臺灣綜合大學系統113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%, 2% each; one correct answer only)

請於答案卡上作答，否則不予計分。

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

2. 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

3. 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

4. Which of the following refers to particularly stable arrangements of amino acid residues in a protein that give rise to recurring patterns?
A) Primary structure
B) Secondary structure
C) Tertiary structure
D) Quaternary structure
E) None of the above

5. 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.

6. Which of the following best represents the backbone arrangement of two peptide bonds?
A) C_α—N—C_α—C—C_α—N—C_α—C
B) C_α—N—C—C—N—C_α
C) C—N—C_α—C_α—C—N
D) C_α—C—N—C_α—C—N
E) C_α—C_α—C—N—C_α—C_α—C

7. Thr and/or Leu residues tend to disrupt an α helix when they occur next to each other in a protein because:
A) an amino acids like Thr is highly hydrophobic.
B) covalent interactions may occur between the Thr side chains.
C) electrostatic repulsion occurs between the Thr side chains.
D) steric hindrance occurs between the bulky Thr side chains.
E) the R group of Thr can form a hydrogen bond.

8. The tripeptide glycylarginylglutamate contains four ionizable groups with pK_as of 2.1, 4.1 9.8, and 12.5. Calculate the pI for this molecule.
A) 3.1
B) 6.4
C) 7.0
D) 7.3
E) 8.3

9. The quantitation of proteins due to their absorbance at ~280 nm (UV region) is due to the large absorbtivity of the _____ amino acids.
A) anionic
B) dansylated
C) cleaved
D) polar
E) aromatic

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 O_2 molecule and one amino acid atom.
C) one O_2 molecule and one heme atom.
D) two O atoms.
E) two O_2 molecules.

11. Myoglobin and the subunits of hemoglobin have:
A) no obvious structural relationship.
B) very different primary and tertiary structures.
C) very similar primary and tertiary structures.
D) very similar primary structures, but different tertiary structures.
E) very similar tertiary structures, but different primary structures.

12. Which one of the following statements is true of enzyme catalysts?
A) Their catalytic activity is independent of pH.
B) They are generally equally active on D and L isomers of a given substrate.
C) They can increase the equilibrium constant for a given reaction by a thousand fold or more.
D) They can increase the reaction rate for a given reaction by a thousand fold or more.
E) To be effective, they must be present at the same concentration as their substrate.

背面有題，請繼續作答。

13. 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 K_m.
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.

14. Which of the following monosaccharides is not an aldose?
A) erythrose B) fructose C) glucose D) glyceraldehyde E) ribose

15. From the abbreviated name of the compound Gal(β1 → 4)Glc, we know that:
A) C-4 of glucose is joined to C-1 of galactose by a glycosidic bond.
B) the compound is a D-enantiomer.
C) the galactose residue is at the reducing end.
D) the glucose is in its pyranose form.
E) the glucose residue is the β anomer.

16. In the laboratory, recombinant plasmids are commonly introduced into bacterial cells by:
A) electrophoresis – a gentle low-voltage gradient draws the DNA into the cell.
B) infection with a bacteriophage that carries the plasmid.
C) microinjection.
D) mixing plasmids with an extract of broken cells.
E) transformation – heat shock of the cells incubated with plasmid DNA in the presence of $CaCl_2$.

17. 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.

18. 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.

19. Inorganic fluoride inhibits enolase. In an anaerobic system that is metabolizing glucose as a substrate, which of the following compounds would you expect to increase in concentration following the addition of fluoride?
A) 2-phosphoglycerate
B) Glucose
C) Glyoxylate
D) Phosphoenolpyruvate
E) Pyruvate

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20. The glycogen-branching enzyme catalyzes:
A) degradation of (α1 → 4) linkages in glycogen
B) formation of (α1 → 4) linkages in glycogen.
C) formation of (α1 → 6) linkages during glycogen synthesis.
D) glycogen degradation in tree branches.
E) removal of unneeded glucose residues at the ends of branches.

21. Glycogen phosphorylase a can be inhibited at an allosteric site by:
A) AMP.
B) calcium.
C) GDP.
D) glucagon.
E) glucose.

22. 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^+

23. Which of the following is not an intermediate of the citric acid cycle?
A) Acetyl-CoA
B) Citrate
C) Oxaloacetate
D) Succinyl-CoA
E) α-Ketoglutarate

24. The carbon atoms from a fatty acid with an odd number of carbons will enter the citric acid cycle as acetyl-CoA and:
A) butyrate.
B) citrate.
C) malate.
D) succinyl-CoA.
E) α-ketoglutarate.

25. 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。

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

1. Give 5 amino acids that their side-chains are polar and uncharged at pH 7. (5%)
2. If G6P (Glucose-6-phosphate) is labeled with ^{14}C at its C1 position, where will the label appear in the product (Fructose-6-phosphate) of the pentose phosphate pathway? (5%)
3. SH2 domains bind phosphotyrosine residues in deep pockets on their surface. Would you expect SH2 domains to bind phosphoserine or phosphothreonine with high affinity? (2%) Why or why not? (3%)
4. Draw the structure of the following compounds:
   (a) phosphoenolpyruvate (1%)　(b) succinate (1%)　(c) lactate (1%)　(d) citrate (1%)
   (e) 1,3-Bisphosphoglycerate (1%)　(f) alanine (1%)
5. How does insulin stimulate glycogen synthesis? (5%)
6. Animals cannot carry out a net conversion of even chain fatty acid carbons to glucose. On the other hand, some of the carbons in odd-chain fatty acids can be gluconeogenic precursors to glucose. Why? (5%)
7. Briefly outline the steps of fatty acid β-oxidation. (5%)
8. Are the acetyl carbons that enter the citric acid cycle the exact same carbons that leave as CO_2? (2%) Briefly explain. (3%)
9. How does blood glucose regulate insulin secretion of pancreatic β cells? (5%)
10. Defects in protein folding are the molecular basis for the development of human serious disease. Give two examples of human diseases due to protein misfolding. (4%)