

# 淡江大學九十四學年度轉學生招生考試試題

系別：化學學系三年級

科目：普通化學

准帶項目請打「V」

簡單型計算機

節次：7月13日第3節

本試題共1頁

## 按照題目順序作答

1. Write a balanced ionic equation to represent the oxidation of iodide ion by permanganate ion in basic solution to yield manganese (IV) oxide. (10%)
2. Calculate the density of ammonia ( $\text{NH}_3$ ) in grams per liter at 752 mmHg and  $55^\circ\text{C}$ . (10%)
3. A neutral atom of a certain element has 25 electrons. (a) What is the electron configuration of the element? (b) How should the element be classified? (c) Are the atoms of this element diamagnetic or paramagnetic? (10%)
4. (a) Which atom should have a smaller first ionization energy: oxygen or sulfur? (b) Which atom should have a higher second ionization energy: lithium or beryllium? Give your reason. (10%)
5. An organic compound has molecular formula of  $\text{CH}_2\text{O}$ . (a) Draw the most likely Lewis structure for the compound. (b) Indicate the hybridization orbitals and formal charge for carbon and oxygen atom in this molecule. (10%)
6. Use the VSEPR model to predict the geometry of the following molecules and ions: (a)  $\text{O}_3$  (b)  $\text{IF}_3$  (c)  $\text{I}_3^-$  (10%)
7. Write the ground-state electron configuration for  $\text{O}_2$  by molecular orbital theory and show that it is paramagnetic. (10%)
8. At  $25^\circ\text{C}$ , the vapor pressure of pure water is 23.76 mmHg and that of a dilute aqueous urea solution is 22.98 mmHg. Estimate the concentration in molality ( $m$ ) of the solution. Urea is a nonvolatile compound. (10%)
9. Describe the first law, the second law, and the third law of thermodynamics. (10%)
10. Calculate the pH of a buffer system containing 0.10 M  $\text{CH}_3\text{COOH}$  and 0.18 M  $\text{CH}_3\text{COONa}$ . (10%)

gas constant  $R = 8.314 \text{ J/K}\cdot\text{mol} = 0.08206 \text{ L}\cdot\text{atm/K}\cdot\text{mol}$ 

atomic weight N=14, C=12, H=1

 $K_a$  of  $\text{CH}_3\text{COOH} = 1.8 \times 10^{-5}$