

國立臺灣師範大學 105 學年度碩士班招生考試試題

科目：基礎生物化學

適用系所：光電科技研究所

注意：1.本試題共 5 頁，選擇題請以 2B 鉛筆作答於答案卡上，其餘請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

第 1-2 題 問答題，第 3-22 題 單選題

※ 選擇題請依題號作答於答案卡

1. Please briefly introduce the principle of immunohistochemistry (IHC) in Chinese?
(10 分)
2. Please briefly describe one multidisciplinary approach about the combination of biochemistry and electrical-optics in Chinese. (10 分)
3. By adding SDS (sodium dodecyl sulfate) during the electrophoresis of proteins, it is possible to :
(A) determine the amino acid composition of the protein.
(B) preserve a protein's native structure and biological activity.
(C) determine a protein's isoelectric point.
(D) separate proteins exclusively on the basis of molecular weight.
(E) determine an enzyme's specific activity. (4 分)
4. Which of the g protein extracts has the highest specific activity?

	Total protein (mg)	Activity (units)
(A)	300	60,000
(B)	200	80,000
(C)	3000	96,000
(D)	5000	100,000
(E)	1000	200,000(4 分)
5. In a mixture of five proteins listed below which should elute second in size-exclusion (gel filtration) chromatography ?
(A) cytochrome c, Mt = 13,000
(B) immunoglobulin G, Mt = 145,000
(C) ribonuclease A, Mt = 13,700
(D) RNA polymerase, Mt = 450,000
(E) serum albumin, Mt = 68,500(4 分)
6. A monoclonal antibody differs from a polyclonal antibody in that monoclonal antibodies:
(A) are produced by cells from the same organism that produced the antigen.
(B) have only a single polypeptide chain that can recognize an antigen.
(C) are synthesized by a population of identical or "cloned" cells.
(D) are labeled with chemicals that can be visualized.
(E) are synthesized only in living organisms. (4 分)

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7. The first step in two-dimensional gel electrophoresis generates a series of protein bands by isoelectric focusing. In the second step, this gel is turned at a right angle, placed on another gel, and a second electric current is applied. In this second step:
- (A) the individual bands undergo a second, more intense isoelectric focusing.
 - (B) the individual bands become stained so that the isoelectric focus pattern can be visualized.
 - (C) the individual bands become visualized by interacting with protein-specific antibodies in the second gel.
 - (D) the proteins in the bands separate more completely because the second electric current is in the opposite polarity to the first current.
 - (E) proteins with similar isoelectric points become further separated according to their molecular weights by an SDS gel. (4 分)
8. All of the following are considered "weak" interactions in proteins except:
- (A) van der Waals forces.
 - (B) hydrogen bonds.
 - (C) ionic bonds.
 - (D) peptide bonds.
 - (E) hydrophobic interactions. (4 分)
9. The single most important contribution to the stability of a protein's conformation appears to be the:
- (A) sum of free energies of formation of many weak interactions among the hundreds of amino acids in a protein.
 - (B) entropy increase from the decrease in the number of ordered water molecules forming a solvent shell around a protein.
 - (C) sum of free energies of formation of many weak interactions between a protein's polar amino acids and surrounding water.
 - (D) maximum entropy increase from ionic interactions between the ionized amino acids in a protein.
 - (E) stabilizing effect of hydrogen bonding in a protein between the carbonyl group of one peptide bond and the amino group of another, as indicated by $-C=O \cdots H-N-$. (4 分)
10. An average protein will not be denatured by:
- (A) sodium dodecyl sulfate.
 - (B) pH 10.
 - (C) heating to 90°C .
 - (D) urea.
 - (E) iodoacetic acid. (4 分)

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11. Which of the following is least likely to result in protein denaturation?
- (A) disruption of weak interactions by boiling.
 - (B) mixing with organic solvents such as acetone.
 - (C) reducing intrachain disulfide bonds.
 - (D) altering net charge by changing pH.
 - (E) exposure to detergents. (4 分)
12. Which of the following statements about proteins is true ?
- (A) Proteins are generally very loosely structured.
 - (B) In water-soluble proteins, hydrophobic (nonpolar) amino acid residues are generally buried and not exposed to water.
 - (C) Proteins that contain α -helical regions never contain β -pleated sheets.
 - (D) Detergents (such as sodium dodecyl sulfate, SDS) will not affect the structure of a protein that contains disulfide (-S-S-) bonds.
 - (E) Hydrogen bonds are not important in the structure of proteins. (4 分)
13. Which of the following is a cofactor in the reaction catalyzed by glyceraldehyde-3-phosphate dehydrogenase?
- (A) NADP^+
 - (B) NAD^+
 - (C) ATP
 - (D) heme
 - (E) Cu^{+2} (4 分)
14. If fructose labeled with ^{14}C at C-1 were metabolized in the liver, the first radioactive pyruvate formed would be labeled in :
- (A) C-1
 - (B) C-2
 - (C) C-3
 - (D) C-1 and C-3
 - (E) C-1, C-2 and C-3(4 分)
15. Which of the following statements is true concerning glycolysis in anaerobic muscle?
- (A) It is an endergonic process.
 - (B) It results in net synthesis of cytoplasmic NADH.
 - (C) Fructose-1,6-bisphosphatase is one of the enzymes of the pathway.
 - (D) Its rate is slowed by a high $[\text{ATP}]/[\text{ADP}]$ ratio.(4 分)

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16. Which of these enzymes is a control point, regulated by the cell's energy supply?
- (A) glycogen phosphorylase
 - (B) phosphofructokinase-1
 - (C) pyruvate kinase
 - (D) All of the above are control points.
 - (E) None of the above is a control point. (4 分)
17. The largest energy store in a well-nourished human is:
- (A) muscle glycogen.
 - (B) liver glycogen.
 - (C) blood glucose.
 - (D) triacylglycerols in adipose tissue.
 - (E) ATP in all tissues. (4 分)
18. Skeletal muscle uses _____ as an energy source.
- (A) fatty acids
 - (B) ketone bodies
 - (C) glucose
 - (D) All of the above(4 分)
19. Which of the following statements about metabolism in the mammalian liver is false?
- (A) The enzymatic complement of liver tissue changes in response to changes in the diet.
 - (B) The presence of glucose-6-phosphatase makes liver uniquely able to release glucose into the bloodstream.
 - (C) Most plasma lipoproteins are synthesized in the liver.
 - (D) The liver synthesizes most of the urea produced in the body.
 - (E) When the liver is surgically removed, its metabolic role is performed by the kidneys and muscle.
- (4 分)
20. Which of these is not a normal component of human blood?
- (A) erythrocytes
 - (B) LDL (low-density lipoproteins)
 - (C) prothrombin
 - (D) immunoglobulins
 - (E) All of the above are found in blood. (4 分)

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21. When blood glucose is abnormally low, the pancreas releases

- (A) insulin
- (B) glucagon
- (C) epinephrine
- (D) trypsin
- (E) glucose(4 分)

22. When blood glucose is abnormally high, the pancreas releases

- (A) insulin
- (B) glucagon
- (C) epinephrine
- (D) trypsin
- (E) glucose(4 分)