大葉大學九十三學年度碩士班甄試試題紙					
所　別	組別	考試科目（中文名稱）	考試日期	考試時間	備註
生物產業科技學系		生物化學	12月8日	9:00 – 10:30	P2-1

註：備註欄若未註明可攜帶計算機或其他輔助工具作答時，考生一律不准攜帶。

I. Single choice (2 pts each)

1. Which statement is incorrect?
   (A) Proteins sharing a significant degree of sequence similarity are homologous.
   (B) Proteins that perform the same function in different organisms are referred to as homologous
   (C) Invariant residues usually are a result of random mutations.
   (D) Proteins with related function may have common evolutionary origin.
   (E) Proteins with different functions may have common evolutionary origin.
2. Amino acids are ampholytes because they can function as either
   (A) a neutral molecule or an ion. (B) a polar or a nopolar molecule. (C) a transparent or a light-absorbing compound.
   (D) an acid or a base. (E) a standard or a nonstandard monomer in proteins.
3. Which two amino acids are most suited to beta-turn?
   (A) Phenylalanine and tyrosine (B) Proline and alanine (C)Phenylalanine and alanine
   (D) Proline and glycine (E)Tyrosine and glycine
4. Which statement of the following about anabolism is incorrect?
   (A) Often driven by energy. (B) Endergonic pathways. (C) Results in increase in molecular complexity.
   (D) Involved in phosphorylation of ADP to ATP (E) NADPH serves as source of electrons.
5. Which statement is incorrect?
   (A) An A/T base pair and a G/C base pair have about the same physical dimensions.
   (B) If GGGGCCCC represents the sequence of bases in one strand of a double-stranded DNA then the complementary strand must have the sequence CCCCGGGG.
   (C) mRNA is single-stranded.
   (D) hnRNA are RNA molecules made in the nucleus and processed into mRNA.
   (E) rRNA and tRNA contain modified nucleosides.
6. Which of the following pairs is interconverted in the process of mutarotation?
   (A) α-D-glucose and β-L-glucose. (B) α-D-glucose and β-D-glucose. (C) D-glucose and D-glucosamine.
   (D) D-glucose and D-fructose. (E) D-glucose and L-glucose
7. A sequence of amino acids in a certain protein is found to be –S-G-P-G-. The sequence is most probably part of a(n)
   (A) alpha helix. (B) alpha sheet. (C) beta turn. (D) parallel beta sheet. (E) antiparallel beta sheet.
8. The steady-state assumption, as applied to enzyme kinetics, implies
   (A) $K_m = K_s$. (B) the enzyme is regulated. (C) the K_m is equivalent to the cellular substrate concentration.
   (D)the maximum velocity occurs when the enzyme is saturated.
   (E)the ES complex is formed and broken down at equivalent rates.
9. When two carbohydrates are epimers, (A) they differ only in the configuration around one carbon atom.
   (B) they rotate plane-polarized light in the same direction. (C) one is a pyranose, the other a furanose.
   (D)one is an aldose, the other a ketose. (E) they differ in length by one carbon.
10. Which of the following is true of sphingolipids? (A) They always contain glycerol and fatty acids.
    (B)They may be charged, but never amphipathic. (C) They are precursors of steroid hormones.
    (D)Cerebrosides and gangliosides are sphingolipids. (E) Phosphatidylcholine is a typical sphingolipid.
11. Which of the following statements is not a characteristic of intermediary metabolism?
    (A) It includes catabolic and anabolic pathways (B) ADP is phosphorylated to ATP in an aerobic catabolic pathways (C) It maintains all the reactions in the body at equilibrium (D) Macromolecules are synthesized in an anabolic pathways.
12. What statement is incorrect about the fate of pyruvate in various cells?
    (A) It is oxidized to form carbon dioxide under aerobic conditions in muscle cells (B) It will be reduced to lactate under anaerobic conditions in muscle cells (C) It will be preferentially converted to lactate when the ratio of NAD^+ to NADH is elevated in the mitochondria of muscle cells (D) It is preferentially reduced to ethanol under anaerobic conditions in yeast cells.
13. The two molecules of CO_2 which are produced in the TCA cycle are derived directly from (A) the carbons of the acetyl group which entered the cycle in this round (B) the carboxyl groups in oxaloacetate (C) the non-carboxyl groups in oxaloacetate (D) the carboxyl carbon in the acetyl group which entered the cycle in this round and the α-carbonyl group in oxaloactate.
14. As cAMP levels rise in liver cells, what event is likely to occur? (A) Protein kinase A will be more active.
    (B) Glycogen phosphorylase will be less active. (C) Glucose will be stored as glycogen.
    (D) Phosphofructokinase will more active.

