

系所組別： 環境工程學系丙組

考試科目： 普通化學

考試日期： 0225，節次： 1

- Equilibrium Chemistry.** Calculate the ratio of HOCl and OCl⁻. In solutions with following pH values (a) 6.0 (b) 7.0 (c) 8.0. The pK_a for HOCl is 7.5. (15 pts)
- Water Softening.** The water in table below is to be softened by lime softening. How many kgs of lime must be added to treat 50 m³ of the water and how many kgs of calcium carbonate will be precipitated? (15 pts).

Concentration (mg/L)			
Cation		Anion	
Ca ²⁺	100	HCO ₃ ⁻	270
Mg ²⁺	5	Cl ⁻	50
Na ⁺	35	SO ₄ ²⁻	45
		NO ₃ ⁻	10

- Solubility.** Anthracene has contaminated harbor sediments, and the solid portion of sediments is in equilibrium with the pore water. If the organic content of sediments is 5 % and the solid sediment anthracene concentration is 50 μg/kg sediment, what is the pore water concentration of anthracene at equilibrium? Assuming that the soil-water partition coefficient normalized to organic carbon is 4.32 (log K_{oc}). (20 pts).
- Chemical Reaction Kinetics.** Assuming the degradation of one organic pollutant in natural water environment follows the first-order kinetics. In one accident, this pollutant releases to water environment and remains 60% after 50 days. Please calculate (a) the half-life for this pollutant in natural water environment and (b) how long does it take to naturally degrade this pollutant to 20% remained. (15 pts)
- Chemical Reaction Stoichiometry.** A synthesis gas, containing 6.4% CO₂, 0.2% O₂, 40% CO, and 50.8 % H₂ (the balance is N₂), is burned with 40% dry excess air. What is the composition of the flue gas? (20 pts)
- Colloidal Chemistry.** Please clearly explain properties of colloidal particles in surface water and removal mechanisms for colloidal particles using coagulation/flocculation in drinking water treatment. (15 pts)