淡江大學九十學年度日間部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」	
計 算 機	字 典
○	✓

本試題共 2 頁

本試題雙面印製

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第一部份：選擇題 （單選，每題 4 分，共 20 分）

1. The electron configuration of a copper atom is:
   A. $[Ar]4s^2 4d^4$　　　B. $[Ar]4s^2 4p^6 3d^3$　　　C. $[Ar]4s^2 3d^7$　　　D. $[Ar]4s^1 3d^{10}$
   E. $[Ar]3d^9$

2. Which element will display an unusually large jump in ionization energy values between I_3 and I_4, the 3rd and 4th ionization energies?
   A. Na　　　B. Mg　　　C. Al　　　D. Si　　　E. P

3. The F-Cl-F bond angles in ClF_3 are:
   A. $90°$ only　　　B. $109.5°$ only　　　C. $120°$ only　　　D. $90°$ and $109.5°$
   E. $90°$ and $180°$

4. An increase in the temperature of the reactants causes an increase in the rate of reaction. The best explanation is: As the temperature increase:
   A. the concentration of reactants increases.
   B. the fraction of collisions with total kinetic energy > Ea increases.
   C. the activation energy decreases.
   D. the collision frequency increases.
   E. the activation energy increases.

5. When comparing acid strength of binary acids HX, as X varies within a particular group of the periodic table, which one of the following factors dominates in affecting the acid strength?
   A. bond strength
   B. electron withdrawing effects
   C. percent ionic character of H-X bond
   D. solubility
   E. Le Chatelier's principle

第二部份：填充題 （每題 3 分，共 30 分）

1. In the coordination compound $[Cr(NH_3)_2(en)Cl_2]Br_2$, where en=ethylenediamine. The *sum* of coordination number (C.N.) and oxidation number (O.N.) of the metal atom is _____.

2. When an aqueous solution of $AgNO_3$ is electrolyzed, a gas is observed to form at the anode. The gas is _____.

3. Many different ways have been proposed to make batteries. One cell is setup with copper and lead electrodes in contact with $CuSO_4(aq)$ and $Pb(NO_3)_2(aq)$, respectively. If the Pb^{2+} and Cu^{2+} are each 1 M, the cell potential will be _____ V.

$$Pb^{2+} + 2e^- \rightarrow Pb \qquad Eo = -0.22 \text{ V}$$
$$Cu^{2+} + 2e^- \rightarrow Cu \qquad Eo = +0.34 \text{ V}$$

◀ 注意背面尚有試題 ▶

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4. Refer to the above question. If sulfuric acid is added to the $Pb(NO_3)_2$ solution, forming a precipitate of $PbSO_4$. The cell potential will _____. (decrease, increase or not change)

5. The molecules of different samples of an ideal gas have the same average kinetic energies at the same _____.

6. The hybridization of the central atom in ClO_3^- is _____.

7. For the chemical reaction $A + B \rightarrow C$, a plot of $[A]$ versus time is found to give a straight line with a negative slope. This is a _____-order reaction.

8. Consider ice in equilibrium with liquid water at 273 K. The relationship between G(s), the free energy per mole of ice and G(l), the free energy per mole of the liquid, is: G(s)_____G(l). (fill in ">", "=" or "<")

9. The oxidizing agent in the following reaction is _____.
$$5H_2O_2 + 2MnO_4^- + 6H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5O_2$$

10. For a conjugate acid-base pair, the relationship between its K_a and K_b can be described by an equation:_____.

第三部份：計算問答題（共 50 分）

1. Pure carbon was burned in an excess of oxygen. The gaseous products were CO_2 (72.0 mol%), CO (16.0 mol%), and O_2 (12.0 mol%). How many moles of O_2 were present in the initial reaction mixture for every mole of carbon? (10%)

2. Calculate the solubility of solid silver chromate (Ag_2CrO_4, K_{sp} = 9.0 x 10^{-12}) in a 0.100 M solution of $AgNO_3$. (10%)

3. A certain first-order reaction has a half-life of 20.0 min.
   a. Calculate the rate constant for this reaction. (10%)
   b. How much time is required for this reaction to be 75% complete? (5%)

4. a. Using the relationship : $\ln(K) = -\Delta H^o/(RT) + \Delta S^o/R$
   show that for a system at equilibrium the equilibrium will shift to the right for an endothermic process when the temperature is increased. (5%)
   b. Use the above equation to estimate the value of ΔG^o for the autoionization of water at its critical temperature, 374 °C. (K_w = 1.00 x 10^{-14} at 25 °C; ΔS^o for the reaction is –75.6 $JK^{-1}mol^{-1}$; R = 8.3145 $JK^{-1}mol^{-1}$) (10%)