# 國立中央大學98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

＊請在試卷答案卷（卡）內作答

一. 單選題(每題 2 分；共 80 分)

1. Which of the following organisms has the largest genome in size? (a) *Drosophila melanogaster* (b) *E. coli* (c) *Aspergillus niger* (d) Bacteriophage ϕX174 (e) Adenovirus AD-2 (f) *Saccharomyces cerevisiae.*
2. B form DNA has a rise of (a) 0.10 (b) 0.15 (c) 0.34 (d) 0.54 (e) 1 (f) 3.4 nm/residue.
3. Which of the following descriptions about Hb (hemoglobin) is incorrect? (a) Low pH facilitates $O_2$ unloading from Hb (b) $CO_2$ reduces $O_2$ binding of Hb (c) HbA has an $\alpha_2\beta_2$ structure (d) HbF has an $\alpha_2\gamma_2$ structure (e) BPG enhances $O_2$ binding of Hb (f) BPG is an allosteric effector of Hb.
4. Regarding the Michaelis-Menten rate equation, which of the following descriptions 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 (c) The ratio $k_{cat}$/[enzyme] is a convenient measure of enzyme efficiency (d) The units of $k_{cat}$ are $s^{-1}$ (e) A competitive inhibitor increases the apparent $K_M$ (f) A noncompetitive inhibitor reduces the apparent $V_{max}$.
5. Which of the following dyes is most commonly used in staining protein on a SDS-PAGE? (a) bromophenol blue (b) EtBr (c) ninhydrin reagent (d) CNBr (e) commassic brilliant blue (f) BUdR.
6. A DNA segment of 100 base pairs in the Z form. What is its approximate molecular weight? (a) 3.3 (b) 6.6 (c) 33 (d) 66 (e) 330 (f) 660 kD.
7. Which of the following α-amino acids has the highest absorbance at 280 nm? (a) Trp (b) Tyr (c) Gly (d) Glu (e) His (f) Phe.
8. Which of the following compounds has the highest molecular weight? (a) adenine (b) adenosine (c) adenylate (d) uracil (e) uridine (f) uridylate.
9. Which of the following descriptions regarding disaccharide is incorrect? (a) Lactose is a glucoside (b) Maltose has an α(1->4) linkage (c) Cellobiose is β-D-glucopyranosyl (1->4) β-D-glucopyranose (d) Sucrose is α-D-glucopyranosyl (1->2) β-D-fructofuranoside (e) Lactose has a reducing end (f) Sucrose has no reducing end.
10. Which of the following restriction endonucleases is an isoschizomer of XhoI (CTCGAG)? (a) EcoRI (GAATTC) (b) XbaI (TCTAGA) (c) SalI (GTCGAC) (d) BamHI (GGATCC) (e) EagI (CGGCCG) (f) none of the above.
11. Which scientist made a significant contribution to the understanding of protein secondary structures? (a) K. B. Mullis (b) J. D. Watson and H. C. Crick (c) A. D. Hershey and M. Chase (d) S. B. Prusiner (e) L. Pauling (f) M. Meselson and F. Stahl.
12. Waxes are formed by esterification of __ and __? (a) fatty acids and glycerols (b) fatty acids and glucose (c) fatty acids and alcohols (d) fatty acids and glycerol-3-phosphate (e) fatty acids and sphingosine (f) none of the above.
13. How many different codons are expected to exist in the genome of *Aquifex aeolicus* (an extreme thermophile)? (a) < 10 (b) < 20 (c) < 30 (d) < 40 (e) < 80 (f) none of the above.
14. In lactose, the chemical bond between glucose and galactose is an (a) Amide (b) Ester (c) Ether (d) Aldehyde (e) Ketone (f) Carbamate.
15. Which of the following lipids is not a major component of cellular membranes? (a) glycerophospholipids (b) sphingolipids (c) fatty acids (d) glycosphingolipids (e) glycoglycerolipid (f) all of the above.
16. Dihydrouracil or pseudouridine is found predominantly in (a) tRNA (b) rRNA (c) mRNA (d) hnRNA (e) snRNA (f) siRNA.
17. The Shine-Dalgarno sequence is _____ in *E. coli*? (a) AATT (b) AAGG (c) ATGC (d) TTCC (e) TTGG (f) GCGC.
18. 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



注意：背面有試題

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.

19. Which of the following codons cannot be used as a translation initiation codon in *E. coli*? (a) AAG (b) AUU (c) ACG (d) UUG (e) AUG (f) GUG.

20. There are approximately "N" genes in the human genome. "N" is
(a) 30 (b) 300 (c) 3,000 (d) 30,000 (e) 300,000 (f) none of the above.

21. How many moles of ATP plus NADH can be generated by the complete oxidation of 1 mole of acetyl-CoA to $CO_2$ and water? (a) 15 moles (b) 14 moles (c) 13 moles (d) 12 moles (e) 11 moles (f) 10 moles

22. Pyruvate dehydrogenase activity is (a) activated by cAMP-dependent phosphorylation (b) inhibited by the action of an NADH-activated kinase (c) allosterically activated by a high ratio of NADH/$NAD^+$ (d) activated under conditions of accelerated fatty acid oxidation (e) decreased by an elevated insulin/glucagon ratio

23. A deficiency in which of the following proteins would most likely result in lactic acidosis and hypoglycemia? (a) glucokinase (b) pyruvate kinase (c) phosphofructokinase-1 (d) fructose-bisphosphatase-1 (e) hexokinase

24. Which pair of enzymes listed below is unique to pentose phosphate pathway? (a) malic enzyme and 6-phosphogluconate dehydrogenase (b) glucose-6-phosphate dehydrogenase and malic enzyme (c) glucose-6-phosphate dehydrogenase and 6-phosphogluconate dehydrogenase (d) fructose-bisphosphatase-1 and 6-phosphogluconate dehydrogenase (e) fructose-bisphosphatase-1 and glucose-6-phosphate dehydrogenase.

