臺灣綜合大學系統114學年度學士班轉學生聯合招生考試試題

科目名稱	生物化學	類組代碼	C07
		科目碼	C0701

※本項考試依簡章規定所有考科均「不可」使用計算機。　　本科試題共計 5 頁

A. Multiple choice question (50%; one correct answer only) 請於答案卡上作答，否則不予計分。

1. Which of the following is *not true* of the reaction producing malonyl-CoA during fatty acid synthesis?
A) It is stimulated by citrate.
B) It requires acyl carrièr protein (ACP).
C) It requires CO2 (or bicarbonate).
D) One mole of ATP is converted to ADP + Pi for each malonyl-CoA synthesized.
E) The cofactor is biotin.

2. Which amino acid does not have a primary α-amino group?
A) glutamine
B) arginine
C) lysine
D) proline
E) glutamate

3. Which amino acid residues are commonly found at the central positions of a β-turn?
A) Alanine and Glycine
B) Hydrophobic residues
C) Proline and Glycine
D) Residues with ionized R-groups
E) Two cysteines

4. The conversion of 1 mol of fructose 1,6-bisphosphate to 2 mol of pyruvate by the glycolytic pathway results in a net formation of:
A) 1 mol of NAD^+ and 2 mol of ATP.
B) 1 mol of NADH and 1 mol of ATP.
C) 2 mol of NADH and 4 mol of ATP.
D) 2 mol of NADH and 2 mol of ATP.
E) 2 mol of NAD^+ and 4 mol of ATP.

5. Which of the following substrates *cannot* contribute to net gluconeogenesis in mammalian liver?
A) Lysine
B) glutamate
C) alanine
D) pyruvate
E) α-ketoglutarate

6. Of the 20 standard amino acids, only _____ is not optically active. The reason is that its side chain _____.
A) alanine; is a simple methyl group
B) glycine; is a hydrogen atom
C) glycine; is unbranched
D) lysine; contains only nitrogen
E) proline; forms a covalent bond with the amino group

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7. One amino acid directly involved in the purine biosynthetic pathway is:
A) alanine.
B) aspartate.
C) glutamate.
D) leucine.
E) tryptophan

8. Which tripeptides carry a net positive charge at pH 7.0?
A) Ala—Thr—Asn
B) Gln—Val—Ser
C) Arg—Glu—Met
D) Pro—Ile—Leu
E) Leu—Lys—Gly

9. All of the following are considered "weak" interactions in proteins, except:
A) hydrogen bonds.
B) hydrophobic interactions.
C) ionic bonds.
D) peptide bonds.
E) van der Waals forces.

10. When oxygen binds to a heme-containing protein, the two open coordination bonds of Fe^{2+} are occupied by:
A) one O atom and one amino acid atom.
B) one O2 molecule and one amino acid atom.
C) one O2 molecule and one heme atom.
D) two O atoms.
E) two O2 molecules.

11. Glucose labeled with ^{14}C in C-1 and C-6 gives rise in glycolysis to pyruvate labeled in:
A) A and C.
B) all three carbons.
C) its carbonyl carbon.
D) its carboxyl carbon.
E) its methyl carbon.

12. Which of the following molecules can inhibit glycogen phosphorylase a by binding to an allosteric site?
A) AMP.
B) calcium.
C) GDP.
D) glucagon.
E) glucose.

13. Transamination from alanine to α-ketoglutarate requires the coenzyme:
A) biotin.
B) NADH.
C) No coenzyme is involved.
D) pyridoxal phosphate (PLP).
E) thiamine pyrophosphate (TPP).

 背面有題，請繼續作答。

14. In an anaerobic muscle preparation, lactate formed from glucose labeled in C-3 and C-4 would be labeled in:
A) all three carbon atoms.
B) only the carbon atom carrying the OH.
C) only the carboxyl carbon atom.
D) only the methyl carbon atom.
E) the methyl and carboxyl carbon atoms.

15. If electron transfer in tightly coupled mitochondria is blocked (with antimycin A) between cytochrome b and cytochrome c1, then:
A) all ATP synthesis will stop.
B) ATP synthesis will continue, but the P/O ratio will drop to one.
C) electron transfer from NADH will cease, but O2 uptake will continue.
D) electron transfer from succinate to O2 will continue unabated.
E) energy diverted from the cytochromes will be used to make ATP, and the P/O ratio will rise.

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17. If a person's urine contains unusually high concentrations of urea, which one of the following diets has he or she probably been eating recently?
A) High carbohydrate, very low protein
B) Very high carbohydrate, no protein, no fat
C) Very very high fat, high carbohydrate, no protein
D) Very high fat, very low protein
E) Very low carbohydrate, very high protein

18. Which of the below is not required for the oxidative decarboxylation of pyruvate to form acetyl-CoA?
A) ATP
B) CoA-SH
C) FAD
D) Lipoic acid
E) NAD^+

19. Which of the following statements about a plot of V_0 vs. [S] for an enzyme that follows Michaelis-Menten kinetics is false?
A) As [S] increases, the initial velocity of reaction V_0 also increases.
B) At very high [S], the velocity curve becomes a horizontal line that intersects the y-axis at Km.
C) Km is the [S] at which $V_0 = 1/2\ V_{max}$.
D) The shape of the curve is a hyperbola.
E) The y-axis is a rate term with units of μm/min.

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20. Glutamine, arginine, and proline:
A) do not have a common precursor.
B) may all be derived from a citric acid cycle intermediate.
C) may all be derived from a Cori cycle intermediate.
D) may all be derived from a glycolytic intermediate.
E) may all be derived from a urea cycle intermediate.

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B. Assay Questions (50%): 請於答案卷上作答，否則不予計分。

1. Give two reactions that require the cofactor of vitamin B12 or its derivative in mammalian metabolism. (6%)
2. Calculate the number of ATP molecules obtained from the anaerobic conversion of the following compounds to lactate in glycolysis:
   (a) glycerol (1%) (b) fructose in liver (1%) (c) mannose (1%) (d) galactose (1%)
   (e) fructose-6-phosphate (1%) (f) 1,3-bisphosphoglycerate (1%)
3. How does binding of epinephrine to β-adrenergic receptor initiate the cAMP production? (5%)
4. What are receptor tyrosine kinases? (2%) Give an example. (2%)
5. Insulin signaling can block the activity of GSK-3. Give the detailed molecular pathway for this signal transduction. (5%)
6. Describe the pathway for fatty acids that are activated and transported into mitochondria for β-oxidation. (5%)
7. Where is the site of respiratory chain or the site of oxidative phosphorylation that is inhibited by the following inhibitors?
   (a) Cyanide (1%) (b) antimycin A (1%) (c) rotenone (1%) (d) bongkrekic acid (1%)
8. Epinephrine acts on muscles, activates the activity of cAMP-dependent protein kinase and stimulates glycolysis. However, epinephrine acts on the liver and also activates the activity of cAMP-dependent protein kinase, but blocks glycolysis. Why? (5%)
9. Hypercholesterolemic individuals taking statins are sometimes advised to take supplements of coenzyme Q. Why? (5%)
10. A globular protein aggregates to form either a tetrahedral tetramer or a linear tetramer. If a mixture is chromatographed with a Sephadex gel, which form will elute first? (2%) Why? (3%)