

問答與計算題 (可中、英文答題)：

※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

1. (A) Draw the chemical structure of β -D-glucopyranose by Haworth projection. (5%) (B) α -D-glucose has a specific rotation $[\alpha]^{20}_D +112.1$, whereas β -D-glucose has a specific rotation of $[\alpha]^{20}_D +18.7$. What is the composition of a mixture of α -D-glucose and β -D-glucose, which has a specific rotation of $+83.0$? (5%)
2. (A) Calculate the NaCl concentration of the seawater (salinity = 35‰) in molarity (M). NaCl = 58.4 g/mol. Density of seawater = 1.0 g/cm³ (5%) (B) How to prepare a 0.1 M NaCl solution using seawater? (5%)
3. (A) Describe the fatty acid composition difference between seawater fish and freshwater fish. (4%) (B) Give two characteristic fatty acids in seawater fish and draw the chemical structures. (6%)
4. Short answer questions: (A) an iodine-containing hormone (B) a sulfur-containing vitamin (C) a cobalt-containing vitamin (D) a selenium-containing enzyme (E) a four nitrogen atoms-containing amino acid. (10%)
5. Give three-letter abbreviations for the following chemicals: (A) Glucose (B) Glutamine (C) Tryptophan (D) Isoleucine (E) Asparagine. (10%)
6. (A) What peptides would be released from the following peptides by treatment with trypsin? (6%)

Ala-Ser-Thr-Lys-Gly-Arg-Ser-Gly-Ala

(B) What peptides would be released from the following peptides by treatment with chymotrypsin? (4%)

Ser-Thr-Lys-Gly-Trp-Ser-Gly-Ala-Lys
7. A protein mixture containing ovalbumin (pI = 4.6), urease (pI = 5.0), and myoglobin (pI = 7.0) were separated by DEAE-Sepharose column eluted with pH 6.5 buffer followed by gradient NaCl aqueous solution. (A) Predict the elution sequence (from early to late). (6%) (B) Which protein can be precipitated under a pH 5.0 buffer? (4%)
8. Describe the theory and application of the following methods: (A) Gel filtration chromatography (5%) (B) Western blotting (5%).
9. A DNA sequence is as follows: 5'-GTCATGAC-3'. (A) Give a complementary DNA strand (From 3' to 5'). (5%) (B) Give a complementary RNA strand (From 5' to 3'). (5%)
10. Describe the reason why it is difficult to identify the coding DNA of secondary metabolites in organisms. (10%)