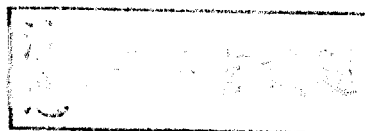


所別：生命科學系碩士班 分子與細胞生物組(一般生) 科目：生物化學
(學位在職生)

一. 單選題(每題 2 分; 共 36 題)

1. How many NADH are generated in converting 1 mole of glucose to lactate? (a) 0 mole (b) 1 moles (c) 2 moles (d) 4 moles (e) 12 moles (f) 38 moles
2. Which of the following enzymes is **not** involved in the pentose phosphate pathway? (a) Glucose-6-phosphate dehydrogenase (b) 6-phosphogluconate dehydrogenase (c) Transaldolase (d) succinate dehydrogenase (e) transketolase (f) phosphopentose epimerase
3. Which of the following compounds inhibits ATP synthesis through oxidative phosphorylation? (a) Cordycepin (b) Puromycin (c) 2,4-Dinitrophenol (DNP) (d) Fluoroacetate (e) Ethidium bromide (f) Acetyl-CoA
4. Which of the following organisms has the **smallest** genome in size? (a) *E. coli* (b) *Saccharomyces cerevisiae* (c) T4 phage (d) *Drosophila melanogaster* (e) *Homo sapiens* (f) all of the above.
5. α helix of a polypeptide has a pitch of (a) 0.10 (b) 0.15 (c) 0.34 (d) 0.54 (e) 1 (f) 3.2 nm/turn.
6. Which of the following descriptions about Hb (hemoglobin) is **incorrect**? (a) HbA has an $\alpha_2\beta_2$ structure (b) One HbA can bind 4 O_2 molecules (c) HbF has an $\alpha_2\gamma_2$ structure (d) HbA has a much lower affinity for BPG than does HbF (e) CO_2 can reduce the binding affinity of Hb for O_2 (f) The efficiency of O_2 unloading increases as the pH drops.
7. Which of the following descriptions regarding monosaccharide is **incorrect**? (a) D-Threose and D-Erythrose are diastereomers (b) D-Threose and L-Threose are enantiomers (c) α -D-Glucopyranose and β -D-Glucopyranose are anomers (d) The chair form and boat form of β -D-Glucopyranose are two conformational isomers (e) Anomers differ in configuration only at carbon 1 (f) Only the α anomers of D-ribofuranose are involved in DNA structure.
8. Which of the following descriptions about the Michaelis-Menten rate equation is **incorrect**? (a) K_M measures the product 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) The most convenient ways to determine K_M and k_{cat} are via Lineweaver-Burk plots (e) A competitive inhibitor increases the apparent K_M (f) A noncompetitive inhibitor reduces the apparent V_{max} .
9. Which of the following sub-cellular structures does not exist in mammalian cells? (a) mitochondria (b) nucleus (c) Golgi complex (d) chloroplasts (e) lysosomes (f) all of the above.
10. Suppose you wish to separate two DNA fragments (0.5 and 1 kb each) on an agarose gel, which of the following agarose gels best fits the requirement? (a) 0.1% (b) 1% (c) 10% (d) 100% (e) all of the above (f) none of the above.
11. 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) $L = 940$ (b) $T = 1,000$ (c) $W = -60$ (d) $L = T + W$ (e) all of the above (f) none of the above.
12. Which of the following compounds is a specific inhibitor of citric acid cycle? (a) AZT (b) Chloramphenicol (c) Novobiocin (d) Fluoroacetate (e) Cordycepin (f) IPTG
13. An actively respiring bacterial culture is briefly incubated with $[1-^{14}C]$ glucose, and the glycolytic and TCA intermediates are isolated. Where is the ^{14}C in Glyceraldehyde 3-phosphate? Consider only the initial incorporation of ^{14}C in the first pass of labeled glucose through the pathways. (a) C1 (b) C2 (c) C3 (d) C1 and C2 (e) C2 and C3 (f) C1 and C3.
14. How many high-energy phosphates are generated in oxidizing 1 mole of NADH via malate/aspartate shuttle? (a) 0 (b) 1 (c) 2 (d) 3 (e) 38 (f) none of the above
15. Which of the following amino acids has the highest UV absorbance at 280 nm? (a) Phe (b) Tyr (c) Trp (d) Glu (e) Gln (f) Arg.
16. Which of the following compounds has the highest molecular weight? (a) galactose (b) mannose (c) tryptophan (d) arginine (e) guanosine (f) uracil.
17. Which of the following descriptions regarding disaccharide is **incorrect**? (a) Sucrose is α -D-glucopyranosyl (1 \rightarrow 2)



