

所別：環境工程研究所碩士班 甲組 科目：環境化學及環境微生物學

**Part I Environmental Chemistry (50%)**

1. Calculate the following questions: (18%)
  - (1) Sodium hydroxide (NaOH) is used as the base in acid-base titration. It has a molecular weight of 40. How many grams of NaOH are needed to prepare 2 L of a 0.25N solution? (6%)
  - (2) If calcium (Ca) is 60 mg/L and magnesium (Mg) is 8.8 mg/L, what is the total hardness of the water in mg/L as  $\text{CaCO}_3$ ? (6%)
  - (3) What mass of carbon dioxide would be produced if 200 g butane ( $\text{C}_4\text{H}_{10}$ ) is completely oxidized to carbon dioxide and water? (6%)
2. Define and describe the following terms: (16%)
  - (1) photochemical oxidant
  - (2) photochemical reaction
  - (3) photosynthesis
  - (4) photocatalysis
3. Define LNAPL (Lighter nonaqueous-phase liquids) and DNAPL (Denser nonaqueous-phase liquids), also in your answer, describe their important in groundwater pollution. (8%)
4. Write chemical equations summarizing all the essential reactions involved in the unmodified Winkler method for dissolved oxygen measurement. (8%)

**Part II Environmental microbiology (50%)**

5. Protozoa and bacteria are partners in some wastewater treatment processes. Describe their interaction and the role of protozoa in activated sludge process, especially in relation to the removal of pollutants. (10%)
6. Discuss various removal mechanism of heavy metal by microorganisms in the environment. (10%)
7. How are activated sludge process and tricking filter similar and different in specific growth rate ( $\mu$ )? Which system has a wider distribution range of  $\mu$  and why? (10%)
8. What is self-purification? Describe the stages, water quality variation and corresponding succession of microbial and/or biological phases identified. (10%)
9. Define the following terms: (10%)
  - (1) Eutrophication
  - (2) Heterotrophs
  - (3) Nitrosomonas
  - (4) Red tide
  - (5) Acinetobacter