

題號： 306

國立臺灣大學 109 學年度碩士班招生考試試題

科目： 環境化學(B)

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1. (15%) For the reaction $A \leftrightarrow B$ in a closed system, $TOTA = 1.0 \times 10^{-3}M$. The equilibrium constant for the reaction is 10. The rate constant in the forward direction is 1.0 day^{-1} .
 - A. What are the concentrations of species A and B at equilibrium? (5%)
 - B. If the initial concentration of species A is $1.0 \times 10^{-3}M$, what is the initial rate of change in the concentration of A? (5%)
 - C. What are the rates of the forward and backward reactions at equilibrium? (5%)
2. (10%) The following equation has been often used by water chemists.
 $\log[Ca^{2+}] + 2pH = \text{constant} - \log PCO_2$
 - A. Under what conditions does this equation hold? (5%)
 - B. Express the constant in terms of known equilibrium constants. (5%)
3. (10%) Explain why pH and temperature should always be measured when measuring redox potential of a sediment?
4. (15%) Explain the following terms.
 - A. Adsorption isotherm
 - B. Zeta potential
 - C. Ionic strength
 - D. Critical coagulation concentration
 - E. Ion exchange selectivity
5. (10%) Explain the "direct effects" and "indirect effects" of aerosols on the climate (especially the surface temperature).
6. (10%) (a)What are the main sources of arsenic in the environment? (b)What are the two important oxidation states of inorganic arsenic? (c)Which inorganic one is more toxic? (d)How are organic forms of arsenic formed in the environment? (e)What are their chemical structures? (f)Is organic arsenic more toxic to human than the inorganic form based on current evidence?
7. (10%) In the purification of wastewater contaminated by pentachlorophenol and 2,3,5,6-tetrachlorophenol using ultraviolet light, it was noticed that octachlorodibenzo-p-dioxin (OCDD) and 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxins were formed. (a) Deduce the chemical reaction. (b) Which of these two forms of dioxin is more toxic?
8. (10%) (a)Draw the structure of Polychlorinated Biphenyls (PCB)? What is meant by a coplanar PCB (5%)? (b)What does "Toxicity Equivalent Factor (TEQ)" stand for? Why is it used? (5%)
9. (10%) (a)Define the term environmental estrogens. (b) Give two examples of environmental estrogens. (c)How do such compounds operate in the human body?

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