

Chemistry 121  
Fall 2004  
Test 2, FORM A

Name: KEY

Instructions: You have 50 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

**I. MULTIPLE CHOICE:** (25 pts, 5 points each) Carefully and clearly circle the best answer. If you circle two answers, *one of which is correct*, you will receive 3 points.

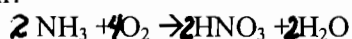
1. What precipitate will form when solutions of  $\text{AgNO}_3$  and  $\text{NaCl}$  are mixed?

- a.  $\text{NaNO}_3$
- b.  $\text{AgNO}_3$
- c.  $\text{NaCl}$
- D**  d.  $\text{AgCl}$
- e. No precipitate will form.

2. Which of the following is not a strong acid?

- a.  $\text{HCl}$
- B**  b.  $\text{HF}$
- c.  $\text{HNO}_3$
- d.  $\text{H}_2\text{SO}_4$
- e. None of the above

3. Nitric acid is produced by the reaction of oxygen with ammonia. The unbalanced net reaction is below. If the coefficient of ammonia is 2 in the balanced chemical equation, what is the coefficient in front of oxygen?



- a. 2
- b. 3
- C**  c. 4
- d. 5
- e. None of the above

4. What are the spectator ions in the reaction of lithium carbonate with iron (II) chloride?

- a.  $\text{Li}^+$ ,  $\text{CO}_3^{2-}$
- B**  b.  $\text{Li}^+$ ,  $\text{Cl}^-$
- c.  $\text{Fe}^{2+}$ ,  $\text{Cl}^-$
- d.  $\text{Fe}^{2+}$ ,  $\text{CO}_3^{2-}$
- e. None of the above

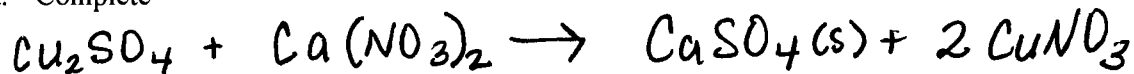
5. Which of the following molecules or ions is a polyprotic acid?

- a.  $\text{HCl}$
- b.  $\text{SO}_4^{2-}$
- C**  c.  $\text{H}_2\text{PO}_4^-$
- d.  $\text{HSO}_4^-$
- e. None of the above.

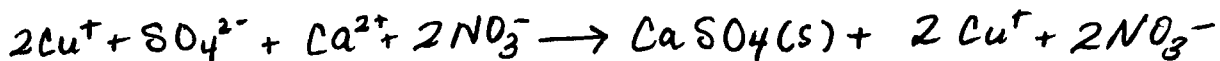
II. Short Answer and Calculations (85 pts): Clearly indicate your answer in the space provided. Partial credit will be given for correct work. If I cannot read the work, it will not be graded.

1. (15 pts) Write the balanced complete, total ionic and net ionic equations for the reaction of copper (I) sulfate with calcium nitrate.

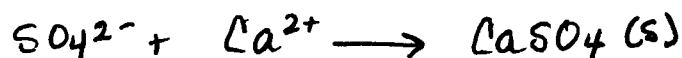
a. Complete



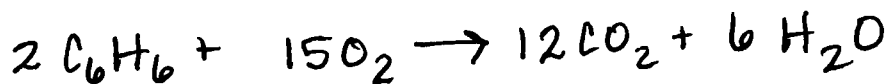
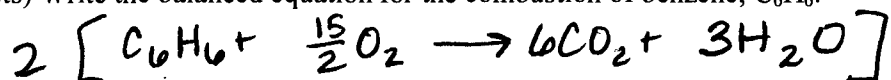
b. Total Ionic



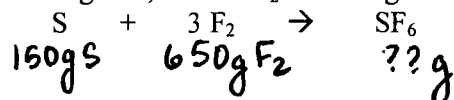
c. Net Ionic



2. (10 pts) Write the balanced equation for the combustion of benzene,  $\text{C}_6\text{H}_6$ .



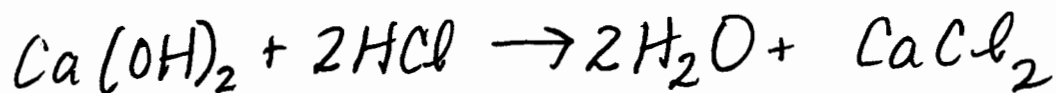
3. (20 pts) Sulfur hexafluoride, a very good electrical insulator, is prepared by the reaction of sulfur with elemental fluorine. What mass of  $\text{SF}_6$  can be produced from the reaction of 150. g of S with 650. g of  $\text{F}_2$ ? (MM of S = 32.06 g/mol, MM of  $\text{F}_2$  = 38.00 g/mol, MM of  $\text{SF}_6$  = 146.06 g/mol)



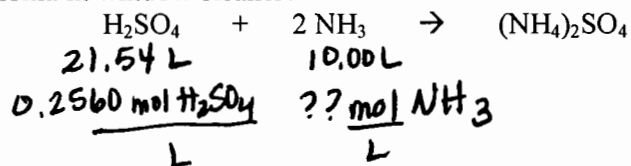
$$150\text{g S} \times \frac{1\text{ mol S}}{32.06\text{g S}} \times \frac{1\text{ mol SF}_6}{1\text{ mol S}} \times \frac{146.06\text{g SF}_6}{1\text{ mol SF}_6} = \boxed{683\text{g SF}_6}$$

$$650\text{g F}_2 \times \frac{1\text{ mol F}_2}{38.00\text{g F}_2} \times \frac{1\text{ mol SF}_6}{3\text{ mol F}_2} \times \frac{146.06\text{g SF}_6}{1\text{ mol SF}_6} = 832\text{g SF}_6$$

4. (10 pts) Write the complete balanced equation of calcium hydroxide with hydrochloric acid.



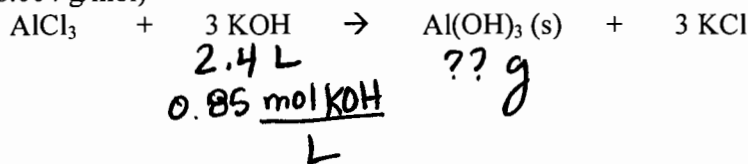
5. (15 pts) Most window cleaners are aqueous solutions of ammonia. A 10.00 L sample of a particular window cleaner requires 21.54 L of 0.2560 M  $\text{H}_2\text{SO}_4$  for its titration. What is the molarity of ammonia in window cleaner?



$$21.54\text{ L} \times \frac{0.2560\text{ mol H}_2\text{SO}_4}{\text{L}} \times \frac{2\text{ mol NH}_3}{1\text{ mol H}_2\text{SO}_4} = 11.03\text{ mol NH}_3$$

$$C_{\text{NH}_3} = \frac{11.03\text{ mol NH}_3}{10.00\text{ L}} = \boxed{1.103\text{ M NH}_3}$$

6. (15 pts) During the purification water, hydroxide ion is commonly added to precipitate out aluminum ion. What mass of  $\text{Al(OH)}_3$  can be precipitated with 2.4 L of 0.85 M KOH? (MM of  $\text{Al(OH)}_3 = 78.004\text{ g/mol}$ )



$$2.4\text{ L} \times \frac{0.85\text{ mol KOH}}{\text{L}} \times \frac{1\text{ mol Al(OH)}_3}{3\text{ mol KOH}} \times \frac{78.004\text{ g Al(OH)}_3}{1\text{ mol Al(OH)}_3}$$

$$= \boxed{53.\text{ g Al(OH)}_3}$$