

科目：生物化學

適用：應化系(生物醫學碩士班)

考生注意：

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2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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選擇題 (100%, 每小題 2%)

1. Amino acids are the basic component of protein. **How many amino acids** are found in human cells? (A) ~20; (B) ~50; (C) ~100; (D) ~200.
2. Which description about **phospholipids** is wrong? (A) Phospholipids form the basis of plasma membrane; (B) All the phospholipids are both hydrophobic and hydrophilic; (C) Phospholipids consist of a molecule of glycerol, 2 molecules of fatty acids, and a phosphate group attached to a base; (D) Phospholipids are mainly used as an energy source in cells.
3. **Plasma membrane** allows the passage of (A) small and charged molecules; (B) small ions; (C) large and hydrophobic molecules; (D) small and uncharged polar molecules.
4. Which of the following factors is a **protein**? (A) Operator in an operon; (B) Terminator during transcription; (C) Repressor in an operon; (D) Enhancer in the regulation of gene expression.
5. When a **gene is turned off**, which of the following statement is not correct? (A) A chromatin remodeling complex may work to loose the local structure of a chromatin segment; (B) DNA may be acetylated; (C) DNA may be demethylated; (D) Histone may be acetylated.
6. Which description about **protein phosphorylation** is not correct? (A) The enzyme catalyzing the transfer of a phosphate group to a protein is termed protein kinase; (B) Protein phosphorylation always activate a protein; (C) The enzyme engaged in removing a phosphate group from a protein is called protein phosphatases; (D) Adding or removing

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a phosphate from a protein usually induces conformational change of protein.

7. The **protein model** describing the importance of side chain of protein structure is (A) backbone; (B) ribbon; (C) wire; (D) space filling.
8. A **disulfide bond** is (A) formed between two cysteins; (B) weaker than hydrogen bond; (C) can be broken by oxidizing agent; (D) can be formed between protein and water.
9. Which description of **DNA, RNA and protein** is not correct? (A) The central dogma in cell biology is: protein is made from RNA and RNA comes from DNA; (B) Human genomic DNA is double strand, RNA is single strand, protein can be consist of single or multiple polypeptide chains; (C) DNA is generally considered as the earliest biomolecule appeared on the earth; (D) The order of size of the three macromolecules when they have same number of building block or monomer is DNA=RNA>protein.
10. A **ribosome** (A) is an organelle of eukaryotic cells; (B) is consist of protein, RNA and DNA; (C) contains a large subunit and a small subunit; (D) can be found on the membrane of nuclear envelopment.
11. Which one of the following combination is not correct? (A) Nucleic acid: glycosidic bond; (B) Protein: phosphodiester bond; (C) Sugar: peptide bond; (D) All of above are incorrect.
12. Which description about **sugars** is not correct? (A) They usually have the formula $(CH_2O)_n$; (B) Monosaccharides have aldose and ketose form; (C) Sugars are usually straight, but not cyclic, in aqueous solution; (D) Starch and glycogen, but not cellulose, can be digested by human, although they are all sugars.

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13. Which of the following **amino acids** has the smallest molecular weight? (A) Glycine; (B) Alanine; (C) Valine; (D) Isoleucine.
14. Which of the following **amino acids** is abbreviated as P? (A) Phe; (B) Pro; (C) Trp; (D) Asp.
15. Which of the following descriptions about an **enzyme** is not correct? (A) An enzyme can accelerate a reaction; (B) An enzyme cannot change the direction of a reaction; (C) An enzyme becomes a part of the product after a reaction is completed; (D) An enzyme can reduce the activation energy of a reaction.
16. Which of the following description about the **degradation of food** is not correct? (A) The majority of food including protein, polysaccharide and fat are broken down into their building units outside the cells; (B) The digested monomers can be moved into cells via the activities of specific membrane proteins; (C) Pyruvate is produced after a series of catalysis of protein, polysaccharide and fat; (D) All the food molecules stated above contain high energy H-C-C-H bond which is oxidized to release stored energy.
17. Which of the following description about **glycolysis** is not correct? (A) Glycolysis is a process where cells degrade sugar and harvest ATP; therefore, no energy input is required during the process; (B) One glucose can produce two glyceraldehydes 3-phosphate; (C) Two pyruvates are generated after glycolysis is finished; (D) 4 ATP and 2 NADH are harvest when one glucose is converted to pyruvates.
18. When people **quickly and persistently use their muscle**, (A) they need breath heavily because higher level of oxygen is required for the complete oxidation of food molecules in TCA cycle and subsequent

