Complete the following problems. Write your final answers in the blanks provided. You must show your work to receive full credit. Show numerical answers to the correct number of significant figures with the correct units.

1. Your lab mate has prepared a dilute solution by pipetting 5.00 mL of a stock iron solution into a 100.0 mL volumetric flask and diluting it to the mark with water to prepare solution A. She then pipets 3.00 mL of solution A in to a 50.0 mL volumetric flask and dilutes to the mark to prepare solution B. You measure the concentration of iron in solution B to be 0.000264 M. What was the iron concentration in the original stock solution? (8 pts)

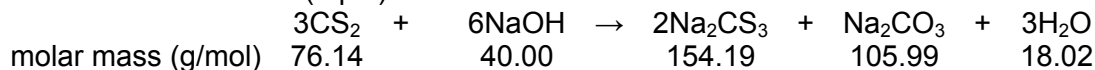Two dilutions to account for:

Last dilution: $M_A V_A = M_B V_B$

$$M_B = \frac{M_A V_A}{V_B} = \frac{0.00264 \text{ M} \times 50.00 \text{ mL}}{3.00 \text{ mL}} = 0.00440 M$$

Last dilution: $M_{Stock} V_{Stock} = M_A V_A$

$$M_{Stock} = \frac{M_A V_A}{V_{Stock}} = \frac{0.00440 M \times 100.00 \text{ mL}}{5.00 \text{ mL}} = \mathbf{0.0880 \ M}$$

Answer_____**0.0880 M**_____

2. A side reaction in the manufacture of rayon from wood pulp is shown below. How many grams of Na_2CS_3 are produced from the reaction of 92.5 mL of liquid CS_2 (density = 12.6 g/mL) with 40.0 mL of 4.16 M NaOH? (8 pts)

	$3CS_2$	+	$6NaOH$	→	$2Na_2CS_3$	+	Na_2CO_3	+	$3H_2O$
molar mass (g/mol)	76.14		40.00		154.19		105.99		18.02

This is a limiting reactant problem!

$$92.5 \text{ mL} \times \frac{12.6 \text{ g CS}_2}{\text{mL}} \times \frac{1 \text{ mol CS}_2}{76.14 \text{ g CS}_2} \times \frac{2 \text{ mol Na}_2CS_3}{3 \text{ mol CS}_2} \times \frac{154.19 \text{ g Na}_2CS_3}{1 \text{ mol Na}_2CS_3} = 1574 \text{ g Na}_2CS_3$$

$$0.0400 \text{ L} \times \frac{4.16 \text{ mol NaOH}}{\text{L}} \times \frac{2 \text{ mol Na}_2CS_3}{6 \text{ mol NaOH}} \times \frac{154.19 \text{ g Na}_2CS_3}{1 \text{ mol Na}_2CS_3} = 8.55 \text{ g Na}_2CS_3$$

Therefore, NaOH is the limiting reactant and the maximum amount of Na_sCS_3 possible is 8.55 g.

Answer_____8.55 g Na_2CS_3_____

3. Write balanced overall reactions and net ionic equations for each of the following: Indicate the state (*s, ℓ, g, aq*) of each of the reactants and products. (9 pts)

a. **KI(aq) + Pb(NO₃)₂(aq) →**

Balanced Reaction:

$$2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbCl_2(s) + 2KNO_3(aq)$$

Net Ionic Equation:

$$Pb^{2+} + 2I^- \rightarrow PbI_2(s)$$

b. **H₂SO₄(*aq*) + Ba(OH)₂(*aq*) →**
Balanced Reaction:

$$H_2SO_4(aq) + Ba(OH)_2(aq) \rightarrow BaSO_4(s) + 2H_2O(\ell)$$

Net Ionic Equation:

$$2H^+ + 2OH^- + SO_4^{2-} + Ba^{2+} \rightarrow BaSO_4(s) + 2H_2O(\ell)$$

c. **aqueous sodium carbonate and aqueous calcium nitrate.**
Balanced Reaction:

$$Na_2CO_3(aq) + Ca(NO_3)_2(aq) \rightarrow 2NaNO_3(aq) + CaCO_3(s)$$

Net Ionic Equation:

$$Ca^{2+} + CO_3^{2-} \rightarrow CaCO_3(s)$$

Copyright © 2007 Pearson Prentice Hall, Inc.