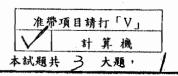# 淡江大學 98 學年度轉學生招生考試試題

系別：化學學系二年級　　　　　科目：普　通　化　學

第一部份：選擇題 （每題 4 分，共 20 分）

1. Place the following species in order of increasing size: Ar, Al^{3+}, S^{2-}, and Mg^{2+}.
   (A) $Al^{3+} < Mg^{2+} < Ar < S^{2-}$　　　　(B) $Ar < Al^{3+} < Mg^{2+} < S^{2-}$　　　　(C) $Mg^{2+} < Al^{3+} < S^{2-} < Ar$
   (D) $S^{2-} < Ar < Mg^{2+} < Al^{3+}$　　　　(E) $Ar < S^{2-} < Al^{3+} < Mg^{2+}$

2. For the central atoms of the following molecules, which **does not** display sp^3 hybrid orbital?
   (A) SiH_4　　　(B) H_3O^+　　　(C) NCl_3　　　(D) CH_3^+　　　(E) none of these

3. How many grams of carbon dioxide are produced from the burning of 684 g of sucrose?
   (A) 88　　　(B) 352　　　(C) 528　　　(D) 1056　　　(E) none of these

4. Which of the following is a factor determining the activation energy of a chemical reaction?
   (A) temperature　　　(B) collision frequency　　　(C) orientation of molecules
   (D) reaction enthalpy　　　(E) none of these

5. Which one of the following statements about chromium is **not true**?
   (A) Its atomic number is 24.
   (B) Its electron configuration is $[Ar]\ 4s^1 3d^5$
   (C) Its common oxidation states include +2, +3, +6.
   (D) The lower the pH, the higher the oxidizing abilities of chromium(VI).
   (E) Chromite, produced by reacting carbon with ferrochrome, is added to iron in the steelmaking process.

第二部份：解釋名詞（每題 5 分，共 30 分）

1. Isomers
2. Coordination number
3. Pauli exclusion principle
4. Integrated rate law in chemical kinetics
5. Internal energy of a thermodynamic system
6. An isothermal free expansion process of a thermodynamic system

第三部份：問答題（共 50 分）

1. For the B_2, O_2, and BN molecules, draw the MO energy-level diagrams, calculate the bond orders, and predict their magnetisms. (15%)

2. Calculate the solubility of AgI(s) in 1.00 M CN^- ion. (15%)
   (K_{sp} for AgI = 1.5×10^{-16}; $\beta_{Ag(CN)_2^-}$, the complex formation constant of $Ag(CN)_2^-$, is 1.3×10^{21})

3. Describe how to determine the standard electrode potential of an Ag/AgCl electrode. (10%)

4. (1) Draw the titration curve for the titration of 20 mL of 0.10M diprotic acid H_2A with 0.10 M NaOH. The two acid dissociation constants for H_2A are 1.0×10^{-3} and 1.0×10^{-7}. (5%)
   (2) Calculate the pH at the first equivalence point. (5%)