

淡江大學 109 學年度日間部轉學生招生考試試題

系別：化學工程與材料工程學系二年級

科目：普通化學

5 - |

考試日期：7 月 22 日(星期三) 第 1 節

本試題共 6 大題，1 頁

1. Name the following species in English or write their molecular formulas. (15%)

For examples: H_2SO_4 : Sulfuric acid; Water: H_2O

CO_2 : (a); NaCl: (b); Ethanol: (c);

Hypochlorous acid: (d); Gallium arsenide: (e)

2. Briefly answer the following questions. (25%)

(a) Describe the Pauli exclusion principle.

(b) The electron configuration of magnesium can be expressed as $[\text{Ne}]3s^2$. Write the similar expression for the electron configuration of copper.

(c) Define the dipole moment of a molecule.

(d) Draw the Lewis structure for O_3 . Also calculate the respective formal charge for each of the three oxygen atoms.

(e) Differentiate between the reaction quotient and the equilibrium constant for the following chemical reaction: $\text{A} + 2\text{B} \rightleftharpoons 3\text{C} + 4\text{D}$, where A, B, C, and D are chemicals dissolved in an aqueous solution.

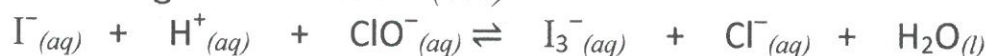
3. On a phase diagram of a pure substance, draw the triple point, the normal melting point, and the supercritical fluid region, and indicate a pathway for the sublimation process. (15%)

4. (a) In chemical kinetics, the Arrhenius equation can correlate k , the rate constant, E_a , the activation energy, and T , the Kelvin temperature. Write the equation and define the other terms in the equation. (5%)

(b) According to the Arrhenius equation, design an experiment to measure the activation energy of the following chemical reaction: $3\text{H}_2(\text{g}) + \text{N}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$.

Include the principle and experimental procedure in your answer. (10%)

5. (a) Balance the following redox reaction. (6%)



(b) Knowing that the reaction in (a) proceeds to the right spontaneously, indicate the strongest reductant and the strongest oxidant in (a). (6%)

(c) Write the balanced cathode reaction. (3%)

6. (a) Calculate the pH value of a buffer solution consisting of 0.50 M HOAc ($K_a = 1.80 \times 10^{-5}$) and 0.25 M NaOAc. (10%)

(b) Propose a method to enhance the buffer capacity of the buffer in (a) without changing its pH value. (5%)