

國立臺北科技大學九十九學年度碩士班招生考試

系所組別：3610、3620、3630 生物科技研究所甲、乙、丙組

第一節 生物化學 試題

第一頁 共三頁

注意事項：

1. 本試題共四大題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、單選題，每題 2 分，共 60%，務必將答案填寫於答案紙上

(Single Choice Questions, 2 points each, 60%, must fill the answers onto the sheets) :

1. Functional groups are
 - a) mathematical concepts applied to the topology of molecules
 - b) laboratory teams in industrial laboratories
 - c) sets of atoms that act in concert in chemical reactions
 - d) none of the above
2. Which of the following functional groups are not commonly seen in biomolecules?
 - a) Alkyl halides
 - b) Amides
 - c) Carboxylic acids
 - d) Ethers
3. Which of the following cellular components is commonly found in bacteria?
 - a) Nucleus
 - b) Ribosomes
 - c) Chloroplasts
 - d) Mitochondria
 - e) More than one of these is characteristic of bacteria.
4. Which of these eukaryotic kingdoms consists primarily of unicellular organisms?
 - a) Animals
 - b) Fungi
 - c) Plants
 - d) Protista
 - e) Both fungi and protista.
5. Which of the following classes of compounds is hydrophilic?
 - a) Sugars
 - b) Fatty acids
 - c) Amino acids
 - d) Sugars and amino acids.
 - e) All of these
6. A micelle is a structure which
 - a) aggregates with other micelles in water.
 - b) has its polar groups on the outside and non-polar groups on the inside when in

water.

- c) explains how soaps and detergents work.
 - d) B & C
 - e) All of the above.
7. A buffer solution at pH 10 has a ratio of $[HA]/[A^-]$ of 10. What is the pK_a of the acid?
 - a) 8
 - b) 9
 - c) 10
 - d) 11
 - e) 12
 8. Which of the following is an amino acid not found in proteins?
 - a) asparagine
 - b) ornithine
 - c) isoleucine
 - d) proline
 9. Which of the following correctly describes peptide bonds?
 - a) They are special type of amide bond.
 - b) They are a very stable bonds.
 - c) They are formed when water is split out from an amino group and a carboxylic acid.
 - d) They are a bond which displays resonance.
 - e) All of the above.
 10. Which of the following is the most common function for fibrous proteins?
 - a) enzymes
 - b) structural roles.
 - c) carrier molecules.
 - d) enzymes and carrier molecules.
 - e) All of these.
 11. The following bond forces are important in quarternary structure:
 - a) Disulfide bonds
 - b) Hydrogen bonds
 - c) Hydrophobic attraction
 - d) Both hydrogen bonds and hydrophobic attraction.
 - e) All of these are important in quarternary structure.
 12. The typical order for the major steps of enzyme isolation would be (from first to last):
 - a) Homogenization, salt fractionation, electrophoresis, column chromatography.
 - b) Homogenization, column chromatography, salt fractionation, electrophoresis.
 - c) Homogenization, salt fractionation, column chromatography, electrophoresis.
 - d) Salt fractionation, homogenization, electrophoresis, column chromatography.
 - e) Homogenization, electrophoresis, salt fractionation, column chromatography.
 13. Methods for breaking proteins into smaller peptides include all of the following **except**:
 - a) Digestion with chymotrypsin
 - b) Cyanogen Bromide treatment
 - c) Digestion with Trypsin
 - d) Edmann degradation
 - e) All of the above create short peptides suitable for sequencing
 14. How many bands would be produced when hemoglobin is subjected to SDS-PAGE?
 - a) 1
 - b) 2
 - c) 3
 - d) 4

