1. (10%) Name the following compounds with **English** and **Chinese.**

(1) CaF_2, (2)$TiCl_3$, (3) $Mg(HCO_3)_2$, (4) $K_2Cr_2O_7$, (5) $(NH_4)_3PO_4$

2. (10%) Consider the (1) sulfate ion, SO_4^{2-}, and (2) sulfur dioxide, SO_2. Draw and name its shape, and estimate the bond angles.

3. (10%) Consider the unbalanced reaction: $C_6H_6 + H_2 \rightarrow C_6H_{12}$

(a) Balance the reaction by inspection.

(b) Write this reaction in English, using the word mole(s) wherever appropriate.

(c) To produce 1 mole of C_6H_{12} from this reaction, how many grams of C_6H_6 and H_2 must you combine?

(d) What is the theoretical yield of C_6H_{12} for this reaction?

(e) Suppose only 24.0 g of C_6H_{12} was recovered. What would be the percent yield of this reaction?

4. (10%) A 2.136 g sample of a solid burns in oxygen to produce 5.933 g of CO_2 and 1.227 g of H_2O.

(a) What are the mass percents of the elements present in this sample?

(b) What is the empirical formula for this compound?

(c) The molar mass of this compound is determined to be about 94 g/mole. What is the molecular formula for this compound?

5. (10%) Would you expect (1) CCl_4 or CBr_4, (2) CH_3Cl or CH_4 to have a higher boiling point? Explain your answer and give their reasons.

6. (10%) Consider the reaction: $CH_4\,(g) + 2\,H_2S\,(g) \rightleftharpoons CS_2\,(g) + 4\,H_2\,(g)$

The equilibrium concentrations of the reactions and products are: $CS_2 = 6.10 \times 10^{-3}$ M; $H_2 = 1.17 \times 10^{-3}$ M; $CH_4 = 2.35 \times 10^{-3}$ M; $H_2S = 2.93 \times 10^{-3}$ M. Please calculate the value of equilibrium constant (K_{eq}) for this reaction.

7. (10%) Describe the alternative definitions of acids and bases on the basis of Arrhenius, Bronsted-Lowry and Lewis concepts, respectively.

（背面仍有題目,請繼續作答）

8. (10%) Which amines shown as follows are (a) primary, (b) secondary, (c) tertiary amines? Please also give an IUPAC name for these amines, respectively.

(1) $(CH_3)_2CHNHCH_3$, (2) $(CH_3CH_2CH_2)_2NCH_3$,

(3) $(C_2H_5)_2CHNH_2$, (4) $(C_3H_7)_2NH$, (5) $(C_4H_9)_3N$

9. (10%) Draw a dot diagram for the molecule; (1) O_3, ozone, and (2) CO, carbon monoxide.

10. (5%) A tank of acetylene gas (C_2H_2) contains 48.5 lb if the gas and is at a pressure of 600.2 lb/in.^{2} (760 mmHg = 14.696 lb/in.^{2}, 453.6 g = 1 lb). Express the pressure of the gas in atmospheres and the amount of gas in moles.

11. (5%) How many milliliters of a 0.250 M solution of glucose ($C_6H_{12}O_6$) are required to obtain 100.0 g of glucose?