| 大葉大學 98 學年度　研究所碩士班　招生考試試題紙 | | | | | |
|---|---|---|---|---|---|
| 系　所　別 | 組 別 | 考　試　科　目<br>（中 文 名 稱） | 考 試<br>日 期 | 節 次 | 備　　註 |
| 生物產業科技學系 | 甲組 | 生物化學 | 4 月 12 日 | 第 1, 節 | 共 2 頁 P1 |

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）　08:30 ~ 10:00

**I. Simple Choice (60%, 2% each)**

1. All of the amino acids that are found in proteins, except for proline, contain a(n):
   A) amino group.　B) carbonyl group.　C) carboxyl group.　D) ester group.
2. At the isoelectric pH of a peptide:
   A) only the amino and carboxyl termini contribute charge.　B) the amino and carboxyl termini are not charged.
   C) the total net charge is zero.　D) there are four ionic charges.
3. In a mixture of the five proteins listed below, which should elute second in size-exclusion (gel-filtration) chromatography?
   A) cytochrome *c* $M_r$ = 13,000　B) immunoglobulin G $M_r$ = 145,000
   C) RNA polymerase $M_r$ = 450,000　D) serum albumin $M_r$ = 68,500
4. One method used to prevent disulfide bond interference with protein sequencing procedures is:
   A) cleaving proteins with proteases that specifically recognize disulfide bonds.
   B) protecting the disulfide bridge against spontaneous reduction to cysteinyl sulfhydryl groups.
   C) reducing disulfide bridges and preventing their re-formation by further modifying the —SH groups.
   D) removing cystines from protein sequences by proteolytic cleavage.
5. All of the following are considered "weak" interactions in proteins, *except:*
   A) hydrogen bonds.　B) hydrophobic interactions.　C) van der Waals forces.　D) peptide bonds.
6. Which of the following best represents the backbone arrangement of two peptide bonds?
   A) $C_\alpha$-N-$C_\alpha$-C-$C_\alpha$-N-$C_\alpha$-C　B) $C_\alpha$-N-C-C-N-$C_\alpha$　C) C -N-$C_\alpha$-$C_\alpha$-C-N　D) $C_\alpha$-C-N-$C_\alpha$-C- N
7. A prosthetic group of a protein is a non-protein structure that is:
   A) permanently associated with the protein.　B) a part of the secondary structure of the protein.
   C) a substrate of the protein.　D) transiently bound to the protein.
8. Which of the following is *not* correct concerning cooperative binding of a ligand to a protein?
   A ) It is usually a form of allosteric interaction.　B) It is usually associated with one peptide-chain proteins.
   C) It results in a nonlinear Hill Plot.　D) It results in a sigmoidal binding curve.
9. Which one of the following statements is true of enzyme catalysts?
   A) Their catalytic activity is independent of pH.
   B) They can increase the equilibrium constant for a given reaction by a thousand fold or more.
   C) They can increase the reaction rate for a given reaction by a thousand fold or more.
   D) To be effective, they must be present at the same concentration as their substrate.
10. The following data were obtained in a study of an enzyme known to follow Michaelis-Menten kinetics:

| $V_0$ (μmol/min) | Substrate added (mmol/L) |
|---|---|
| 217 | 0.8 |
| 325 | 2 |
| 433 | 4 |
| 488 | 6 |
| 647 | 1,000 |

The $K_m$ for this enzyme is approximately:
A) 1,000 mM.　B) 1 mM.　C) 2 mM.　D) 4 mM.

11. In competitive inhibition, an inhibitor:
   A) binds at several different sites on an enzyme.　B) binds covalently to the enzyme.
   C) binds *only* to the ES complex.　D) binds reversibly at the active site.
12. Which of the following monosaccharides is *not* an aldose?
   A) ribose　B) fructose　C) glucose　D) glyceraldehyde
13. The DNA oligonucleotide abbreviated pATCGAC:
   A) has a hydroxyl at its 3′ end.　B) has a phosphate on its 3′ end.　C) has an A at its 3′ end.　D) violates Chargaff's rules.
14. Chargaff's rules state that in typical DNA:
   A) A = G.　B) A = C.　C) A + T = G + C.　D) A + G = T + C.
15. Sphingosine is *not* a component of:
   A) cardiolipin.　B) ceramide.　C) cerebrosides.　D) gangliosides.
16. The anaerobic conversion of 1 mol of glucose to 2 mol of lactate by fermentation is accompanied by a net gain of:
   A) 1 mol of ATP　B) 2 mol of ATP　C) 1 mol of NADH　D) 2 mol of NADH.
17. Which of the following is a cofactor in the reaction catalyzed by glyceraldehyde 3-phosphate dehydrogenase?
   A) ATP　B) $Cu^{2+}$　C) $NADP^+$　D) $NAD^+$

