HW07 - Solubility Equilibria

Question 1 — 2.0 pts

What is the net ionic equation for the reaction between aqueous solutions of Na_3PO_4 and $CuSO_4$?

a. No reaction occurs since no precipitate is formed.

b. $Cu^{2+} + PO_4^{3-} \longrightarrow CuPO_4$

c. $2Na^{+} + SO_4^{2-} \longrightarrow Na_3SO_4$

d. $3Cu^{2+} + 2PO_4^{3-} \longrightarrow Cu_3(PO_4)_2$

Question 2 — 2.0 pts

What ions are present in solution after aqueous solutions of $Cu(NO_3)_2$ and K_2S are mixed? Assume we mixed stoichiometric equivalent amounts of both reactants and 100% reaction.

a. No ions are present as both products form precipitates.

b. Cu^{2+}, S^{2-}

c. K^{+}, NO_3^{-}

d. Cu^{2+}, NO_3^{-}, K^{+}, S^{2-}

Question 3 — 2.0 pts

Molar solubility is...

a. the number of moles that dissolve to give one liter of saturated solution.

b. the total molarity of the solution.

c. equal to the K_{sp}.

d. the number of moles that dissolve to give one liter of super-saturated solution.

Question 4 — 2.0 pts

The K_{sp} equation for sodium bicarbonate ($NaHCO_3$) should be written as:

a. $K_{sp} = [Na^{+}][H^{+}][C^{4+}][O^{2-}]^3$

b. $K_{sp} = [Na^{+}][HCO_3^{-}]$

c. $K_{sp} = [Na^{+}][H^{+}][CO_3^{2-}]$

d. $K_{sp} = [NaH^{2+}][CO_3^{2-}]$

Question 5 — 2.0 pts

Pure water is saturated with $PbCl_2$. In this saturated solution, which of the following is true?

a. $K_{sp} = [Pb^{2+}]^2[Cl^{-}]$

b. $[Pb^{2+}] = 0.5[Cl^{-}]$

c. $K_{sp} = [Pb^{2+}][Cl^{-}]$

d. $[Pb^{2+}] = [Cl^{-}]$

Question 6 — 2.0 pts

A hypothetical ionic substance T_3U_2 ionizes to form T^{2+} and U^{3-} ions. The solubility of T_3U_2 is 4.04×10^{-20} mol/L. What is the value of the solubility-product constant?

a. 1.63×10^{-39}

b. 1.16×10^{-95}

c. 9.79×10^{-39}

d. 1.08×10^{-97}

Question 7 — 2.0 pts

The value of K_{sp} for $SrSO_4$ is 2.8×10^{-7}. What is the solubility of $SrSO_4$ in moles per liter?

a. 5.3×10^{-4}

b. 1.4×10^{-7}

c. 2.8×10^{-7}

d. 7.6×10^{-7}

Question 8 — 2.0 pts

Determine the molar solubility of some salt with the generic formula AB_2 if $K_{sp} = 2.56 \times 10^{2}$.

a. 10 M

b. 4 M

c. 0.1 M

d. 1 M

Question 9 — 2.0 pts

Rank the following salts from least to most molar solubility:

BiI	$K_{sp} = 7.7 \times 10^{-19}$
$Cd_3(AsO_4)_2$	$K_{sp} = 2.2 \times 10^{-33}$
$AlPO_4$	$K_{sp} = 9.8 \times 10^{-21}$
$CaSO_4$	$K_{sp} = 4.9 \times 10^{-5}$

a. $Cd_3(AsO_4)_2 < AlPO_4 < BiI < CaSO_4$

b. $CaSO_4 < BiI < AlPO_4 < Cd_3(AsO_4)_2$

c. $Cd_3(AsO_4)_2 < BiI < AlPO_4 < CaSO_4$

d. $AlPO_4 < BiI < Cd_3(AsO_4)_2 < CaSO_4$

Question 10 — 3.0 pts

A hypothetical compound MX_3 has a molar solubility of 0.00562 M. What is the value of K_{sp} for MX_3?

a. 3.16×10^{-5}

b. 2.69×10^{-8}

c. 2.99×10^{-9}

d. 9.48×10^{-5}

Question 11 — 2.0 pts

Determine if a precipitate will form when 0.96g Na_2CO_3 is combined with 0.2g $BaBr_2$ in a 10L solution. (For $BaCO_3$, $K_{sp} = 2.8 \times 10^{-9}$).

a. $BaBr_2$ will remain in solid form as it is insoluble in water.

b. $BaCO_3$ does not precipitate

c. It is impossible to know if any $BaCO_3$ will precipitate with the information given.

d. $BaCO_3$ precipitates

Question 12 — 2.0 pts

$CaSO_4$ has a $K_{sp} = 3 \times 10^{-5}$. In which of the following would $CaSO_4$ be the most soluble?

a. 0.5 M K_2SO_4(aq)

b. 1.0 M $CaCl_2$(aq)

c. pure water

d. $CaSO_4$ would have the same solubility in all three of these solutions

Question 13 — 2.0 pts

A solution of AgI contains 1.9 M Ag^{+}. K_{sp} of AgI is 8.3×10^{-17}. What is the maximum I^{-} concentration that can exist in this solution?

a. 1.9 M

b. 8.3×10^{-17} M

c. 1.6×10^{-16} M

d. 4.4×10^{-17} M

Question 14 — 3.0 pts

What would be the molar solubility of Li_3PO_4 ($K_{sp} = 2.37 \times 10^{-4}$) in a 1M LiCl solution?

a. 5.44×10^{-2}

b. 1.24×10^{-1}

c. 2.37×10^{-4}

d. 1.54×10^{-2}