzyme-linked immunosorbent assay. (5%)
2. You are given 500 ml of a solution at pH 7.0 containing an unknown concentration of adenosine-5'-triphosphate (ATP, the molar extinction coefficient of ATP is $14300 \text{ M}^{-1} \cdot \text{cm}^{-1}$ at 260 nm and pH 7.0). You place 0.5 ml of this solution in a 0.5 cm wide, 0.5 cm long, 2 cm high quartz cuvette and determine the $A_{260\text{nm}}$ of this solution to be 0.286. What is the molarity of the ATP solution? How many moles of ATP are in the 500 ml of solution? (5%)
3. Please define the following terms: (a) tautomers (b) mutarotation (c) chaperonins (d) cDNA library (e) frame-shift mutation. (2% each)

參考用