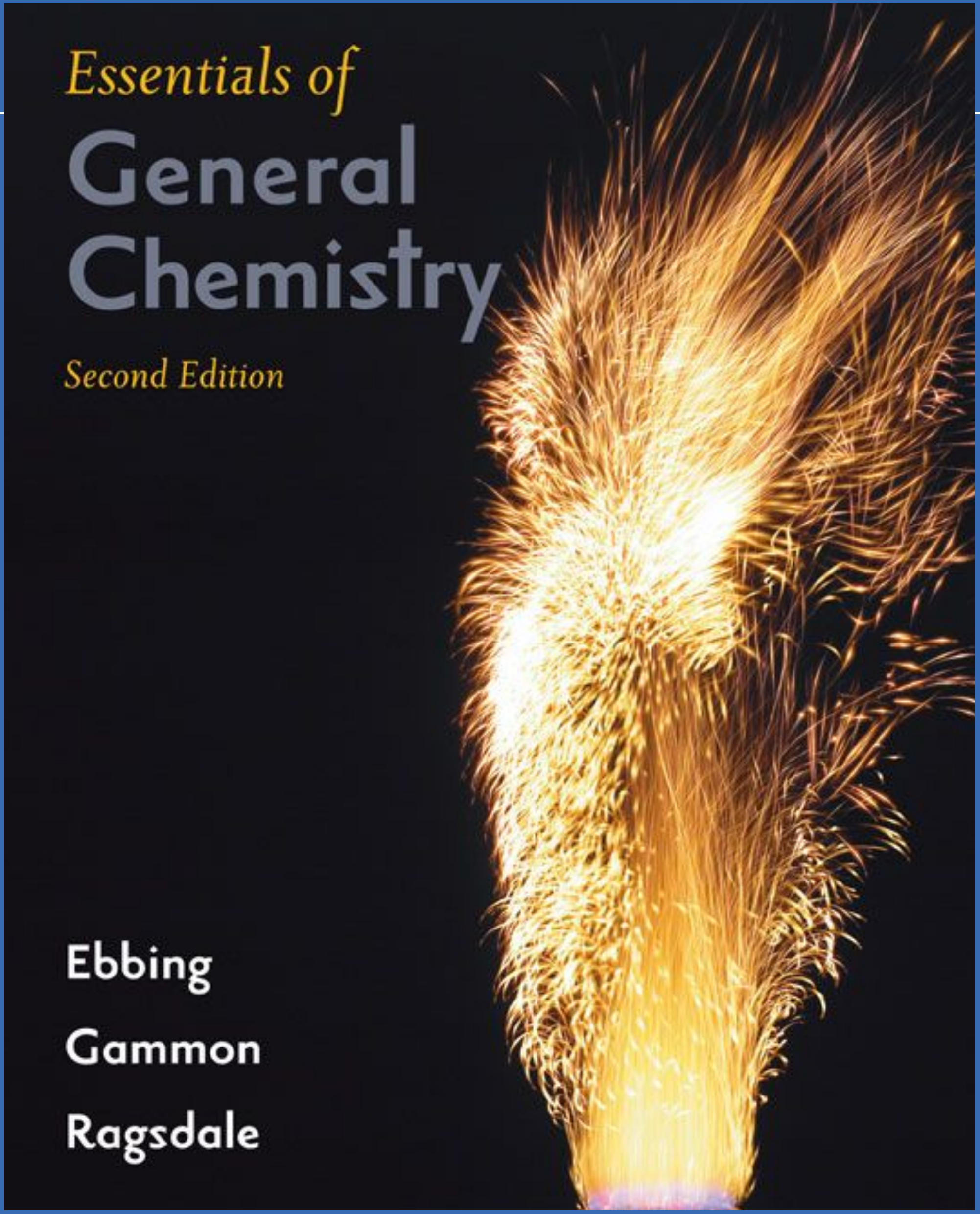

Chapter 17

CRS Questions

Solubility and Complex-Ion Equilibria

Question

		K_{sp}
1)	$BaSO_4$	1.1×10^{-10}
2)	$BaCrO_4$	1.2×10^{-10}
3)	$AgCl$	1.8×10^{-10}
4)	MnS	2.5×10^{-10}
5)	$SrCO_3$	9.3×10^{-10}

Which salt has the highest molar solubility?

