

# 淡江大學 106 學年度日間部寒假轉學生招生考試試題

系別：水環系環境工程組三年級

科目：環境化學

33-1

考試日期：1 月 6 日(星期六) 第 2 節

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## A. Multiple Choice Questions (10 point/question)

1. What is the equivalent weight (E.W.) of  $\text{H}_2\text{SO}_4$ : (A) 147 (B) 98 (C) 49 (D) 24.5. (Atomic weight: S: 32)
2. How many grams of  $\text{AgNO}_3$  are required to prepare 1 L of a 0.1 N solution to be used in a precipitation reaction? (A) 170 (B) 17 (C) 8.5 (D) 108. (Atomic weight: Ag: 108)
3. For the  $\text{CO}_{2(\text{aq})} - \text{HCO}_3^- - \text{CO}_3^{2-}$  system in water, the **incorrect** statement is (A) for pH significantly below  $\text{pK}_{a1}$ ,  $\alpha_{\text{CO}_{2(\text{aq})}}$  is essentially 1 (B) when  $\text{pH} = \text{pK}_{a1}$ ,  $\alpha_{\text{CO}_{2(\text{aq})}} = \alpha_{\text{HCO}_3^-}$  (C) when  $\text{pH} = 1/2 (\text{pK}_{a1} + \text{pK}_{a2})$ , the predominant species is  $\text{CO}_{2(\text{aq})}$  (D) when  $\text{pH} = \text{pK}_{a2}$ ,  $\alpha_{\text{HCO}_3^-} = \alpha_{\text{CO}_3^{2-}}$
4. Of the following, the **least likely** mode of transport of iron(III) (Fe) in a normal stream is: (A) bound to suspended humic material, (B) bound to clay particles by cation exchange processes, (C) as suspended  $\text{Fe}_2\text{O}_3$ , (D) as soluble  $\text{Fe}^{3+}$  ion, (E) bound to colloidal clay humic substance complexes.
5. Regarding sewage wastewater treatment, the **false** statement of the following is (A) primary treatment is designed to remove the insoluble matter, (B) secondary treatment is designed to remove COD (chemical oxygen demand), (C) rotating biological reactor is an attached growth process, (D) most secondary treatments utilize biological processes, (E) approximately 40% of organic matter in wastewater goes to oxidation pathway.

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33-2

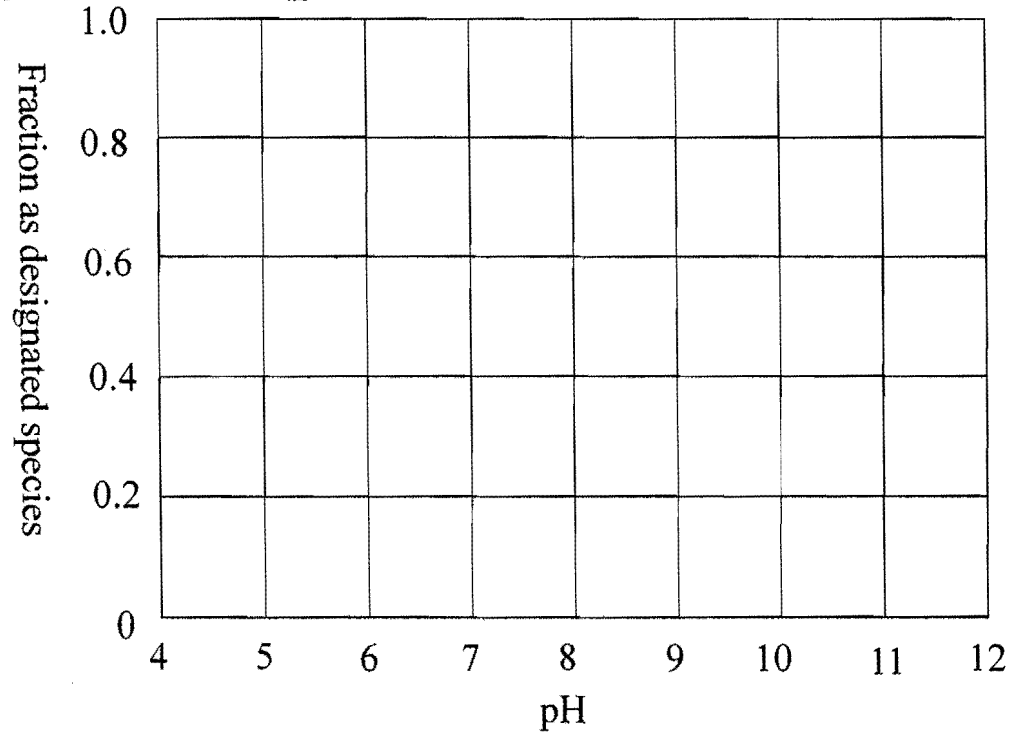
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## B. Questions

1. Please draw the species diagram for the  $\text{CO}_{2(\text{aq})}$  -  $\text{HCO}_3^-$  -  $\text{CO}_3^{2-}$  system in water. (25 point)

$$K_{a1} = 4.45 \times 10^{-7} \quad K_{a2} = 4.695 \times 10^{-11}$$



(Please draw the diagram on the answer sheet)

2. Assume that a waste contains 300 mg/L of biodegradable  $\{\text{CH}_2\text{O}\}$  and is processed through a 200,000-L/day sewage-treatment plant which converts 40% of the waste to  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . Calculate the volume of air (at 25°C, 1 atm) required for this conversion. Assume that the  $\text{O}_2$  is transferred to the water with 40% efficiency. Air only has 20%  $\text{O}_2$ . The volume of a mole of air at 25°C and 1 atm is 24.4 L.  $\{\text{CH}_2\text{O}\} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$  (25 point)