

國立臺北科技大學 107 學年度碩士班招生考試

系所組別：3601

化學工程與生物科技系生化與生醫工程碩士班

第一節 生物化學 試題 (選考)

第一頁 共三頁

注意事項：

1. 本試題共【27】題，選擇題 25 題每題【3】分，簡答題 26 題【15】分，簡答題 27 題【10】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。

選擇題 (共 25 題，每題 3 分)

- 1 Two amino acids of the standard 20 contain sulfur atoms. They are:
 - A) cysteine and serine.
 - B) cysteine and threonine
 - C) methionine and cysteine
 - D) methionine and serine
 - E) threonine and serine
- 2 All of the following are considered "weak" interactions in proteins, *except*:
 - A) hydrogen bonds
 - B) hydrophobic interactions
 - C) ionic bonds
 - D) peptide bonds
 - E) van der Waals forces
- 3 In an α helix, the R groups on the amino acid residues:
 - A) alternate between the outside and the inside of the helix.
 - B) are found on the outside of the helix spiral
 - C) cause only right-handed helices to form.
 - D) generate the hydrogen bonds that form the helix.
 - E) stack within the interior of the helix.
- 4 During muscle contraction, hydrolysis of ATP results in a change in the:
 - A) conformation of actin
 - B) conformation of myosin.
 - C) structure of the myofibrils
 - D) structure of the sarcoplasmic reticulum
 - E) structure of the Z disk
- 5 Which of the following is *not* correct concerning 2,3-bisphosphoglycerate (BPG)?
 - A) It binds at a distance from the heme groups of hemoglobin
 - B) It binds with lower affinity to fetal hemoglobin than to adult hemoglobin.
 - C) It increases the affinity of hemoglobin for oxygen
 - D) It is an allosteric modulator
 - E) It is normally found associated with the hemoglobin extracted from red blood cells
- 6 Enzymes are potent catalysts because they:
 - A) are consumed in the reactions they catalyze
 - B) are very specific and can prevent the conversion of products back to substrates
 - C) drive reactions to completion while other catalysts drive reactions to equilibrium
 - D) increase the equilibrium constants for the reactions they catalyze
 - E) lower the activation energy for the reactions they catalyze
- 7 In a double-stranded nucleic acid, cytosine typically base-pairs with
 - A) adenosine
 - B) guanine
 - C) inosine
 - D) thymine
 - E) uracil
- 8 Which of the following deoxyoligonucleotides will hybridize with a DNA containing the sequence (5')AGACTGGTC(3')?
 - A) (5')CTCATTGAG(3')
 - B) (5')GACCAGTCT(3')
 - C) (5')GAGTCAACT(3')
 - D) (5')TCTGACCAG(3')
 - E) (5')TCTGGATCT(3')
- 9 The PCR reaction mixture does *not* include:
 - A) all four deoxynucleoside triphosphates
 - B) DNA containing the sequence to be amplified
 - C) DNA ligase.
 - D) heat-stable DNA polymerase.
 - E) oligonucleotide primer(s).
- 10 An example of a glycerophospholipid that is involved in cell signaling is:
 - A) arachidonic acid.
 - B) ceramide.
 - C) phosphatidylinositol.
 - D) testosterone.
 - E) vitamin A (retinol).