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- β -D-fructofuranoside (b) Maltose has an $\alpha(1\rightarrow4)$ linkage (c) Cellobiose is β -D-glucopyranosyl (1 \rightarrow 4) β -D-glucopyranose (d) Lactose has one reducing and one nonreducing end (e) The glucose moiety in lactose can exist in either α or β configuration in solution (f) Sucrose has only one reducing end.
- Which of the following restriction endonucleases is an isoschizomer of XhoI (CTCGAG)? (a) EcoRI (GAATTC) (b) XbaI (TCTAGA) (c) BamHI (GGATCC) (d) Sall (GTCGAC) (e) EagI (CGGCCG) (f) none of the above
 - Which scientist made a significant contribution to the discovery of prion? (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.
 - Which enzyme is **not** directly involved in the catabolism of purine nucleotides to uric acid? (a) xanthine oxidase (b) Adenosine deaminase (c) Nucleotidase (d) PRPP amidotransferase (e) Purine nucleoside phosphorylase (f) Guanine deaminase.
 - How many ATPs are produced from the oxidation of *cis*-9-octadecenoic acid? (a) 143 (b) 144 (c) 145 (d) 146 (e) 148
 - Which of these amino acids can serve as the precursor of thyroid hormones and catecholamines? arginine (b) tyrosine (c) histidine (d) lysine (e) glutamine
 - Which of these statements is **true**? (a) Insulin increases triacylglycerol synthesis and lipolysis (b) Epinephrine increases triacylglycerol mobilization and glycogenolysis (c) Glucagon increases glycogenolysis and triacylglycerol synthesis (d) Insulin and glucagon increase glycolysis (e) both a and b.
 - Which of these lipoproteins can play essential roles in the transport of dietary lipids to tissue? (a) chylomicron (b) VLDL (c) IDL (d) LDL (e) HDL
 - Which of these compounds **does not** belong to ketone bodies? (a) hydroxybutyrate (b) acetone (c) acetoacetate (d) pyruvate (e) both b and c.
 - Which of these enzymes is considered as the lipogenic enzymes? (a) fatty acid synthase (b) citrate lyase (c) malic enzyme (d) glucose-6-phosphate dehydrogenase (e) all of them.
 - Which of these compounds can serve as the precursor of triacylglycerol synthesis? (a) glycerol-3-phosphate (b) monoacylglycerol (c) dihydroxyacetone phosphate (d) both a and c. (e) all a, b, and c.
 - What is the energy cofactor for phospholipid biosynthesis? (a) UTP (b) CDP (c) ATP (d) TTP (e) CTP
 - Which of these phospholipids is absent in *E. coli*? (a) cardiolipin (b) phosphatidylserine (c) phosphatidylglycerol (d) phosphatidylcholine
 - A deficiency of the following enzyme can lead to feminization of males (a) aromatase (b) cyclooxygenase (c) squalene epoxidase (d) 5α -reductase
 - What is the source of the nitrogen atom in urea? (a) mitochondrial carbamoyl phosphate (b) cytosolic carbamoyl phosphate (c) aspartate (d) both a and c. (e) both b and c.
 - A deficiency of the following enzyme can lead to phenylketonuria (a) tyrosine hydroxylase (b) tyrosinase (c) tryptophan hydroxylase (d) phenylalanine hydroxylase (e) proline hydroxylase
 - A deficiency of the following enzyme can lead to homocystinuria (a) cystathionine synthase (b) methionine synthase (c) 5,10-methylene-THF reductase (d) both a and b. (e) all a, b, and c.
 - What is the specific action of PD98059? (a) an inhibitor of G protein (b) an inhibitor of phosphoinositide 3-kinase (c) an inhibitor of Erk MAPKK (d) an inhibitor of adenylate cyclase
 - Which of these coenzymes involves primarily in transamination reactions of amino acid metabolism? (a) vitamin C (b) vitamin E (c) vitamin B6 (d) vitamin B12 (e) folic acid
 - What is the substrate for the last cycle of beta-oxidation of an odd-chain acyl-CoA? (a) acetyl-CoA (b) propionyl-CoA (c) acetoacetyl-CoA (d) malonyl-CoA

二、簡答題(每題五至十分;共四題)

- Please define the term "ribozyme" (3%), and give an example. (2%)
- What are the **pitch** (in nm) and **diameter** (in nm) of a classical B form DNA? (3% and 2%, respectively)
- Specify the biochemical reactions catalyzed by acetyl-CoA carboxylase (5%) and hormone-sensitive lipase (5%).
- Draw the chemical structure of cholesterol and phosphatidylinositol-4,5-bisphosphate. (4% each)