

淡江大學 107 學年度日間部轉學生招生考試試題

系別：水資源及環境工程學系
環境工程組三年級

科目：環境化學

47-1

考試日期：7月27日(星期五) 第2節

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A. Multiple Choice Questions (8 point/question)

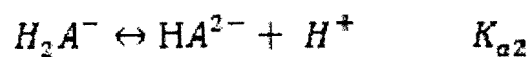
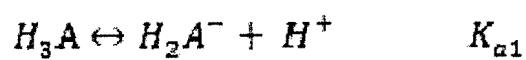
1. For the $\text{CO}_{2(\text{aq})} - \text{HCO}_3^- - \text{CO}_3^{2-}$ system in water, the **incorrect** statement is (A) for pH significantly below pK_{a1} , $\alpha_{\text{CO}_{2(\text{aq})}}$ is essentially 1 (B) when $\text{pH} = \text{pK}_{a1}$, $\alpha_{\text{CO}_{2(\text{aq})}} = \alpha_{\text{HCO}_3^-}$ (C) when $\text{pH} = 1/2 (\text{pK}_{a1} + \text{pK}_{a2})$, the predominant species is $\text{CO}_{2(\text{aq})}$ (D) when $\text{pH} = \text{pK}_{a2}$, $\alpha_{\text{HCO}_3^-} = \alpha_{\text{CO}_3^{2-}}$.
2. Regarding secondary wastewater treatment, the **true** statement of the following is (A) the activated sludge process is predominantly a physical/chemical process, (B) the activated sludge process gets rid of all of the sludge as soon as it is made, (C) trickling filters make use of a mass of biological sludge that is continuously pumped over the filter, (D) the trickling filter is an aerobic treatment process, (E) excess sludge from activated sludge treatment is likely to undergo the process represented by $2\{\text{CH}_2\text{O}\} + \text{O}_2 \rightarrow \text{CH}_4 + \text{CO}_2$.
3. 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.
4. Of the following, the statement that is **untrue** regarding **heavy metals** in the environment is (A) Cr(VI) is more toxic than Cr(III) (B) Cadmium is very similar to calcium and may replace calcium in some enzymes which cause disease symptoms (C) Lead can cause mental retardation in many children (D) Organic forms of mercury are highly toxic (E) Tributyl tin (TBT) chloride was once widely used in boat and ship hull coatings to prevent the growth of fouling organisms.
5. Of the following **heavy metals**, choose the one **most likely** to have microorganisms involved in its mobilization in water: (A) Lead, (B) zinc, (C) cadmium, (D) chromium, (E) arsenic.

B. Questions

1. A water sample was run through the colorimetric procedure for the analysis of nitrate, giving 60.0% transmittance. A sample containing 1.00 ppm nitrate run through the exactly identical procedure gave 25% transmittance. What was the concentration of nitrate in the first sample? (20 point)

$$A = \log \frac{100}{\%T}$$

2. Triprotic acid (H_3A)



Determine the ionization fraction (α) of each species (including H_3A , H_2A^- , HA^{2-} , and A^{3-}) as a function of acid dissociation constants (K_a) and hydrogen ion concentration ($[\text{H}^+]$). (40 point)