注意：背面尚有試題

- 11 An integral membrane protein can be extracted with:
 A) a buffer of alkaline or acid pH.
 B) a chelating agent that removes divalent cations.
 C) a solution containing detergent.
 D) a solution of high ionic strength.
 E) hot water.
- 12 Movement of water across membranes is facilitated by proteins called:
 A) annexins
 B) aquaporins
 C) hydropermeases
 D) selectins
 E) transportins
- 13 Hormone-activated phospholipase C can convert phosphatidylinositol 4,5-bisphosphate to:
 A) diacylglycerol + inositol triphosphate.
 B) diacylglycerol + inositol+ phosphate.
 C) glycerol + inositol + phosphate.
 D) glycerol + phosphoserine.
 E) phosphatidyl glycerol + inositol + phosphate.
- 14 The anaerobic conversion of 1 mol of glucose to 2 mol of lactate by fermentation is accompanied by a net gain of:
 A) 1 mol of ATP.
 B) 1 mol of NADH
 C) 2 mol of ATP.
 D) 2 mol of NADH.
 E) none of the above.
- 15 During strenuous exercise, the NADH formed in the glyceraldehyde 3-phosphate dehydrogenase reaction in skeletal muscle must be reoxidized to NAD^+ if glycolysis is to continue. The most important reaction involved in the reoxidation of NADH is:
 A) dihydroxyacetone phosphate \rightarrow glycerol 3-phosphate
 B) glucose 6-phosphate \rightarrow fructose 6-phosphate
 C) isocitrate \rightarrow α -ketoglutarate
 D) oxaloacetate \rightarrow malate
 E) pyruvate \rightarrow lactate
- 16 Which combination of cofactors is involved in the conversion of pyruvate to acetyl-CoA?
 A) Biotin, FAD, and TPP
 B) Biotin, NAD^+ , and FAD
 C) NAD^+ , biotin, and TPP
 D) Pyridoxal phosphate, FAD, and lipoic acid
 E) TPP, lipoic acid, and NAD^+
- 17 Malonate is a competitive inhibitor of succinate dehydrogenase. If malonate is added to a mitochondrial preparation that is oxidizing pyruvate as a substrate, which of the following compounds would you expect to decrease in concentration?
 A) Citrate
 B) Fumarate
 C) Isocitrate
 D) Pyruvate
 E) Succinate
- 18 Conversion of 1 mol of acetyl-CoA to 2 mol of CO_2 and CoA via the citric acid cycle results in the net production of:
 A) 1 mol of citrate
 B) 1 mol of FADH_2
 C) 1 mol of NADH
 D) 1 mol of oxaloacetate
 E) 7 mol of ATP
- 19 Transport of fatty acids from the cytoplasm to the mitochondrial matrix requires:
 A) ATP, carnitine, and coenzyme A
 B) ATP, carnitine, and pyruvate dehydrogenase
 C) ATP, coenzyme A, and hexokinase
 D) ATP, coenzyme A, and pyruvate dehydrogenase
 E) carnitine, coenzyme A, and hexokinase
- 20 The conversion of palmitoyl-CoA (16:0) to myristoyl-CoA (14:0) and 1 mol of acetyl-CoA by the β -oxidation pathway results in the net formation of:
 A) 1 FADH_2 and 1 NADH
 B) 1 FADH_2 and 1 NADPH
 C) 1 FADH_2 , 1 NADH, and 1 ATP
 D) 2 FADH_2 and 2 NADH
 E) 2 FADH_2 , 2 NADH, and 1 ATP

- 21 The carbon atoms from a fatty acid with an odd number of carbons will enter the citric acid cycle as acetyl-CoA and
- A) butyrate
 - B) citrate
 - C) malate
 - D) succinyl-CoA
 - E) α -ketoglutarate
- 22 Transamination from alanine to α -ketoglutarate requires the coenzyme:
- A) biotin
 - B) NADH
 - C) No coenzyme is involved
 - D) pyridoxal phosphate (PLP)
 - E) thiamine pyrophosphate (TPP)
- 23 Serine or cysteine may enter the citric acid cycle as acetyl-CoA after conversion to:
- A) oxaloacetate
 - B) propionate
 - C) pyruvate
 - D) succinate
 - E) succinyl-CoA
- 24 During oxidative phosphorylation, the proton motive force that is generated by electron transport is used to
- A) create a pore in the inner mitochondrial membrane
 - B) generate the substrates (ADP and P_i) for the ATP synthase
 - C) induce a conformational change in the ATP synthase
 - D) oxidize NADH to NAD^+
 - E) reduce O_2 to H_2O
- 25 The rate-limiting step in fatty acid synthesis is
- A) condensation of acetyl-CoA and malonyl-CoA
 - B) formation of acetyl-CoA from acetate
 - C) formation of malonyl-CoA from malonate and coenzyme A
 - D) the reaction catalyzed by acetyl-CoA carboxylase
 - E) the reduction of the acetoacetyl group to a β -hydroxybutyryl group

簡答題 (共 25 分)

26. In the glycolytic path from glucose to phosphoenolpyruvate, two steps are practically irreversible.
- (a) What are these steps, and how is each bypassed in gluconeogenesis? (10分)
 - (b) What advantages does an organism gain from having separate pathways for anabolic and catabolic metabolism? (5分)
27. (a) What is the effect of pH on the binding of oxygen to hemoglobin (the Bohr Effect)? (5分)
- (b) Briefly describe the mechanism of this effect. (5分)

