

國立臺北科技大學 104 學年度碩士班招生考試

系所組別：3601、3602

化學工程與生物科技系生化與生醫工程碩士班

第二節生物化學試題

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 50%，務必將答案填寫於答案卷之答案欄內
(Single Choice Questions, 2 points each, 50%, must fill the answers onto the sheets) :

1. Viruses are acellular, but they act as cellular parasites in order to:
 - a. reproduce
 - b. protect themselves.
 - c. grow in size
 - d. gain genetic information
 - e. all are true
2. Which molecules are amphiphilic (amphipathic) ?
 - a. sugars
 - b. acidic amino acids
 - c. inorganic salts
 - d. water
 - e. salts of fatty acids
3. Entropy, S , is exactly zero at:
 - a. 25°C
 - b. 0°C
 - c. 25°K
 - d. 0°K
 - e. 38°C

4. Which of the following statements regarding ATP is true?
- a. the energy of hydrolysis is the same for all of the phosphate groups of the molecule
 - b. despite the very exergonic nature of the hydrolysis, ATP does not hydrolyze spontaneously due to a very high activation energy
 - c. the ΔG of hydrolysis within the cell is substantially greater than the ΔG° due to a higher concentration of ATP with respect to ADP
 - d. electrostatic attraction of the phosphate groups contributes to a more exergonic free energy
 - e. both b and c are correct
5. Which of the following amino acids has more than one chiral carbon?
- a. serine
 - b. lysine
 - c. threonine
 - d. cysteine
 - e. aspartic acid
6. What is the product formed from the acid hydrolysis of a simple amide?
- a. acid & base
 - b. aldehyde & alcohol
 - c. acid & amine
 - d. ester & alcohol
 - e. amine & aldehyde
7. The "Greek Key" topology is composed of _____.
- a. Adjacent α -helices oriented in the same direction
 - b. Adjacent α -helices oriented in the opposite direction
 - c. Discreet regions of β -sheet oriented in an antiparallel fashion
 - d. Parallel β -sheet structures connected by α -helices
8. Proteoglycans are a group of macromolecules formed from:
- a. proteases and monosaccharides
 - b. proteins and glycosaminoglycans
 - c. proteins and polysaccharides
 - d. proteases and glycosaminoglycans
 - e. proteins and glycogen

注意：背面尚有試題

9. Pore-forming toxins solve the problem of a need to provide hydrogen-bonding partners for the polypeptide backbone N-H and C=O groups in the bilayer that lacks hydrogen-bond donors and acceptors by utilizing extensive:
- a. salt bridge formation
 - b. disulfide bond formation
 - c. β -turns
 - d. α -helices and β -sheets
 - e. none of the above
10. What is the nucleotide sequence of the DNA strand that is complementary to 5'-ATCGCAACTGTCAC TA-3'?
- a. 5'-TAGCGTTGACAGTGAT-3'
 - b. 5'-UAGUGACAGUUGCGAU-3'
 - c. 5'-TAGTGACAGTTGCGAT-3'
 - d. 5'-ATCACTGTCAACGCTA-3'
11. The pH optimum of an enzyme is:
- a. always between pH 6-8
 - b. nearly the same for all enzymes
 - c. pretty broad over 6-8 pH units
 - d. occurs when there is optimum secondary and tertiary structure in the active site of the enzyme
 - e. all are true
12. Glycogen phosphorylase displays allosteric activation and inhibition by multiple modes. Which of the following is a correct relation?
- a. glucose-6-phosphate: negative heterotropic effector
 - b. AMP: negative heterotropic effector
 - c. ATP: positive heterotropic effector
 - d. phosphate: positive heterotropic effector
 - e. phosphorylation: covalent inhibitor
13. Which of the following muscle protein components is responsible for ATP hydrolysis?
- a. tropomyosin
 - b. myosin
 - c. troponin C
 - d. actin

e. troponin M

14. What are the final products of aerobic catabolism?

- a. pyruvate and H₂O
- b. acetyl-CoA and CO₂
- c. CO₂ and H₂O
- d. pyruvate and acetyl-CoA
- e. ammonia and O₂

15. Glyceraldehyde-3-phosphate dehydrogenase belongs to what class of enzymes?

- a. oxidoreductases
- b. isomerases
- c. transferases
- d. hydrolases
- e. ligases

16. Which of the following is an essential amino acid?

- a. proline
- b. valine
- c. glutamine
- d. aspartate
- e. glycine

17. Wavelengths of what color are mostly responsible for the reactions in the light phase of photosynthesis?

- a. Blue
- b. Green
- c. Red
- d. Blue and red
- e. All three colors

18. Which of the following fats are linked with high cholesterol and heart disease?

- a. saturated fats
- b. monounsaturated fats
- c. polyunsaturated fats
- d. all fats, regardless of saturation

19. How many electrons are required for the complete reduction of one molecule of oxygen gas?

- a. one
- b. two
- c. four
- d. eight

20. Which of the following enzymes interconverts an aldose and a ketose?

- a. kinase
- b. isomerase
- c. mutase
- d. dehydrogenase
- e. phosphorylase

21. The most common form of post-translational processing is:

- a. carbohydrate addition
- b. lipid addition
- c. phosphorylation
- d. adding signal sequences
- e. proteolytic cleavage

22. When cyclic AMP is a second messenger

- a. cyclic AMP inhibits a protein kinase
- b. the binding of hormone produces the desired effect in the cell by stimulating the production of cyclic AMP
- c. the G protein plays no role
- d. a target enzyme is phosphorylated with cyclic AMP as the source of the phosphate group

23. How many carbon atoms are in the simplest carbohydrates?

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

24. What does amphipathic mean?

- a. having both positive and negative charges
- b. having both acid and base properties
- c. having both hydrophilic and hydrophobic regions
- d. having two stereoisomers

25. The ratio of a weak acid and its conjugate base at the point of maximum buffering capacity is

- a. 1/1
- b. 1/10
- c. 10/1
- d. no definite ratio is needed

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

1. Glutathione

2. Allosteric effector

3. Calvin Cycle

4. Tetrahydrofolate

5. cAMP

三、What is "Stimulus Triggered Acquisition of Pluripotency (STAP)" cell? Please comment the possibility from the biochemical point of view. (15%)

四、何謂「餽水油」? 攝取餽水油可能影響人體哪些生化反應? (15%)