國立中央大學99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
分子與細胞生物組(在職生)

＊請在試卷答案卷（卡）內作答
＊本科考試禁用計算器

一. 單選題(每題 2 分；共 80 分)

1. Which of the following enzymes is not involved in *E. coli* DNA replication? (a) DNA polymerase I (b) DNA polymerase III (c) DNA ligase (d) primase (e) DNA gyrase (f) reverse transcriptase.
2. Which of the following compounds is an inhibitor of protein translation? (a) AZT (b) puromycin (c) novobiocin (d) fluoroacetate (e) cordycepin (f) tetracyclin.
3. Which of the following descriptions about Hb (hemoglobin) is incorrect? (a) It has quaternary structure (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) HbF has a much lower affinity for BPG than does HbA (f) BPG is an allosteric effector of Hb that regulates short-term changes in O_2 affinity.
4. Which of the following descriptions about the Michaelis-Menten rate equation is false? (a) The units of K_M are M (b) K_M measures the substrate concentration at which the reaction rate is V_{max} (c) The units of k_{cat} are s^{-1} (d) k_{cat} is the turnover number (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 DNA in an agarose gel? (a) bromophenol blue (b) EtBr (c) ninhydrin reagent (d) CNBr (e) commassie brilliant blue (f) BUdR.
6. A DNA segment of 500 base pairs in the A form. What is its approximate molecular weight? (a) 3.3 (b) 6.6 (c) 33 (d) 66 (e) 330 (f) 660 kD.
7. An α-helix of a polypeptide is best characterized by (a) 1.2 (b) 2.4 (c) 3.6 (d) 4.8 (e) 1 (f) 6.0 residues/turn.
8. Which of the following compounds has the highest molecular weight? (a) tryptophan (b) adenosine (c) guanylate (d) galactoase (e) uridine (f) phenylalanine.
9. In D-ribose, which of the following forms is less than 1%? (a) α–D-ribofuranose (b) α-D-ribopyranose (c) β-D-ribofuranose (d) β-D-ribopyranose (e) open-chain form (f) none of the above.
10. Which of the following restriction endonucleases is an isoschizomer of SpeI (ACTAGT)? (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 invention of PCR? (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 _____ of fatty acids and alcohols? (a) glycosylation (b) mutarotation (c) hydrolysis (d) saponification (e) transamidation (f) esterification.
13. How many different "sense" codons exist in the genome of *Drosophila melanogaster*? (a) < 10 (b) < 20 (c) < 30 (d) < 40 (e) < 80 (f) none of the above.
14. The glycosidic bond in methyl-α-D-glucopyranoside is an (a) Amide (b) Ester (c) Ether (d) Aldehyde (e) Ketone (f) Carbamate.
15. Which of the following lipids is not a saturated fatty acid? (a) lauric acid (b) linoleic acid (c) myristic acid (d) stearic acid (e) arachidic acid (f) all of the above.
16. A TψC loop is found predominantly in (a) tRNA (b) rRNA (c) mRNA (d) hnRNA (e) snRNA (f) siRNA.
17. The ribosome binding sequence is _____ in *E. coli*? (a) AAAA (b) AUGC (c) GCGC (d) AAUU (e) GGCC (f) AAGG
18. A DNA segment of 10,500 base pairs in the B form, with a superhelical density of about –0.06. Which of the following descriptions is correct? (W = writhing number; L = linking number; T = twist number) (a) $\Delta L = 0$, $\Delta W = 0$, $\Delta T = 0$ (b) $\Delta L = -60$, $\Delta W = -60$, $\Delta T = -60$ (c) $\Delta L = -60$, $\Delta W = 0$, $\Delta T = 0$ (d) $\Delta L = 0$, $\Delta W = -60$, $\Delta T = 0$ (e) $\Delta L = 0$, ΔW

注意:背面有試題

參考用

= 0, ΔT = -60 (f) ΔL = -60, ΔW = -60, ΔT = 0.

