

Chemistry 255
Spring 2011
Problem Set #2
Answer Key

1. A = 1.25 atm = 1.267bar
B = 11.7 mol/L
C = 0.862 mol/mL = 862 mol/L
D = 3.21 mol/L

$$K_{eq} = \frac{[C]^2[D]}{[A]^2[B]^3} = \frac{(862)^2(3.21)}{(1.25)^2(11.7)^3} = 9.53 \times 10^2 \quad \text{if used atm}$$

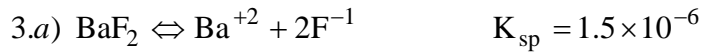
or

$$K_{eq} = \frac{[C]^2[D]}{[A]^2[B]^3} = \frac{(862)^2(3.21)}{(1.267)^2(11.7)^3} = 9.28 \times 10^2 \quad \text{if used bar}$$

2. $K_f = 7.73 \times 10^2$ (formation) $\frac{[SO]}{[S][O]} = \frac{1}{[S][O]} = 7.73 \times 10^2$

$$[S][O] = \frac{1}{7.73 \times 10^2} = 1.2937 \times 10^{-3} \quad (K_{sp} - \text{the solubility of the complex})$$

If [S] is 0.930 M, $[O] = \frac{1.2937 \times 10^{-3}}{0.930} = 1.39 \times 10^{-3} \text{ M} = \text{concentration of O req'd to start ppt SO}$



$$[\text{Ba}^{+2}][\text{F}^{-}]^2 = 1.5 \times 10^{-6}$$

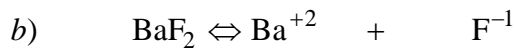
$$(x)(2x)^2 = 1.5 \times 10^{-6}$$

$$4x^3 = 1.5 \times 10^{-6}$$

$$x^3 = 3.75 \times 10^{-7}$$

$$x = 7.211 \times 10^{-3} = 7.2 \times 10^{-3} = [\text{Ba}^{+2}]$$

$$2x = 1.442 \times 10^{-2} = 1.4 \times 10^{-2} = [\text{F}^{-}]$$



Initial solid x 0

Final solid $(\frac{6.8 \times 10^{-4}}{2}) + x$ 6.8×10^{-4}

Plug : $[\text{Ba}^{+2}][\text{F}^{-}]^2 = 1.5 \times 10^{-6}$

$$[(\frac{6.8 \times 10^{-4}}{2}) + x][6.8 \times 10^{-4}]^2 = 1.5 \times 10^{-6}$$

$$(x + 3.4 \times 10^{-4})(4.624 \times 10^{-7}) = 1.5 \times 10^{-6}$$

$$x = 3.244M$$

$$[\text{BaCl}_2] = 3.2M$$

4. a. $1.06 \times 10^{-3} M$

b. $2.66 \times 10^{-3} M$

5. a. $2.6 \times 10^{-8} M$

b. $3.0 \times 10^{-8} M$

c. $4.1 \times 10^{-8} M$

$$\text{6. a. } \frac{1}{2}[(0.0087)(1)^2(0.0087)(-1)^2] = 0.0087M$$

$$\text{b. } \frac{1}{2}[(0.0002)(3)^2(0.0006)(-1)^2] = 0.001_2M$$