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electron transfer chain, which provides main energy for the muscle cells of those people; (B) the catalytic rate of glycolysis is accelerated so that more pyruvate is generated to get into TCA cycle; (C) NADH is quickly generated and then used as a main energy to provide what muscle cells need; (D) ATP is quickly generated from glycolysis through the consumption of NADH where pyruvate does not get into TCA cycle but undergoes anaerobic fermentation.

19. Which statement of **pyruvate dehydrogenase** complex is not correct?

(A) It catalyzes the conversion from pyruvate to acetyl-coA; (B) A NADH and a CO₂ are produced after a pyruvate dehydrogenase complex execute its reaction; (C) Pyruvate dehydrogenase complex contains a molecule of lipoamide reductase-transacetylase, a molecule of dihydrolipoyl dehydrogenase, and a molecule of pyruvate decarboxylase; (D) Pyruvate dehydrogenase complex is located in mitochondria.

20. Which statement of the **oxidation of fatty acid** is not correct? (A) The degradation or oxidation of long chain fatty acid is occurred in mitochondria and peroxisome; (B) Acety-CoA is involved in the process; (C) ATP is produced after a round of beta-oxidation; (D) FADH₂ and NADH are generated in the process.

21. Which of the following descriptions is not correct about **citric acid cycle**?

(A) is also termed TCA cycle and is occurred in mitochondria; (B) NADH, FADH₂ and ATP are produced after accomplishment of a cycle; (C) A two-carbon molecule attached to coenzyme A is fully oxidized to release its bond energy; (D) There are eight steps in the cycle.

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22. Which statement of **electron transferred chain** (ETC) is correct? (A) The process of ETC consumes O_2 and does not produce CO_2 ; (B) ATP is synthesized by the flowing back of proton from mitochondria interspace to matrix through ATP synthase; (C) The energy used to pump proton to mitochondria interspace is from the high energy electron of NADH and $FADH_2$; (D) All the statements are correct.
23. Which statement of the **enzymes involved in electron transferred chain** (ETC) is correct? (A) Three enzyme complexes are engaged in ETC including NADH dehydrogenase complex, cytochrome b-c1 complex and cytochrome oxidase complex; (B) The enzymes allow the passage of an electron from NADH and a proton is pumped out to interspace of mitochondria; (C) Ubiquinone and cytochrome c are used as electron carrier; (D) All the statements are correct.
24. The **proton gradient** accumulated in the space between inner and outer membrane of mitochondria is not used to (A) pump phosphate, ADP and pyruvate into mitochondria matrix; (B) pump ATP out of mitochondria; (C) release Ca^{2+} into cytosol; (D) phosphorylate ADP.
25. **Cytochrome oxidase** (A) is the last enzyme complex in the electron transfer chain; (B) consumes nearly all oxygen we breath; (C) the net reaction catalyzed by cytochrome oxidase is $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$; (D) All the statements are correct.
26. When two proteins are held together to carry out a specific cellular function, we may say that the proteins form a (A) primary structure; (B) secondary structure; (C) tertiary structure; (D) quaternary structure.
27. All of the followings are **carbohydrates** EXCEPT: (A) starch; (B) glycogen; (C) chitin; (D) cholesterol.