19. There are ___ amino acids, each of which could be encoded by 6 different codons? (a) 1 (b) 2 (c) 3 (d) 4 (e) 5 (f) none of the above.
20. Which amino acids are called the 21st and 22nd amino acids that are incorporated into natural proteins? (a) selenocysteine and 1-pyrrolysine (b) cysteine and selenocysteine (c) lysine and 1-pyrrolysine (d) 4-hydroxyproline and 5-hydroxylysine (e) phosphoserine and phosphotyrosine (f) none of the above.
21. How many moles of ATP plus $FADH_2$ 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 kinase has which of the following characteristics? (a) It is activated by phosphorylation (b) It is dependent on thiamin pyrophosphate (c) It is located in mitochondria (d) It is inhibited by ATP (e) It is the rate-limiting enzyme in glycolysis (f) It does not require ADP as a cosubstrate.
23. A deficiency in which of the following amino acids would most likely result in the loss of thermogenesis? (a) Tyr (b) Leu (c) Gly (d) Thr (e) Glu (f) Arg
24. Which pair of enzymes listed below is unique to pentose phosphate pathway? (a) Malic enzyme and 6-phosphogluconate dehydrogenase (b) Malic enzyme and glucose-6-phosphate dehydrogenase (c) Citrate lyase and malic enzyme (d) 6-Phosphogluconate dehydrogenase and fructose-bisphosphatase-1 (e) Glucose-6-phosphate dehydrogenase and fructose-bisphosphatase-1 (f) Glucose-6-phosphate dehydrogenase and 6-phosphogluconate dehydrogenase
25. Which set of compounds listed below can serve as precursors for heme? (a) Gly, succinyl-CoA (b) Gly, propionyl-CoA (c) Gly, acetic acid (d) Biliverdin, CO, Fe (e) Bilirubin, CO, Fe (f) Gly, biliveridin
26. The standard free energy change ($\triangle G^\circ$) for the hydrolysis of creatine phosphate is -10.3 kcal/mole, and the $\triangle G^\circ$ for the hydrolysis of ATP to ADP and Pi is -7.3 kcal/mole. What is the $\triangle G^\circ$ for the following reaction?
ADP + creatine phosphate → ATP + creatine
(a) -10.6 kcal/mole (b) +3.0 kcal/mole (c) +10.6 kcal/mole (d) -3.0 kcal/mole (e) +7.3 kcal/mole (f) -7.3 kcal/mole.
27. How many moles of ATP are produced from the oxidation of 1 mole of 16:1 fatty acid to CO_2? (a) 125 (b) 127 (c) 129 (d) 131 (e) 133 (f) 135
28. Debranching of glycogen requires which of the following enzymes? (a) Uridine diphosphate glucose pyrophosphorylase (b) Glycogen phosphorylase (c) α-(1,4) → α-(1,4)-glucan transferase (d) Phosphoglucomutase (e) α-(1,4)→α-(1,6)-glucan transferase (f) Glycogen synthase
29. Which of the following conditions would most likely result in the accumulation of cholesterol in extrahepatic tissues? (a) A deficiency in acyl CoA:cholesterol acyltransferase (b) A deficiency in lipoprotein lipase (c) A high level of lecithin-cholesterol acyltransferase (d) A high level of HDL (e) A deficiency in apoprotein A-I (f) all of them.
30. During fatty acid oxidation, fatty acyl-CoA appears in the mitochondria as a result of which of the following enzymes? (a) acyl-CoA dehydrogenase (b) ketoacyl-CoA thiolase (c) carnitine acyltransferase (d) L-3-hydroxyacyl-CoA dehydrogenase (e) trans-△2-enoyl-CoA hydratase (f) acetyl-CoA carboxylase
31. The addition of C2 units from a malonyl-ACP to acetyl-ACP during fatty acid biosynthesis involves which of the following sequences of reaction? (a) Condensation, reduction, dehydration, and reduction (b) Condensation, reduction, hydration, and reduction (c) Reductioin, condensation, dehydration, and reduction (d) Reduction, condensation, dehydration, and oxidation (e) Hydrogenation, dehydration, hydrogenation, and condensation (f) Oxidation, condensation, dehydrogenation, and reduction.
32. Rat acetyl-CoA carboxylase does not have which of the following characteristics? (a) It is a single protein

