

國立臺灣海洋大學 106學年度研究所碩士班招生考試試題

考試科目：生物化學

系所名稱：水產養殖學系碩士班生命科學組

1. 答案以橫式由左至右書寫。2. 請依題號順序作答。

一. Briefly define the following terms (20 points)

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|-----------------------------------|-----------------------|
| 1. Entropy | 2. Gelatin |
| 3. Essential amino acids | 4. Anomeric carbon |
| 5. Ramachandran plots | 6. Chitosan |
| 7. Terpene | 8. Fluid Mosaic Model |
| 9. α -helix of polypeptide | 10. Hyaluronic acid |

二. Short Answer Questions (30 points)

1. a) Draw the predominant ionic structures of histidine ($\text{COOH} pK_a = 1.8$, $\text{NH}_3 pK_a = 9.2$, R group $pK_a = 6.0$), b) calculate the isoelectric point of histidine (5 points)
2. When the partial pressure of oxygen tension is 30 mmHg in the muscles; partial pressure of oxygen of 10 mmHg; a) determine the binding of oxygen of human muscle myoglobin (θ_{Mb}) in the physiological condition from resting muscles to extreme exercise; b) Under this condition, what percentage of the oxygen bound to in the muscles is delivered during extreme exercise (at 50% saturation of MbO_2 , $P_{50} = 2.8$ mmHg) (5 points)
3. DHA is required by marine fishes and shrimp for growth. Survival, and stress resistance, What is the chemical structural of DHA? (5 points)
4. Collagen is an abundant structural protein in all animals. What are the major features of the collagen? (5 points)
5. Draw a chemical structure showing the basic structure of cholesterol. (5 points)
6. Define configurational isomers, enantiomers, anomers, epimers, diastereoisomers and conformation isomers, which are described the isomer structure of sugar molecules. (5 points)

三、選擇題（每題二分）

1. If the rate constant for the enzyme catalyzed reaction is $2 \times 10^5/\text{sec}$ and the rate constant for the uncatalyzed reaction is $2 \times 10^{-6}/\text{sec}$, the catalytic power of the enzyme is:
- A) 10^{-1} B) 10^{11} C) 10^{-11} D) 4×10^{-1}

2. The catalytically active complex of _____ and _____ group is called the _____.
A) apoenzyme; holoenzyme; prosthetic B) apoenzyme; prosthetic; holoenzyme
C) holoenzyme; prosthetic; apoenzyme D) prosthetic; holoenzyme; apoenzyme
3. Enzymes have active sites which have the greatest complementarity to the:
A) substrate. B) transition state. C) product. D) both substrate and product.
4. Which of the following is an essential amino acid?
A) praline B) valine C) glutamine D) glutamate
5. Ketone bodies are synthesized in the:
A) cytosol of muscle. B) mitochondria of liver.
C) endoplasmic reticulum of heart. D) plasma membrane of brain.
6. The pentose phosphate pathway can provide _____ for biosynthesis, and _____ for nucleotide synthesis.
A) ATP; NADH B) NADPH; ribose-5-phosphate
C) NADH; NADPH D) ribose-5-phosphate; NADH
7. What are the final products of aerobic catabolism?
A) pyruvate and H₂O. B) CO₂ and H₂O.
C) acetyl-CoA and CO₂. D) pyruvate and acetyl-CoA.
8. Many of the catabolic pathways converge to the common two-carbon intermediate:
A) alanine. B) acetyl group of acetyl-CoA. C) lactic acid. D) glucose.
9. Dehydrogenases are enzymes that:
A) move hydrogens within the molecule.
B) transfer hydride ions to NAD⁺ (or NADP⁺) and release a proton.
C) transfer hydrogens between substrates.
D) add hydrogens across double bonds.
10. Gluconeogenesis is the synthesis of:
A) glycogen from glucose. B) glucose from non-carbohydrate precursors.
C) pyruvate from glucose. D) fatty acids from glucose.
11. A key intermediate at the branch point in the synthesis of tryptophan, phenylalanine and tyrosine is
A) shikimate B) ornithine C) phosphoenolpyruvate D) chorismate

12. The synthesis of AMP is inhibited in bacteria but not in humans by a class of drugs called sulfonamides. This is because sulfonamides
- A) allosterically inhibit ribose phosphate pyrophosphokinase
 - B) allosterically inhibit one or more synthetases
 - C) inhibit the formation of 5'-phosphoribosylamine
 - D) inhibit the synthesis of tetrahydrofolate
13. The initial, common intermediate in purine catabolism for both AMP and GMP is
- A) inosine B) uric acid C) hypoxanthine D) xanthine
14. Most coenzymes are derived from, or are
- A) metal ions B) carbohydrates C) amino acids D) vitamins
15. The primary control in the clotting of blood is
- A) association of subunits to form different B) induction
 - C) post-translational modification D) proteolytic cleavage of proenzymes
16. The hormone, glucagon, activates all of the following in liver cells except
- A) cAMP protein kinase B) adenylate cyclase
 - C) triacylglycerol lipase D) biosynthesis of fatty acids
17. The first three reactions in the β -oxidation of saturated fatty acids produce?
- A) 2 moles of NADH B) 2 moles of FADH_2
 - C) 2 moles of ATP D) 1 moles of both NADH and FADH_2
18. Cholesterol enters most extrahepatic tissues
- A) as cholesterol esters found in HDL.
 - B) as part of chylomicron remnants which are taken up by endocytosis.
 - C) as unesterified cholesterol from serum.
 - D) as part of LDL which is taken up endocytosis.
19. Palmitic acid can be converted to all of the following molecules in human hepatocytes except
- A) cholesterol B) oleic acid C) sphingosine D) linoleic acid
20. Reactions in the urea cycle takes place in the
- A) mitochondrial matrix B) cytoplasm
 - C) mitochondrial inner membrane D) cytoplasm and mitochondrial matrix

21. The committed step in cholesterol biosynthesis is catalyzed by
A) HMG-CoA synthase B) mevalonate kinase
C) HMG-CoA reductase D) squalene monooxygenase
22. What type of linkage occurs between ACP and the intermediates in fatty acid biosynthesis?
A) an ester B) an ether C) a thioester D) an amide
23. The biosynthesis of what amino acid involves reactions which are also part of the urea cycle?
A) threonine B) histidine C) arginine D) lysine
24. In eukaryotic cells, glycolysis occurs in the _____, and the TCA cycle reactions take place in _____.
A) mitochondria; mitochondria B) cytoplasm; cytoplasm
C) cytoplasm; mitochondria D) mitochondria; ribosomes
25. All are linked to the electron-transport chain through Complex I accepting electrons from NADH EXCEPT:
A) glycolysis. B) TCA cycle.
C) gluconeogenesis. D) fatty acid oxidation.