| (102)輔仁大學碩士班招生考試試題 | 考試日期：102 年 3 月 08 日第 1 節 |
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科目： 生物化學　　系所組：營養科學系

一、選擇題 (60%。單選，每題 2 分)。作答格式:

| | | | | |
|---|---|---|---|---|
| 1. A | 2.A | 3.B | 4.B | 5.C |
| 6.A | 7.A | 8.B | 9.B | 10.C |
| 11.A | 12.A | 13.B | 14.B | 15.C |

請依照上述範例之格式，以橫式書寫方式將全部答案寫在彌封答案卷。

1. Glutamic acid has pKa at 2.2, 4.3 and 9.7. Calculate the isoelectric point for glutamic acid.
(A) 3.25 (B) 4.3 (C) 5.4 (D) 8.6
2. Which of the peptides would absorb light at 280 nm?
(A) ala-lys-his (B) ser-gly-asn (C) ala-ala-trp (D) val-pro-leu
3. Secondary and higher orders of structure are determined by all EXCEPT:
(A) hydrophobic interactions. (B) ionic bonds.
(C) peptide bonds. (D) van der Waals forces.
4. Tertiary structure is defined as:
(A) the sequence of amino acids.
(B) the folding of a single polypeptide chain in three-dimensional space.
(C) hydrogen bonding interactions between adjacent amino acid residues into helical or pleated segments.
(D) the way in which separate folded monomeric protein subunits associate to form oligomeric proteins.
5. The unique composition of collagen is accommodated in a structure called a(n):
(A) β-pleated sheet. (B) coiled coils.
(C) helix-turn-helix motif. (D) triple helix.
6. Hemoglobin is an example of a(n):
(A) regulatory protein. (B) storage protein.
(C) structural protein. (D) transport protein.
7. _____ is specific in hydrolyzing only peptide bonds in which the carboxyl function is contributed by an arginine or a lysine residue.
(A) Chymotrypsin (B) Carboxypeptidase (C) Trypsin (D) CNBr
8. A gene can be defined as:
(A) the unique function that some cells have but other cells do not have.
(B) a specific segment of nucleotide bases in DNA that encode for the synthesis of a particular protein.
(C) a single strand of DNA that is designated as the sense strand.
(D) the segment of DNA that is changed in a mutation.
9. Globular proteins are usually all EXCEPT:
(A) Insoluble in water. (B) Roughly spherical.
(C) Folded so that the hydrophobic amino acids are in the interior of the molecule.
(D) Hydrophobic side chains are exposed to the water.
10. Which of the following sugars is an aldopentose?
(A) galactose (B) ribulose (C) ribose
(D) xylulose (E) mannose

11. If carbon 1 is the carbonyl group of an aldohexose, which carbon determines if the sugar is a D- or L- stereoisomer?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5

12. Glucuronic acid is formed by oxidation of which carbon of glucose?
(A) C-1 (B) C-2 (C) C-4
(D) C-6 (E) both a and b

13. The fatty acid which is described as 16:0 is
(A) arachidonic acid (B) lauric acid
(C) linoleic acid (D) palmitic acid

14. Which of the following substances is most hydrophilic?
(A) beeswax (B) cholesterol ester
(C) sphingolipids (D) triacylglycerols

15. Which lipid is least likely to be found in plasma membrane of erythrocytes?
(A) triglyceride (B) sphingomyelin
(C) ganglioside (D) cholesterol

16. The specific site on the enzyme where _____ binds and catalysis occurs is called the ____ site.
(A) coenzyme; substrate (B) substrate; active
(C) coenzyme; regulatory (D) regulatory; active

17. Enzymes have active sites which are complementary to
(A) the substrate (B) the product
(C) the transition state (D) both the substrate and the product

18. In a plot of $1/V$ against 1/[S] for an enzyme-catalyzed reaction, the presence of a competitive inhibitor will alter the:
(A) curvature of the plot. (B) intercept on the 1/[S] axis.
(C) intercept on the $1/V$ axis. (D) p$K$ of the plot. (E) $V_{max}$.

19. If glucose radiolabeled on carbon 6 is converted to pyruvate by the glycolysis pathway, on what carbon of pyruvate would the radiolabel be found?
(A) carbon 1 (B) carbon 2 (C) carbon 3 (D) carbon 1 and 3

20. In addition to NADH, ____ and ____ are products of glycolsis, and the NADH must be recycled to ____ before it becomes limiting in glycolysis
(A) ATP; pyruvate; $NAD^+$ (B) $NAD^+$; ATP; pyruvate
(C) ATP; $NAD^+$; ATP (D) ATP; pyruvate; lactate

21. How many reactions in the glycolytic pathway consume or produce ATP?
(A) 2 (B) 3 (C) 4 (D) 6

22. Which coenzyme listed below is not associated with theα-ketoglutarate dehydrogenase complex.
(A) thiamine pyrophosphate (B) lipoamide
(C) $NAD^+$ (D) biotin

23. Which enzymes in the TCA cycle catalyze oxidative decarboxylation reaction?
(A) aconitase & succinate dehydrogenase
(B) isocitrate dehydrogenase & α-ketoglutarate dehydrogenase complex
(C) α-ketoglutarate dehydrogenase complex & succinate dehydrogenase
(D) fumarase & succinate dehydrogenase

24. A species in the electron transport chain which can participate in a two-electron transfer is
(A) cytochrome (B) protein-bound copper
(C) ubiquinone (D) ion-sulfur proteins

25. In eukaryotic cells, glycolysis occurs in the _____, and the TCA cycle reactions take place in _____
(A) mitochondria; mitochondria (B) cytoplasm; mitochondria
(C) cytoplasm; cytoplasm (D) mitochondria; ribosomes

26. The complete reduction of one molecule of oxygen gas requires how many electrons?
(A) 1 (B) 2 (C) 4 (D) 8

27. The anaplerotic reactions associated with the TCA cycle are a result of
(A) the oxidative nature of the TCA cycle
(B) the use of many of the TCA intermediates in biosynthesis
(C) the decarboxylation reactions
(D) the production of GTP and reduced coenzymes

28. The complex in the electron transport chain which does not have a direct link to ubiquinone in some form is
(A) complex I (reductase) (B) complex II (reductase)
(C) complex III (reductase) (D) complex IV (oxidase)

29. Which of the following is NOT a commonly used transamination pair?
(A) Glu /α -ketoglutarate (B) Asp / oxaloacetate
(C) Phe / phenylpyruvate (D) Ala / pyruvate

30. In a sample of double-stranded DNA containing 32% cytosine, the percentage of adenine would be:
(A) 18% (B) 32% (C) 68%
(D) insufficient information to answer question

二、問答題(40%)

1. 請說明為何在 respiratory electron transport chain 的氧化過程中，會偶合氧化磷酸化的現象。(10 分)

2. 細胞內的多醣類作為化學能量使用時，為什麼說以支鏈越多越有利？(10 分)

3. 解釋下列(20分)
(1) Gel filtration chromatography (2) Transcription (3) Mutarotation
(4) glyoxylate cycle (5) Chemiosmotic theory