

國立中山大學 104 學年度碩士暨碩士專班招生考試試題

科目名稱：分析化學【海資系碩士班丙組】

題號：452005

※本科目依簡章規定「不可以」使用計算機(問答申論題)

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請注意：(a)若涉及計算，請將演算過程列出，否則不予計分

(b) $\log 2 = 0.30$ $\log 3 = 0.48$

(c) 原子量：H=1, N=14, O=16, Br=79.9, Ag=107.8

- Concentrated HNO_3 has a specific gravity of 1.42 and is 69 percent HNO_3 .
 - How would you prepare 1.00 L of 0.25 M HNO_3 from the concentrated reagent? (5%)
 - What volume of the concentrated acid contains 24.0 g of HNO_3 ? (5%)
- What weight of AgBr dissolves in 200 mL of 0.100M NaCN ? (10%)
 $\text{Ag}^+ + 2\text{CN}^- \rightleftharpoons \text{Ag}(\text{CN})_2^- \quad K = 1.3 \times 10^{21}$
 $\text{AgBr} \rightleftharpoons \text{Ag}^+ + \text{Br}^- \quad K_{sp} = 5.4 \times 10^{-13}$
- What is the pH of the buffer formed by mixing 50.0 mL of 0.200 M NaH_2PO_4 with 50.0 mL of 0.120 M NaOH ? (For H_3PO_4 , $\text{p}K_{a1} = 2.12$, $\text{p}K_{a2} = 7.21$, $\text{p}K_{a3} = 12.15$) (10%)
- A primary standard is a compound that serves as a reference material in all volumetric and mass titrimetric methods. What are the requirements for a primary standard? (10%)
- Consider the half-reaction
 $\text{As}_{(s)} + 3\text{H}^+ + 3\text{e}^- \rightleftharpoons \text{AsH}_{3(g)} \quad E^\circ = -0.238\text{V}$
 - Write the Nernst equation for the half-reaction. (5%)
 - Find E when $\text{pH} = 3.00$ and $P_{\text{AsH}_3} = 1.00 \times 10^{-2}$ atm. (5%)
- Explain the following terms in pH measurement.
 - Sodium error (or alkaline error) (5%)
 - Acid error (5%)
- Describe or define the following terms of electrolyte solutions
 - Activity
 - Activity coefficient
 - Ionic strength
 - Debye-Hückel equation (12%, 3% each)
- Briefly explain why milligrams of solute per liter and parts per million can be used interchangeably to describe the concentration of a dilute aqueous solution. (6%)
- Briefly explain why fluorescence emission ordinarily occurs at wavelength that are longer than that of the excitation radiation. (10%)
- Describe the fundamental differences between high-performance liquid chromatography and gas-liquid chromatography. (6%)
What are the advantages and disadvantages of each? (6%)