

國立臺灣海洋大學114學年度碩士班考試入學招生考試試題

考試科目：生物化學

學系組名稱：食品科學系碩士班食品科學組、食品科學系碩士班生物科技組

1.答案以橫式由左至右書寫在答案卷上。2.請依題號順序，並標示題號作答。

Part A: Definitions (8 pts, 4 points each)

1. Define allosteric regulation and explain how it influences enzyme activity.
2. Define DNA replication and Transcription.

Part B: Essay Questions (18 points, 6 points each)

1. Describe protein molecules' functions and structures.
2. Please define and discuss the two major types of post-translational modifications and explain how they can alter protein structure and function.
3. DNA Mutations: Analyze the types, causes, and consequences of DNA mutations, including point mutations, frameshift mutations, and silent mutations. Discuss how these changes might affect protein synthesis.

Part C: Single-Choice Questions (24 points, 3 points each)

1. During DNA replication, the enzyme responsible for relieving supercoiling tension ahead of the replication fork is:
A. DNA polymerase I
B. Helicase
C. Topoisomerase
D. Primase
2. Which of the following is the first step in the initiation of eukaryotic transcription?
A. Binding of the TATA-binding protein (TBP) to the promoter
B. RNA polymerase forming the open complex
C. attachment of the sigma factor
D. Splicing of introns

3. In the lac operon model in *E. coli*, which molecule acts as an inducer?
- A. Lactose
 - B. Glucose
 - C. cAMP
 - D. Allolactose
4. The term “wobble” in the context of tRNA refers to:
- A. The flexibility of the ribosome to move along mRNA
 - B. The ability of certain tRNA anticodons to recognize more than one codon
 - C. The mismatch repair of DNA
 - D. An error in polypeptide folding
5. Which of the following statements about ribosomes is false?
- A. They are composed of rRNA and proteins
 - B. They have two major subunits
 - C. They synthesize RNA from a DNA template
 - D. They facilitate peptide bond formation
6. Which level of protein structure is primarily associated with the interactions of side chains leading to overall folding into a three-dimensional shape?
- A. Primary
 - B. Secondary
 - C. Tertiary
 - D. Quaternary
7. Which statement accurately describes the concept of ‘codon degeneracy’?
- A. Each codon corresponds to multiple amino acids
 - B. Multiple codons can specify the same amino acid
 - C. Only one codon corresponds to each amino acid
 - D. Stop codons cannot be mutated
8. In many biochemical processes, enzymes are used to accelerate reactions. Enzyme catalysis functions by:
- A. Decreasing the activation energy of the reaction
 - B. Increasing the activation energy of the reaction
 - C. Changing the overall ΔG (Gibbs free energy) of the reaction
 - D. Shifting the equilibrium constant of the reaction

Part D: Short Answer Questions (5 points each)

1. Please describe the structure and classification of carbohydrates, and explain the differences between monosaccharides, disaccharides, and polysaccharides.
2. Please describe the structure and function of lipids, and explain the differences between saturated and unsaturated fats.
3. Please discuss the composition of enzymes and the various factors that influence enzyme activity.
4. Please compare and contrast competitive and non-competitive enzyme inhibitors.
5. Please draw the structure of a nucleotide and label the components: nucleoside, base, sugar, and phosphate group.
6. Please list the classes of nucleic acids and explain the function of each.
7. What are the chemical differences between DNA and RNA? Discuss their biological significance.
8. Please list the key characteristics of cloning vectors and explain how they are used for cell transformation.
9. What is a DNA library, and what is the process of establishing one?
10. What is the principle behind ChIP-Seq (Chromatin Immunoprecipitation Sequencing) and its main purpose in biochemical research?