containing two identical polypeptide chains (b) It is a key enzyme in fatty acid synthesis (c) It forms malonyl-CoA from acetyl-CoA and bicarbonate (d) It is activated by citrate (e) It is activated by AMP-activated protein kinase (f) It is inhibited by glucagon.

33. Which of the following statements about lipases is true? (a) Pancreatic lipase releases the fatty acids from carbons 1 and 3 of the triglyceride backbone, forming 2-monoglyceride (b) Lipoprotein lipase activated by apo C-II releases fatty acids from chylomicron-triglyceride and VLDL-triglyceride in the blood (c) Hormone-sensitive lipase found in adipose tissue initiates triglyceride degradation by removing the fatty acid from either the C-1 or C-3 position of the glycerol backbone. (d) Phospholipases A2 releases fatty acid from carbon 2 of the phospholipid backbone, forming lysophospholipid (e) Phospholipase C is a key enzyme in the phosphatidylinositol signal transduction pathway. (f) All of them.
34. Which of the following enzymes and pathways are correctly matched? (a) Phospholipase C and prostaglandin synthesis (b) β-Glucocerebrosidase and sphingolipid degradation (c) 5-Lipooxygenase and prostaglandin synthesis (d) Choline kinase and phosphatidylethanolamine synthesis (e) Phospholipase A2 and sphingomyelin synthesis (f) All of them.
35. Which of the following pathways is operating during prolonged fasting and starvation but is not operating in the well-fed state or during an overnight fast? (a) Fatty acid oxidation in muscle (b) Fatty acid synthesis in the liver (c) Triglyceride hydrolysis in adipose tissue (d) Ketone oxidation in the brain (e) Triglyceride synthesis in adipose tissue (f) All of them.
36. Which of the following amino acids is excreted when benzoic acid is used for the treatment of urea cycle disorders? (a) Asp (b) Arg (c) Ornithine (d) Gly (e) Gln (f) all of them.
37. Which of the following statements about gout is true? (a) It results from the overproduction of orotic acid (b) It can result from a deficiency in phosphoribosylpyrophosphate synthetase (c) It can be treated with inhibitors of xanthine oxidase (d) It occurs more frequently in women than men (e) The symptoms appear in early adolescence (f) All of them.
38. Which of the following events occurs in the reaction catalyzed by ribonucleotide reductase? (a) Inhibition by ribonucleotides (b) Reduction of ribonucleotides by thioredoxin and NAD (c) Reduction of purine and pyrimidine ribonucleoside diphosphates (d) Regeneration of tetrahydrofolate (THF) by NADPH (e) Activation by dATP (f) all of them.
39. Which of inhibitors listed below specifically inhibits the activity of hydroxymethylglutaryl-CoA reductase? (a) Aspirin (b) Lovastatin (c) Aminopterin (d) Allopurinol (e) Ibuprofen (f) All of them.
40. Which of the following reactions is located in the cytosol? (a) Electron transport and oxidative phosphorylation (b) Ketone body synthesis (c) Tricarboxylic acid cycle (d) Beta-oxidation (e) Cholesterol biosynthesis (f) All of them.

二、簡答題(共 20 分)

1. Please specify the functions and action modes of the following compounds: (a) Cordycepin (3%) (b) Antimycin A (3%) (c) Diisopropyl fluorophosphate (4%).
2. Compare the difference between radioimmunoassay (RIA) and enzyme-linked immunosorbent assay (ELISA). (4%)
3. Please define the terms *citric acid cycle*, *glycolysis*, and *triglyceride synthesis*. (6%)

參考用