臺灣綜合大學系統 105 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	D24
		科目碼	D2491
※本項考試依簡章規定各考科均「不可以」使用計算機		本試題共計 4 頁	

I. Multiple Choice (choose one best answer; 2% each, total 50%)

1. Which of the following amino acids are more likely to be found in a protein's **interior** away from aqueous solvent molecules?
   A) Val, Leu, Ile, Met, and Phe
   B) Ser, Thr, Asn, Gln, and Tyr
   C) Arg, His, Lys, Asp, and Glu
   D) All of the above
   E) None of the Above

2. Buffer solutions
   A) will always have a pH of 7.
   B) cause a decrease in pH when acids are added to them.
   C) are rarely found in living systems.
   D) tend to maintain a relatively constant pH.
   E) cause an increase in pH when acids are added to them.

3. On the x and y axes of a Lineweaver-Burk plot, the largest values of substrate concentration will be found:
   A) At the top of the y axis
   B) At the intercept on the y axis
   C) At the right end of the x axis
   D) At the intercept on the x axis
   E) At the origin

4. A competitive inhibitor of an enzyme is usually:
   A) a highly reactive compound.
   B) a metal ion such as Hg^{2+} or Pb^{2+}.
   C) structurally similar to the substrate.
   D) water insoluble.
   E) a poison.

5. The peptide, Val-Lys-Glu-Met-Ser-Trp-Arg-Ala, was digested with cyanogen bromide (CNBr) to produce
   A) Val-Lys + Glu-Met-Ser + Trp-Arg-Ala.
   B) Val-Lys-Glu-Met-Ser-Trp + Arg-Ala.
   C) Val-Lys-Glu-Met + Ser-Trp-Arg-Ala.
   D) Val-Lys-Glu + Met-Ser-Trp-Arg-Ala.
   E) Val-Lys-Glu-Met-Ser + Trp-Arg-Ala.

6. The **isoelectronic point** of an amino acid is the point where
   A) the pK_a of the α-carboxylic acid is the same as the pK_a of the α-amino group.
   B) the α-carboxylic acid is protonated and the α-amino group is unprotonated.
   C) the solubility of the amino acid is maximized.
   D) the α-carboxylic acid and the α-amino group are both half protonated.
   E) the amino acid carries no net electrical charge.

7. What can be done to increase the rate at which a protein of interest moves down an ion-exchange chromatography column?
   A) reduce the ion concentration in the eluent
   B) add a protease inhibitor to the eluent
   C) change the pH of the eluent
   D) reduce the temperature of the eluent
   E) add a small amount of a non-ionic detergents to the eluent

8. The cleavage specificity of trypsin and chymotrypsin depend in part on the
   A) proximity of Ser 195 to the active site or specificity pocket
   B) size, shape, and charge of the active site or specificity pocket
   C) presence of a low-barrier hydrogen bond in the active site or specificity pocket
   D) absence of water in the active site

背面有題，請繼續作答。

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9. Edman degradation can be used to
   A) identify the N-terminal amino acid of a polypeptide.
   B) identify the C-terminal amino acid of a polypeptide.
   C) separate the subunits of a multi-subunit protein.
   D) cleave a protein at specific sites.
   E) cleave disulfide bonds within a protein so that the individual polypeptides can be separated.

10. Proteins have regularly repeating structures called secondary structures. One of these is a β-sheet. Which statements are **true** of β-sheets?
   A) β-sheets exist in either parallel (both N → C) directions; not in antiparallel (one C → N and one N → C) directions.
   B) β-sheets contain almost no alanine or glycine residues.
   C) Hydrogen bonds are formed between intrachain and interchain amino acid side chains.
   D) The size and charge of R group side chains is unimportant

11. Bisphosphoglycerate (BPG) cannot bind to the oxygenated R state of hemoglobin because
   A) it is displaced from the heme by oxygen
   B) it is displaced from the heme by movement of the proximal histidine
   C) its binding pocket becomes too small to accommodate BPG
   D) BPG binds to the R state with the same affinity as the T state

12. Given multiple enzymes that can catalyze the same reaction, which of the following would be the **best** choice, given the kinetic parameters below?
   A) Enzyme 1: $K_m = 10$, $V_{max} = 10$
   B) Enzyme 2: $K_m = 0.5$, $V_{max} = 1$
   C) Enzyme 3: $K_m = 2$, $V_{max} = 1$
   D) Enzyme 4: $K_m = 0.1$, $V_{max} = 10$
   E) Enzyme 5: $K_m = 0.5$, $V_{max} = 5$

13. When comparing similarities among multiple protein structures, which of the following is **false**?
   A) Proteins with the same function from a different species are likely to have similar motifs.
   B) Proteins with the same function from different species are likely to be more similar in sequence than in structure.
   C) An effective protein motif is likely be observed in multiple proteins.
   D) Proteins with the same motifs are likely to perform similar functions.
   E) None of the above statements are false.