25. Which set of amino acids listed below can serve as precursors for gluconeogenesis? (a) Ala, Glu, and Leu (b) Gly, Ala, and Val (c) Ser, Lys, and Ile (d) Gln, Phe, and Leu (e) Lys, Met, and Asp

26. What is the systematic name of 18:2c⊗9,12 fatty acid? (a) *n*-9, 12-octadecanoic acid (b) *cis* -9,12-octadecadianoic acid (c) *cis*, *cis*-9, 12-octadecadianoic acid (d) *cis*, *cis*-9, 12-octadecadienoic acid (e) *cis*, *cis*-9, 12-octadecaenoic acid.

27. How many moles of ATP plus $FADH_2$ are produced from the oxidation of 1 mole of 14:0 fatty acid to $CO_2$? (a) 111 (b) 112 (c) 117 (d) 118 (e) 123 (f) 124 (g) 125 (h) 126

28. A patient with a deficiency in lipoprotein lipase would be expected to have which of the following plasma lipoprotein profiles? (a) elevated levels of LDL with no other changes (b) elevated levels of VLDL with no other changes (c) elevated levels of chylomicron and low levels of VLDL (d) elevated levels of both chylomicrons and VLDL (e) low levels of both chylomicrons and VLDL

29. Which of the following conditions would most likely result in the accumulation of cholesterol in extrahepatic tissues? (a) a deficiency in lipoprotein lipase (b) a deficiency in acyl CoA:cholesterol acyltransferase (c) a deficiency in apoprotein A-I (d) a high level of HDL (e) a high level of lecithin-cholesterol acyltransferase

30. During fatty acid synthesis, acetyl-CoA appears in the cytosol as a result of which of the following enzymes? (a) isocitrate dehydrogenase (b) thiolase (c) malic enzyme (d) HMG-CoA lyase (e) citrate synthase (f) citrate lyase

31. The removal of C2 units from a fatty acyl-CoA during β-oxidation involves which of the following sequences of reaction? (a) oxidation, dehydration, reduction, and cleavage (b) reduction, hydration, dehydrogenation, and cleavage (c) reductioin, dehydration, reduction, and cleavage (d) reduction, dehydration, oxidation, and cleavage (e) hydrogenation, dehydration, hydrogenation, and cleavage (f) dehydrogenation, hydration, dehydrogenation, and cleavage

32. Which of the following reactions will be most directly affected by a diet high in cholesterol? (a) lanosterol to cholesterol (b) hydroxymethylglutaryl-CoA to mevalonic acid (c) acetoacetyl-CoA to hydroxymethylglutaryl-CoA (d) geranyl pyrophosphate to farnesyl pyrophosphate (e) acetyl-CoA to acetoacetyl-CoA

33. Which of the following sets of enzymes is required for the synthesis of estrogens? (a) 20,22-lyase, 11-hydroxylase, and 17-hydroxylase (b) 20,22-lyase, 21-hydroxylase, and 17,20-lyase (c) 3β-hydroxysteroid dehydrogenase, 18-hydroxylase, and aromatase (d) 3β-hydroxysteroid dehydrogenase, 17,20-lyase, and aromatase (e) 3β-hydroxysteroid dehydrogenase, 11-hydroxylase, and aromatase (f) 21-hydroxylase, 17-hydroxylase, and aromatase
34. Which of the following bile acids or bile salts is the most effective emulsifying agent? (a) cholic acid (b) glycodeoxycholate (c) taurocholate (d) lithocholic acid (e) chenodeoxycholate
35. Which of the following lipids can be formed by the methylation of phosphatidylethanolamine? (a) phosphatidylcholine (b) phosphatidylinositol (c) phosphatidylserine (d) sphingomyelin (e) lysophosphatidylcholine (f) phosphatidylglycerol
36. A deficiency in vitamin $B_{12}$ will impair the catabolism of which of the following amino acids? (a) Leu (b) Val (c) Phe (d) Arg (e) His
37. Which of the following nonessential amino acids are synthesized from essential amino acids? (a) Gln and Pro (b) Phe and Cys (c) Gly and Asn (d) Tyr and Val (e) Tyr and Cys (f) Met and Ala
38. Which of the following statements correctly describes the de novo synthesis of pyrimidines in humans? (a) Phosphoribosylpyrophosphate (PRPP) is required in the first step (b) formyl-tetrahydrofolate donates two carbon atoms to the pyrimidine ring (c) The conversion of UTP to CTP requires NH4+ (d) The rate-limiting step is activated by UTP and inhibited by ATP (e) Aspartate donates both carbon and nitrogen atoms to the ring
39. Which pair of inhibitors listed below specifically inhibits the activity of cyclooxygenase? (a) aspirin and ibuprofen (b) aspirin and lovastatin (c) aspirin and aminopterin (d) aspirin and allopurinol (e) all of them.
40. Which of the following enzymes is inhibited by insulin? (a) carnitine acyltransferase-I (b) lipoprotein lipase (c) acetyl-CoA carboxylase (d) hydroxymethylglutaryl-CoA reductase (e) fatty acid synthase (f) glycogen synthase

## 二、簡答題(共 20 分)

1. Compare the difference between immunoprecipitation (IP) and Western blot analysis. (4%)
2. Please define the terms *NIH shift*, *transamination*, and *lipolysis*. (6%)
3. Please define the following terms: (a) zymogens (b) suicide inhibitor (c) consensus sequence (d) catalytic antibodies (e) missense mutation. (2% each)