朝陽科技大學 100 學年度碩士班招生考試試題

系（所）別：應用化學系
組　　別：一般生
科　　目：生物化學

滿分：50 分

一、選擇題(單選15題，每題2分，共30分)

1. The complete metabolism of one molecule of myristic acid, a fatty acid with 14 atoms of carbon, would produce _____ molecules of acetyl-CoA.
   (A) 6.
   (B) 14.
   (C) 12.
   (D) 7.
   (E) 8.

2. Hemoglobin resembles myoglobin in that they both:
   (A) are oligomeric proteins.
   (B) bind a maximum of one O_2 per heme group.
   (C) exhibit sigmoidal O_2-binding curves.
   (D) bind 2,3-diphosphoglycerate (2,3BPG).
   (E) exist predominantly as tense forms when oxygenated and relaxed forms when deoxygenated.

3. All of the following enzymes are unique to gluconeogenesis **EXCEPT**:
   (A) phosphoglucoisomerase.
   (B) glucose-6-phosphatase.
   (C) pyruvate carboxylase.
   (D) fructose-1,6-*bis*phosphatase.
   (E) PEP carboxykinase.

4. Which of the following is the correct sequence of carriers in the electron transport chain?
   (A) NADH/CoQ reductase → cytochrome *c* → CoQ → cytochrome reductase → cytochrome oxidase.
   (B) CoQ → cytochrome reductase → cytochrome oxidase → cytochrome *c* → NADH/CoQ reductase.
   (C) NADH/CoQ reductase → CoQ → cytochrome *c* → cytochrome oxidase → cytochrome reductase.
   (D) NADH/CoQ reductase → cytochrome reductase → cytochrome *c* → CoQ → cytochrome oxidase.
   (E) NADH/CoQ reductase → CoQ → cytochrome reductase → cytochrome *c* → cytochrome oxidase.

5. In the Watson-Crick model of DNA structure:
   (A) phosphate groups project toward the middle of the helix, where they are protected from interaction with water.
   (B) T can form three hydrogen bonds with either G or C in the opposite strand.
   (C) the distance between two adjacent bases in one strand is about 0.34 nm (3.4 Å).
   (D) both strands run in the same direction, 3′→5′; they are parallel.
   (E) the distance between the sugar backbone of the two strands is just large enough to accommodate either two purines or two pyrimidines.

6. When fatty acid metabolism creates more acetyl-CoA than can be handled in the citric acid cycle, the excess acetyl-CoA is converted into:
   (A) fatty alcohols.
   (B) ketone bodies.
   (C) glycerol.
   (D) amino acids.
   (E) cholesterol.

7. Which of the following applies to enzyme inhibition of non-competitive nature?
   (A) The addition of the inhibitor does not change V_{max}.
   (B) The inhibitor molecules are generally substrate analogs which bind to the active site of the enzyme.
   (C) The reaction rate is determined by the I/S concentration ratio.
   (D) The inhibition is irreversible.
   (E) The K_m value obtained from the Lineweaver-Burk plots would be the same as in the absence of the inhibitor.

8. The pentose phosphate pathway is an important source of _____, and for _____, an essential precursor for ATP, $NADP^+$, FAD, CoA, DNA and RNA.
   (A) ATP; NADH.
   (B) NADH; NADPH.
   (C) NADPH; ribose-5-phosphate.
   (D) ribose-5-phosphate; ATP.
   (E) all are true.

9. Two amino acids of the standard 20 contain sulfur atoms. They are:
   (A) cysteine and serine.
   (B) cysteine and threonine.
   (C) methionine and serine.
   (D) methionine and cysteine.
   (E) threonine and serine.

10. The diseases identified as diabetes are primarily associated with a malfunction of the hormone:
   (A) insulin.
   (B) cortisone.
   (C) glucagon.
   (D) sorbitol.
   (E) epinephrine.

11. Which of these is a general feature of the lipid bilayer in all biological membranes?
   (A) Individual lipid molecules are free to diffuse laterally in the surface of the bilayer.
   (B) Individual lipid molecules in one face (monolayer) of the bilayer readily diffuse (flip-flop) to the other monolayer.
   (C) Polar, but uncharged, compounds readily diffuse across the bilayer.
   (D) The bilayer is stabilized by covalent bonds between neighboring phospholipids molecules.
   (E) The polar head groups face inward toward the inside of the bilayer.

12. Glycogen synthesis and degradation must be carefully controlled at _____ and _____ to properly serve the metabolic needs for the organism.
(A) glucokinase; hexokinase
(B) hexokinase; glycogen synthase
(C) glycogen synthase; glucokinase
(D) glycogen phosphorylase; glycogen synthase
(E) glycogen phosphorylase; hexokinase

13. The major reason that antiparallel β-stranded protein structures are more stable than parallel β-stranded structures is that the latter:
(A) are in a slightly less extended configuration than antiparallel strands.
(B) have weaker hydrogen bonds laterally between adjacent strands.
(C) do not have as many disulfide crosslinks between adjacent strands.
(D) do not stack in sheets as well as antiparallel strands.
(E) have fewer lateral hydrogen bonds than antiparallel strands.

14. Which conversion is accomplished during glycolysis?
(A) glucose to glycogen.
(B) glycogen to glucose.
(C) starch to glucose.
(D) pyruvate to glucose.
(E) glucose to pyruvate.

15. When making a complementary DNA (cDNA) library, which enzyme is used to copy mRNA into DNA?
(A) primase.
(B) DNA ligase.
(C) reverse transcriptase.
(D) RNA polymerase.
(E) DNA polymerase.

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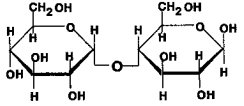
二、問答題(4題，每題5分，共20分)

1. 光合作用有兩部份—光反應(light reaction)及暗反應(dark reaction)，它們的作用為何？

2. 麥芽糖(maltose)的結構式如下所示：



(*a*) 兩個葡萄糖分子間以何種形式糖苷鍵(glycosidic bond)連接？
(*b*) 請圈出異位碳(anomeric carbon)之位置。
(*c*) 請以箭頭指出本化合物之非還原端(non-reducing end)所在位置。
(*d*) 此化合物是屬於吡喃糖(pyranoses)或是呋喃糖(furanoses)？

3. 何謂波爾效應(Bohr effect)？為何它對血紅素(hemoglobin)結合氧氣的作用是如此重要？

4. 糖解作用(glycolysis)的三個不可逆代謝反應是什麼？為何它們是不可逆？