14. The value of *n*, the Hill constant (coefficient), for hemoglobin is about _____ as great as the value for myoglobin.
   A) half B) twice C) three times D) five times E) ten times

15. When [S] = K_M, v_0 = (_____)× (V_{max}).
   A) [S] B) 0.75 C) 0.5 D) K_M E) k_{cat}

16. Which of the following hormones functions by binding to receptors that function directly as transcription factors?
   A) steroids B) insulin C) epinephrine D) glucagon E) somatostatin

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17. For the reaction, the steady state assumption
A) implies that $k_1=k_{-1}$ B) implies that k_{-1} and k_2 are such that the [ES] = k_1[ES]
C) [P]>>[E] D) [S] = [P] E) ES breakdown occurs at the same rate as ES formation

18. Which is a **true statement** comparing phospholipids and triglycerides (fats and oils)?
A) Both molecules contain a phosphate group.
B) Triglycerides may be saturated or unsaturated, but all phospholipids are saturated.
C) Phospholipids are the primary storage form for fats in our bodies.
D) Phospholipids occur in fused rings, whilst triglycerides maintain a straight-chain form.
E) Phospholipid molecules have a distinctly polar 'head' and a distinctly non-polar 'tail,' whilst triglycerides are predominantly non-polar.

19. Which of the following segments of the integral membrane protein glycophorin most likely contains the membrane-spanning sequence?
A) LSTTEVAMHTTTSSSVSKSY B) SQTNDTHKRDTYAATPRA
C) VSEISVRTVYPPEEETGE D) ITLIIFGVMAGVIGTILLI
E) YGIRRLIKKSPSDVKPLP

20. Movement of ions across a cell membrane by the Na/K ATPase is best described as
A) sodium moved outside to inside, potassium inside to outside
B) sodium moved inside to outside, potassium outside to inside
C) sodium moved inside to outside, potassium inside to outside
D) sodium moved outside to inside, potassium outside to inside
E) none of the above

21. The conformational changes of hemoglobin from the T to the R state is initiated by
A) binding of oxygen to the heme B) movement of the proximal histidine towards the heme
C) movement of the F-helix, which contains the proximal His
D) reorganization of protein-protein contacts between the individual subunits

22. If a peptide was composed entirely of α-helical structure and found to contain an integer number of complete turns, which of the following would be a possible number of amino acid residues in the peptide?
A) 12 B) 20 C) 32 D) 36 E) 60

23. Proton transfer from an acid, lowering the free energy of a reaction's transition state, is characteristic of
A) electrostatic catalysis. B) nucleophilic catalysis. C) general base catalysis.
D) general acid catalysis. E) concerted acid-base catalysis.

24. Which of the following pairs of amino acids could form a charge-charge interaction through their R-groups?
A) methionine and histidine B) glutamine and lysine C) serine and glutamic acid
D) aspartic acid and arginine E) threonine and asparagine

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25. Sucrose consists of
A) Glucose + glucose
B) Glucose + fructose
C) Glucose + galactose
D) Glucose + mannose

II. Essay (total 50%)

1. Indicate the **subcellular location** for the following lipid metabolisms in mammals:
(a) Fatty acid synthesis (2%)
(b) Fatty acid elongation (2%)
(c) Fatty acid desaturation (2%)
(d) Phospholipids synthesis (2%)
(e) Ketone body synthesis (2%)

2. Explain why polar compounds are generally unable to diffuse across biological membranes without the aid of a specific transport system. (6%)

3. How does insulin affect the glucose absorption by skeletal muscle and adipocytes. (6%)

4. Describe the importance of phosphorylated intermediates in glycolysis. (6%)

5. Give the reactions that produce NADH in the citric acid cycle. (6%)

6. What is the most significant chemical difference between triacylglycerols and glycerophospholipids that leads to their different biological functions? (6%)

7. Gluconeogenesis and glycolysis are not identical pathways running in opposite directions, although they do share several steps; 7 of the 10 enzymatic reactions of gluconeogenesis are the reverse of glycolytic reactions. List three bypass reactions that are used in gluconeogenesis, but not used in glycolysis (6%).

8. Give two essential fatty acids required in the diet of mammals. (4%)