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28. **Fatty acids** that are unsaturated have: (A) an amino group; (B) a double bond; (C) an **excess** of protons; (D) a carboxyl group.
29. Which of the following **tests** is used to find out if a sample contains **protein**? (A) Benedict's test; (B) The emulsion test; (C) The Biuret test; (D) The iodine test.
30. Which of the following molecules is not **made entirely from glucose molecules**? (A) Sucrose; (B) Starch; (C) Cellulose; (D) Glycogen.
31. Which of the following molecules contains the greatest number of carbon atoms? (A) ~~Ribose~~; (B) Deoxyribose; (C) Glucose; (D) Glycerol.
32. What is a **codon**? (A) The set of mRNA bases that specifies an amino acid; (B) The set of tRNA bases that binds to an amino acid; (C) The set of DNA bases that specifies a protein; (D) The set of amino acids that makes a protein.
33. The two strands of a **DNA** molecule are held together by: (A) Glycosidic bonds; (B) ~~Ester bonds~~; (C) Peptide bonds; (D) Hydrogen bonds.
34. The following equation ($G = \text{glucose}$): $G + G + G \rightarrow G-G-G + 2H_2O$, is an example of (A) ionic bond formation; (B) peptide bond formation; (C) a condensation reaction; (D) a hydrolysis reaction.
35. Where would be a **hydrophobic amino acid R group** found where in a protein? (A) forming a peptide bond with the next amino acid in the chain (B) on the outside of the folded chain, in the water (C) on the inside of the folded chain, away from water (D) forming hydrogen bonds with other R groups
36. Which is a true statement comparing **phospholipids and triglycerides**?

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- (A) Triglycerides may be saturated or unsaturated, but all phospholipids are saturated (B) Phospholipids and triglycerides are the primary storage forms for fats in our bodies. (C) Phospholipids occur in fused rings, whilst triglycerides maintain a straight-chain form. (D) Phospholipid molecules have a distinctly polar 'head' and a distinctly non-polar 'tail,' whilst triglycerides are predominantly non-polar.
37. The '**primary structure**' of a protein refers to (A) interactions among the side chains or R-groups of the amino acids; (B) coiling due to hydrogen bonding between amino acids; (C) the number and sequence of amino acids; (D) the alpha-helix, or beta-sheets.
38. When 18 g of glucose (MW=180) is dissolved in 10 ml water, which concentration in terms of this glucose solution is correct? (A) 18%; (B) 1.8%; (C) 1 M; (D) 10 M.
39. Which of the following amino acids can be **phosphorylated**? (A) Glycine; (B) Serine; (C) Phenylalanine; (D) Histidine.
40. Which **enzyme** is responsible for DNA synthesis in human cells? (A) DNA-dependent RNA polymerase; (B) DNA-dependent DNA polymerase; (C) RNA-dependent DNA polymerase; (D) Reverse transcriptase.
41. A **gene** is best defined as (A) a RNA molecule able to translated into a protein; (B) a segment of DNA able to transcribe a RNA molecule; (C) a protein molecule able to accomplish a kind of cellular activity; (D) a portion of DNA able to encode a protein.
42. **Western blot** is a biochemical technique to detect (A) the level of protein expression; (B) subcellular localization of a protein; (C) the expression level of mRNA; (D) the protein-protein interacting activity.

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43. Which of the following living organisms is not usually used as **research model** in **biochemistry** field? (A) Yeast; (B) Fly; (C) Worm; (D) Elephant.
44. How many protein encoding genes are predicted in human cells so far? (A) about 2,000; (B) about 20,000; (C) about 200,000; (D) 2,000,000.
45. When scientists want to **measure copy number** of a gene in cells, they should perform (A) Northern blot; (B) Southern blot; (C) Farwestern; (D) Eastern blot.
46. Which **amino acid** may carry positive charge in its side chain? (A) Lysine; (B) Aspartate; (C) Methionine; (D) Tryptophan.
47. What is the active group of **glutathione**? (A) Carboxyl group; (B) A hydroxyl group; (C) An amino group; (D) A sulfhydryl group.
48. Which of the following is a common characteristic of a **denatured protein**? (A) More antigenic; (B) Non-functional; (C) Lower nutritional value; (D) More soluble.
49. In a multi-subunit protein such as hemoglobin, the individual **polypeptide chains** are usually bound to one another by ALL of the following EXCEPT:
- (A) Hydrophobic interactions; (B) van der Waals force; (C) Hydrogen bonds; (D) Peptide bonds.
50. Normal **hemoglobin** and sickle cell hemoglobin have different electrophoretic mobility because these two proteins have different (A) Amount of bound O_2 ; (B) Interaction proteins; (C) Charges; (D) Sizes.