Answer

5) $SrCO_3$

Section 17.1 The Solubility Product Constant (pp. 528–531)

Since the ratio of cation-to-anion is 1:1 for all the salts, the molar solubilities will be ranked in the same order as the solubility product constants. Of the choices given, $SrCO_3$ has the highest molar solubility.

Question

The molar solubility for barium fluoride, BaF_2, is 6.3×10^{-3} M at 25°C. Calculate the solubility product constant for barium fluoride.

1) 4.0×10^{-8}
2) 2.5×10^{-7}
3) 1.0×10^{-6}
4) 2.5×10^{-5}
5) 4.0×10^{-4}

Answer

3) 1.0×10^{-6}

Section 17.1 The Solubility Product Constant (pp. 528–531)

$$K_{sp} = [Ba^{2+}][F^{-}]^2 = (x)(2x)^2 = 4x^3 = 4(6.3\times10^{-3})^3$$
$$= 1.0\times10^{-6}.$$

Question

The best way to ensure complete precipitation of SnS from a saturated H_2S solution is to

1) add more H_2S.
2) add a strong acid.
3) add a weak acid.
4) add a strong base.
5) add a weak base.

Answer

4) add a strong base.

Section 17.2 Solubility and the Common Product Effect (pp. 531–533)

Strong base will react with H_2S to increase the concentration of S^{2-}. This will shift the equilibrium $SnS \rightleftarrows Sn^{2+} + S^{2-}$ towards the left.

Question

K_{sp} for $Fe(IO_3)_3$ is 10^{-14}. Mix two solutions, one containing Fe^{3+} and the other IO_3^-. If, at the instant of mixing, Fe^{3+} is 10^{-4} M and IO_3^- is 10^{-5} M, which one of the following statements is true?

1) A precipitate forms because $Q_{sp} > K_{sp}$.
2) A precipitate forms because $Q_{sp} < K_{sp}$.
3) No precipitate forms because $Q_{sp} > K_{sp}$.
4) No precipitate forms because $Q_{sp} < K_{sp}$.
5) None of these statements is true.

Answer

4) No precipitate forms because $Q_{sp} < K_{sp}$.

Section 17.3 Precipitation Calculations (pp. 533–535)

$$Q_{sp} = [Fe^{3+}][IO_3^-]^3 = (10^{-4})(10^{-5})^3 = 10^{-19} < K_{sp}$$

Question

A solution is 0.010 M in each of $Pb(NO_3)_2$, $Mn(NO_3)_2$, and $Zn(NO_3)_2$. Solid NaOH is added until the $[OH^-]$ of the solution is 3.0×10^{-6} M. $K_{sp} = 2.8 \times 10^{-16}$ for $Pb(OH)_2$, 4.5×10^{-14} for $Mn(OH)_2$, and 4.5×10^{-17} for $Zn(OH)_2$. Which of the following statements is true?

1) No precipitate will form.
2) Only $Zn(OH)_2$ will precipitate.
3) Only $Mn(OH)_2$ will precipitate.
4) Only $Zn(OH)_2$ and $Pb(OH)_2$ will precipitate.
5) All three hydroxides will precipitate.

Answer

5) All three hydroxides will precipitate.

Section 17.3 Precipitation Calculations
(pp. 533–535)

For all three solutions,

$$Q = [M^{2+}][OH^-]^2 = (0.010\ M)(3 \times 10^{-6}\ M)^2 = 9.0 \times 10^{-14}.$$

Since this value exceeds all three K_{sp}'s, all three of the metal ions precipitate.