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15. A characteristic of the glycerolphosphate shuttle is
(A) it shuttles "NADH electron equivalents" across the mitochondrial membrane to yield 1.5 ATP/NADH
(B) it shuttles NADH across the mitochondrial membrance to yield 2.5 ATP/NADH
(C) it only operates efficiently when the [NADH] in the cytoplasm is higher than in the matrix
(D) malate is a key component in the shuttle process.
16. Which statement is incorrect for the glycogen phosphorylase in glycogen breakdown?
(A) The reaction produces glucose-1-phosphate. (B) The glucose-1-phosphate is converted into glucose-6-phosphate, which may be fed into glycolysis. (C) The attack by phosphate on glycogen in the phosphorolysis reaction is not thermodynamically favored under standard state conditions. (D) The hydrolysis reaction occurs at the non-reducing end of glycogen.
17. The first oxidation in the β-oxidation of saturated fatty acids, catalyzed by acyl-CoA dehydrogenase, is the conversion of
(A) a primary alcohol to an aldehyde (B) a saturated to an unsaturated carbon-carbon bond
(C) a secondary alcohol to a ketone (D) an aldehyde to a carboxylic acid.
18. In the synthesis of palmitate, the carbon in the bicarbonate used in malonyl-CoA synthesis were labeled with ^{14}C, where would the label be found in the reaction products?
(A) CO_2 (B) C-16 of palmitate (C) C-1 of palmitate (D) C-8 in palmitate.
19. The biosynthesis of what amino acid involves reactions which are also part of the urea cycle?
(A) lysine (B) glycine (C) priline (D) arginine.
20. The purine ring is derived in part from which of the following metabolic precursors?
(A)glutamic acid (B) glutamine (C) asparagine (D) alanine.

II. Multiple choice (5pts each)

1. Which of the following agents is(are) expected to affect protein tertiary structure?
(A) Urea (B) SDS (C) High temperature (D) Distilled water (E) Organic solvents
2. Which statement(s) about passive transport is(are) correct?
(A) Can only move down a concentration. (B)Can occur in both directions across a biological membrane.
(C) Movement is coupled to exergonic process.(D) Can be used to concentrate substances.
(E) Rate is linearly proportional to concentration difference.
3. Which statement(s) about nucleotides is(are) true?
(A) cAMP is a 3'-5' cyclic form of AMP.
(B) The alpha phosphate of GTP is the phosphate closest the sugar moiety.
(C) The only biological function of dCTP is as a building block in synthesis of DNA.
(D) The only biological function of CTP is as a building block in synthesis of RNA.
(E) The most common ribonucleotide triphosphates have phosphate attached to the 3' carbon of the sugar moiety.
4. Enzymes have the distinct features that distinguish them from chemical catalysts. What are they?
(A) Enormous catalytic power. (B) Increasing the free energy of activation. (C) Specificity.
(D) The ability to be regulated. (E) Increasing the equilibrium constant..
5. Glycolysis (A) occurs in mitochondria (B) does not require molecular O_2 to generate energy
(C) glyceraldehyde-3-phosphate is the final production in phase 1 (D) is inhibited by O_2
(E) occurs 2 substrate-level phosphorylation reactions.
6. What statements are correct in electron transport chain? (A) Ubiquinone can participate in a two-electron transfer
(B) Fe-S protein is a mobile electron carrier in the electron transport chain
(C) Complex IV (oxidase) has a direct link to ubiquinone in some form
(D) Coenzyme QH_2 is the electron donor to complex III
(E) Complex II is also named as cytochrome c oxidase.
7. What molecules are substrate(s) or coenzyme(s) of acetyl CoA carboxylase in fatty acid biosynthesis?
(A) NAD^+ (B) acetyl CoA (C) $NADP^+$ (D) ATP (E) biotin.

III. Problems

1. If the internal pH of a muscle cell is 6.8, what is the $[HPO_4^{2-}]/[H_2PO_4^-]$ ratio in this cell? The pKa values of H_3PO_4 are 2.15, 7.20 and 12.40. $10^{0.4} = 2.5$; $10^{4.65} = 44668$; $10^{5.6} = 398107$. (5pts)
2. Chargaff's rules provided an important clue to solve the structure of double-stranded DNA. What are Chargaff's rules? (5pts)
3. What is the essential difference between the "lock and key" hypothesis of enzyme substrate interaction and the "induced fit" hypothesis? (5pts)
4. The coenzymes of NAD^+/NADH and $NADP^+$/NADPH play very different metabolic roles. Please explain briefly the differences and show one reaction in glycolysis/fatty acid biosynthesis used either of them. (10pts)

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