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18. An enzyme used in both glycolysis and gluconeogenesis is:
A) 3-phosphoglycerate kinase. B) hexokinase. C) phosphofructokinase-1. D) pyruvate kinase.
19. The metabolic function of the pentose phosphate pathway is:
A) act as a source of ADP biosynthesis.
B) generate NADPH and pentoses for the biosynthesis of fatty acids and nucleic acids.
C) participate in oxidation-reduction reactions during the formation of $H_2O$.
D) provide intermediates for the citric acid cycle.
20. Glycogen is converted to monosaccharide units by:
A) glucokinase. B) glucose-6-phosphatase C) glycogen phosphorylase. D) glycogen synthase.
21. Which of the following is true of glycogen synthesis and breakdown?
A) Phosphorylation activates the enzyme responsible for breakdown, and inactivates the synthetic enzyme.
B) Synthesis is catalyzed by the same enzyme that catalyzes breakdown.
C) The glycogen molecule "grows" at its reducing end.
D) The immediate product of glycogen breakdown is free glucose.
22. Which of the below is *not* required for the oxidative decarboxylation of pyruvate to form acetyl-CoA?
A) Lipoic acid B) CoA-SH C) FAD D) ATP
23. The reaction of the citric acid cycle that produces an ATP equivalent (in the form of GTP) by substrate level phosphorylation is the conversion of:
A) citrate to isocitrate. B) succinyl-CoA to succinate. C) fumarate to malate. D) succinate to fumarate.
24. Carnitine is:
A) a 15-carbon fatty acid. B) an essential cofactor for the citric acid cycle.
C) essential for intracellular transport of fatty acids. D) one of the amino acids commonly found in protein.
25. If the 16-carbon saturated fatty acid palmitate is oxidized completely to carbon dioxide and water (via the β-oxidation pathway and the citric acid cycle), and all of the energy-conserving products are used to drive ATP synthesis in the mitochondrion, the net yield of ATP per molecule of palmitate is:
A) 3. B) 10. C) 25. D) 108.
26. The coenzyme involved in a transaminase reaction is:
A) pyridoxal phosphate (PLP). B) lipoic acid.
C) nicotinamide adenine dinucleotide phosphate ($NADP^+$). D) thiamine pyrophosphate (TPP).
27. In the urea cycle, ornithine transcarbamoylase catalyzes:
A) cleavage of urea to ammonia. B) formation of citrulline from ornithine and another reactant.
C) formation of urea from arginine. D) transamination of arginine.
28. The relative concentrations of ATP and ADP does not control the cellular rates of:
A) glycolysis. B) oxidative phosphorylation.
C) pentose phosphate pathway. D) the citric acid cycle.
29. During oxidative phosphorylation, the proton motive force that is generated by electron transport is used to:
A) create a pore in the inner mitochondrial membrane. B) induce a conformational change in the ATP synthase.
C) oxidize NADH to $NAD^+$. D) reduce $O_2$ to $H_2O$.
30. Which substance is *not* involved in the production of urea from $NH_4^+$ via the urea cycle?
A) Malate B) ATP C) Ornithine D) Aspartate

**II. Problems (40%)**

1. Based on the five tripeptides, answer the following questions. (10%)
(A) Tyr-Lys-Met (B) Gly-Pro-Arg (C) Asp-Trp-Tyr (D) Asp-His-Glu (E) Leu-Val-Phe
Which one of the above tripeptides:
____(a) is most negatively charged at pH 7?
____(b) will yield DNP-tyrosine when reacted with l-fluoro-2,4- dinitrobenzene and hydrolyzed in acid?
____(c) contains the largest number of nonpolar R groups?
____(d) contains sulfur?
____(e) will have the greatest light absorbance at 280 nm?
2. Describe three possible sources of acetyl-CoA for the metabolism in citric acid cycle. (6%)
3. Show the reactions in glycolysis in which ATP is consumed and produced, respectively. (8%)
4. Show the three reactions in the citric acid cycle in which NADH is produced. (6%)
5. Define the following terms, (a) gene (b) DNA (c) nucleotide (d) nucleosome, and (e) chromosome. (10%)