淡江大學 106 學年度日間部寒假轉學生招生考試試題 4-1

系別：水環系環境工程組二年級　　科目：化　學

考試日期：1 月 6 日(星期六) 第 1 節　　本試題共　二　大題，　2　頁

第一部分，選擇題(單選，每題 3 分，共 30 分)

1. This element may form a compound with the formula $CaXO_4$.

   (A) Se (B) Cl (C) P (D) Na

2. Which of the following elements may occur in the greatest number of different oxidation states?

   (A) C (B) F (C) O (D) Ca

3. The following ionization energies are reported for element *X* . (All the values are in kJ/mol.)

First	Second	Third	Fourth	Fifth
500	4,560	6,910	9,540	13,400

   Based on the above information, the most likely identity of *X* is:

   (A) Mg (B) Cl (C) Al (D) Na

4. What should you do if you spill sulfuric acid on the countertop?

   (A) Neutralize the acid with vinegar.
   (B) Sprinkle solid NaOH on the spill.
   (C) Neutralize the acid with $NaHCO_3$ solution.
   (D) Neutralize the acid with an Epsom salt ($MgSO_4$) solution.

5. Which of the following aqueous solutions is blue?

   (A) $CuSO_4$ (B) $Cr_2(SO_4)_3$ (C) $NiSO_4$ (D) $ZnSO_4$

6. Potassium metal will react with water to release a gas and form a potassium compound. Which of the following is true?

   (A) The final solution is basic.
   (B) The gas is oxygen.
   (C) The potassium compound precipitates.
   (D) The potassium compound will react with strong bases.

7. The addition of excess concentrated NaOH(aq) to a 1.0 *M* $(NH_4)_2\ SO_4$ solution will result in which of the following observations?

   (A) The solution becomes neutral.
   (B) The formation of a brown precipitate takes place.
   (C) Nothing happens because the two solutions are immiscible.
   (D) The odor of ammonia will be detected.

8. $14\ H^+\ (aq) + 6\ Fe^{2+}\ (aq) + Cr_2O_7{}^{2-}\ (aq) \rightarrow 2\ Cr^{3+}\ (aq) + 6\ Fe^{3+}\ (aq) + 7\ H_2O(l)$

   This reaction is used in the titration of an iron solution. What is the concentration of the iron solution if it takes 45.20 mL of 0.1000 *M* $Cr_2O_7{}^{2-}$ solution to titrate 50.00 mL of an acidified iron solution?

   (A) 0.5424 *M* (B) 0.1000 *M* (C) 1.085 *M* (D) 0.4520 *M*

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9. A solution containing 0.20 mol of KBr and 0.20 mol of $MgBr_2$ in 2.0 liters of water is provided. How many moles of $Pb(NO_3)_2$ must be added to precipitate all the bromide as insoluble $PbBr_2$?

   (A) 0.10 mol　(B) 0.50 mol　(C) 0.60 mol　(D) 0.30 mol

10. Choose the gas that probably shows the greatest deviation from ideal gas behavior.

    (A) He　(B) O_2　(C) SF_4　(D) SiH_4

第二部分，問答題(每題 10 分，共 70 分)

1. Explanation: The electron affinity of F is higher than the electron affinity of O.

2. A lead (II) nitrate, $Pb(NO_3)_2$, solution is mixed with an ammonium sulfate, $(NH_4)_2SO_4$, solution and a precipitate forms. What is the precipitate, and which ions, if any, are spectator ions in this reaction?

3. The analysis of a sample of a monoprotic acid found that the sample contained 40.0% C and 6.71% H. The remainder of the sample was oxygen. Determine the empirical formula of the acid.

4. A sample containing 2/3 mol of potassium chlorate, $KClO_3$, is heated until it decomposes to potassium chloride, KCl, and oxygen gas, O_2 . The oxygen is collected in an inverted bottle through the displacement of water. The temperature and pressure of the sample are adjusted to STP. The volume of the sample is slightly greater than 22.4 liters. Explain.

5. $Xe(g) + 3F_2(g) \rightleftharpoons XeF_6(g)$
   Under standard conditions, the enthalpy change for the reaction going from left to right (forward reaction) is $\Delta H^\circ = -294$ kJ.
   Is the value of ΔS°, for the above reaction, positive or negative? Justify your conclusion.

6. Which of the following tetrafluoride compounds is nonpolar? Use Lewis electron-dot structures to explain your conclusions.
   SiF_4　　SF_4　　XeF_4

7. The element with atomic number 84 undergoes alpha decay followed by beta decay. What is the atomic number of the daughter nuclide following these two decays?