注意：背面尚有試題

15. The active site of an enzyme is the place where the following happens:
- The enzyme substrate complex forms here.
 - The catalytic reaction happens here.
 - Allosteric regulation of enzyme rate occurs here.
 - The enzyme-substrate complex forms and the reaction occurs at the active site.
 - All of these are correct.
16. The mechanism of an enzyme-catalyzed reaction makes which of the following assumptions about the conversion of product into substrate?
- The product binds reversibly to the enzyme in order to be converted into the substrate.
 - The product is not converted to substrate to any appreciable extent.
 - The product is converted to substrate following simple first order kinetics.
 - The product is converted to substrate following simple second order kinetics.
17. If the y-intercept of a Lineweaver-Burk plot = 1.91 (sec/millimole) and the slope = 75.3 L/sec, V_{max} equals:
- 0.0254 millimoles per second.
 - 0.523 millimoles per second.
 - 5.23 millimoles per second.
 - 39.4 millimoles per second.
 - 75.3 millimoles per second.
18. The sequential model for allosteric behavior
- cannot account for reactions that display negative cooperativity.
 - postulates binding of substrates and inhibitors by the induced-fit model.
 - requires that the conformation of all subunits change simultaneously.
 - is mathematically simpler than the concerted model.
19. The difference between active transport and passive transport is that
- concentration gradients are involved in one and not in the other.
 - glycolipids play a role in one and not in the other.
 - one requires expenditure of energy by the cell and the other does not.
 - ions are transported into and out of the cell by one process and not by the other.
20. A solution of double-stranded DNA is heated. Which of the following occurs as the DNA reaches its melting point?
- The amount of UV absorbance increases, but the wavelength does not change.
 - The wavelength of absorbance changes, but the amount does not change.
 - Both the amount and wavelength of UV absorbance changes.
 - Neither the amount and wavelength of UV absorbance changes.
21. In *E. coli*,
- the leading strand is synthesized in one piece while the lagging strand is synthesized discontinuously.
 - the leading strand is synthesized discontinuously while the lagging strand is synthesized in one piece.
 - both the leading and lagging strands are synthesized in one piece.
 - both the leading and lagging strands are synthesized discontinuously.
22. Okazaki fragments are
- short DNA pieces that explain how DNA is synthesized on the lagging strand.
 - short DNA pieces that explain how DNA is synthesized on the leading strand.
 - the remnants of the original strands that are dispersed in the new double stranded DNA molecules.
 - RNA primers used for DNA replication.
23. A commonly encountered feature of transfer RNA synthesis is
- the precursor of several tRNA molecules is transcribed in one long polynucleotide sequence
 - there is little or no base modification after transcription
 - modification of the sugar moiety never takes place
 - the covalent binding of tRNA to specific proteins
24. The mRNA must contain the following to allow for initiation of protein synthesis in *E. coli*.
- A purine rich sequence to bind to the ribosome.
 - A pyrimidine rich sequence to bind to the ribosome.
 - A Shine-Delgarno sequence.
 - A purine rich sequence to bind to the ribosome and a Shine-Delgarno sequence.
 - A pyrimidine rich sequence to bind to the ribosome and a Shine-Delgarno sequence.
25. The protein called p53 is especially important in cancer because:
- Protein p53 has the ability to prevent cells from dividing.
 - Protein p53 has the ability to repair mutations.
 - Protein p53 can cause damaged cells to enter programmed cell death.
 - Protein p53 can prevent cells from dividing and cause to enter programmed cell death.
 - All of these.
26. The efficiency of aerobic metabolism is greater than that of anaerobic metabolism even though much more energy is released in aerobic than in anaerobic metabolism because
- aerobic metabolism is linked to oxygen, which is a more powerful oxidizing agent than those in anaerobic metabolism
 - aerobic metabolism produces carbon dioxide and water
 - aerobic metabolism traps much more energy in the form of ATP than does anaerobic metabolism
 - anaerobic metabolism produces two- and three-carbon compounds
27. There are two forms of starch:
- amylose and glycogen, both of which are highly branched polysaccharides
 - glycogen and chitin, both of which are linear polysaccharides
 - amylopectin and glycogen, both of which are linear polysaccharides
 - amylose, which is a linear polysaccharide, and amylopectin, which is highly branched
28. Where is the enzyme glucose-6-phosphatase located?
- cytosol
 - mitochondria
 - endoplasmic reticulum
 - none of the above
29. Other than their use in nucleic acid synthesis, which energy source is used uniquely for the synthesis of lipids?
- ATP
 - CTP
 - GTP
 - UTP
 - None of these is unique to fatty acid synthesis.

30. Which best describes the synthesis of purine nucleotides?

- a) The basic ring structure, inosine, is synthesized first and then linked to ribose. This is then modified to produce either GMP or AMP.
- b) The basic ring structure, orotate, is synthesized stepwise on ribose. This is then modified to produce either GMP or AMP.
- c) The basic ring structure, inosine, is synthesized stepwise on ribose. This is then modified to produce either GMP or AMP.
- d) The basic ring structure, orotate, is synthesized first and then linked to ribose. This is then modified to produce either UMP or CMP.

二、名詞解釋，每題 4 分，共 20 分 (Glossary illustration, 4 points each, 20%)

1. Glycoproteins
2. Hemiacetal
3. Glycolysis
4. Ribozyme
5. Glyoxylate Cycle

三、What is the connection between thermodynamics and life? (10%)

四、What role does electron transport play in metabolism? (10%)