淡江大學九十二學年度轉學生招生考試試題

系別：化學系三年級　　科目：普 通 化 學

准帶項目請打「○」否則打「x」	
X	簡單型計算機

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本試題雙面印製

**********請按題序作答並標示清楚答案之題號**********

第一部份：選擇題 （單選，每題 3 分，共 15 分）

1. Which choice contains all three molecular units found in nucleotides?
   A. phosphate, sugar, nitrogen-containing base　　B. phosphate, amino acid, sugar
   C. carboxylic acid, amine, sugar　　D. protein, amine, carboxylic acid
   E. amino acid, nitrogen-containing base, sugar

2. The maximum number of electrons in an atom with the following set of quantum number is:
   $n = 4 \quad l = +3 \quad m_l = -2 \quad m_s = +1/2$
   A. 0　　B. 1　　C. 6　　D. 14　　E. 32

3. The F-S-F bond angles in SF_6 are:
   A. 90° only　　B. 109.5° only　　C. 120° only　　D. 90° and 109.5°　　E. 90° and 180°

4. The triple point of iodine is at 0.12 atm and 115 °C. This means that liquid I_2
   A. is more dense than $I_{2(s)}$.
   B. cannot exist above 115°C.
   C. is liquid at room temperature.
   D. cannot have a vapor pressure less than 90 torr.
   E. cannot coexist with $I_{2(s)}$.

5. The reaction of Cl_2 with CH_4 to produce methylchloride is an example of a/an
   A. addition reaction
   B. ester hydrolysis
   C. reaction involving radicals
   D. reduction reaction
   E. condensation reaction

第二部份：填充題 （每個空格 4 分，共 40 分）

1. In the coordination compound $[Co(en)_2Cl_2]Cl$, where en=ethylenediamine, the ***sum*** of coordination number (C.N.) and oxidation number (O.N.) of the metal atom is (a).

2. The number of atoms in a face-centered cubic unit cell is (b).

3. Arrange the following molecules in order of increasing acid strength: HI, H_2Te, H_3Sb. (c)

4. The K_{sp} of CaF_2 is 4×10^{-11}. What is the maximum concentration of Ca^{2+} in a solution of 0.010 M NaF? (d)

5. The ground state electron configuration of a chromium atom is (e).

注意背面尚有試題

淡江大學九十二學年度轉學生招生考試試題 27-2

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6. The chemical formula for triammineaquodichlorochromium(III)chloride is (f).

7. (g) coulombs of charge are required to cause reduction of 0.5 mole of Cu^{2+} to Cu.

8. For H_3O^+, the hybridization of the central atom and the molecular geometry are (h) and (i), respectively.

9. Order the following substances from the highest entropy to the lowest entropy.
   He (1 atm , 25 ℃) , N_2O (0 K) , H_2O (1atm , 0 ℃)
   (j)

第三部份：計算問答題（共 45 分）

1. Explain why an acid/base indicator with $K_a = 1 \times 10^{-5}$ typically shows a complete color change when the pH of the solution changes from 4 to 6. (10%)

2. Use Nernst equation to derive the relationship between ε°, standard cell potential, and K, the equilibrium constant of the cell reaction. Define all the terms in your derivation. (10%)

3. Describe how to use entropy and free energy to predict the spontaneities of reactions and their applicable conditions. (10%)

4. Describe or define the following terms:
   (a) Arrhenius equation (5%)
   (b) Colligative properties (5%)
   (c) The second law of thermodynamics (5%)