

淡江大學 97 學年度碩士班招生考試試題

35

系別：化學學系

科目：普通化學

本試題共 1 頁，6 大題

- Define the following terms (**not** just translation!). (30%)
  - Angular momentum quantum number
  - Arrhenius equation
  - London dispersion forces
  - Enantiomers
  - Salt bridge
  - Condensation polymerization
- Write formulas for the following compounds: (15%)
  - Diiodine pentoxide
  - Lithium aluminum hydride
  - Ammonium dichromate
 Draw the structures of the following compounds:
  - trans*-1,2-dichloroethene
  - 3-bromobenzaldehyde
- Briefly answer the following questions: (10%)
  - For the bonding in  $\text{COCl}_2$ , indicate the number of sigma and pi bonds, the geometry, and the type of hybridization.
  - Write the electronic configuration and determine the charge on phosphorus atom when it forms its most stable ion.
- Give an example of a buffer solution. Describe the method of preparing the buffer solution (5%)
  - Derive the expression of the pH value for your buffer solution. Define all the terms used in your derivation. (10%)
- Calculate the cell potential of a galvanic cell based on the following half-reactions at  $25^\circ\text{C}$ . ( $E_1 > E_2$ )(10%)
 
$$\text{A} + 3\text{e}^- \longrightarrow \text{B} \quad E^\circ = E_1 \text{ (Volt)} \quad \text{C} + 4\text{e}^- \longrightarrow \text{D} \quad E^\circ = E_2 \text{ (Volt)}$$
 Use  $E_1$ ,  $E_2$ , and the initial concentrations  $[\text{A}]_0$ ,  $[\text{B}]_0$ ,  $[\text{C}]_0$ , and  $[\text{D}]_0$  to express  $E_{\text{cell}}$ .
  - Derive the expression of the equilibrium constant for the cell reaction in (a). (10%)
- Calculate the concentration of  $\text{Ag}^+$  in a solution prepared by mixing 50.0 mL of  $5.2 \times 10^{-3}$  M  $\text{AgNO}_3$  with 50.0 mL of 2.00 M KCN. (10%)
 
$$\text{Ag}^+_{(\text{aq})} + 2\text{CN}^-_{(\text{aq})} \rightleftharpoons \text{Ag}(\text{CN})_2^-_{(\text{aq})} \quad \beta = 1.3 \times 10^{21}$$

where  $\beta$  is the complex formation constant.