

# 淡江大學 101 學年度轉學生招生考試試題

系別：化學學系二年級

科目：普通化學

考試日期：7 月 16 日(星期一) 第 3 節

本試題共 6 大題， 1 頁

1. Using a molecular orbitals energy-level diagram, would you expect O<sub>2</sub> to have a lower or higher first ionization energy than atomic oxygen? Why? (10 pts)
2. Explain the following terms: (a) standard solutions (b) stock solutions (c) Lewis acids. (15 pts)
3. A 0.6025 g sample was dissolved, and the Ca<sup>2+</sup> and Ba<sup>2+</sup> ions present were precipitated as BaC<sub>2</sub>O<sub>4</sub> · H<sub>2</sub>O and CaC<sub>2</sub>O<sub>4</sub> · H<sub>2</sub>O. The oxalates were then heated in the 320°C to 400°C range to produce an anhydrous residue (MC<sub>2</sub>O<sub>4</sub>, M = Ca or Ba) that weighed 0.5713 g. Subsequently, the anhydrous residue was heated in the 580°C to 620°C range and the resulting products corresponding to the two carbonates weighed 0.4673 g finally.
  - (a) Write down the equations of the chemical reactions occurred in the 580°C to 620°C range. (10 pts)
  - (b) Calculate the percentage Ca and percentage Ba in the sample. (15 pts)  
(Ba = 137.33, Ca = 40.08, C = 12.01)
4. Give the name in English for each of the following compounds: (a) NaH (b) H<sub>2</sub>O<sub>2</sub> (10 pts)
5. (a) Draw both the Lewis structures of I<sub>3</sub><sup>-</sup> and XeF<sub>4</sub>. (10 pts)
  - (b) Draw both the expected molecular structures of I<sub>3</sub><sup>-</sup> and XeF<sub>4</sub> by the VSEPR model. (10 pts)
6. Consider the titration of 100 mL of 0.05 M NH<sub>3</sub> (K<sub>b</sub> = 1.8 × 10<sup>-5</sup>) by 0.1 M HCl. (20 pts)  
Calculate the pH of the resulting solution after the following volumes of HCl have been added.  
(a) 0 mL (b) 25 mL (c) 50 mL (d) 60 mL