CHEM 122 Problem Set 6

1) Using the following table of K_{sp} values, which of the chemicals are the least soluble in water? Most soluble in water? Arrange the chemicals in the table in the order of most soluble in water to least soluble in water.

Compound	K_{sp}
$Al(OH)_3$	$1.1*10^{-15}$
$Fe(OH)_2$	$1.6*10^{-7}$
$Mg(OH)_2$	$1.2*10^{-11}$
AgOH	$1.5*10^{-8}$
$Zn(OH)_2$	$1.8*10^{-14}$
CdS	$3.6*10^{-29}$
CoS	$3*10^{-26}$
CuS	$8.5*10^{-45}$
PbS	$3.4*10^{-28}$
Ag_2S	$1.6*10^{-49}$
ZnS	$1.2*10^{-23}$
CuI	$5*10^{-12}$
HgI	$1.2*10^{-28}$
AgI	$1.5*10^{-16}$

2) What phenomena are occurring when the ion product A) is less than the K_{sp}? B) equals the K_{sp}? C) is greater than the K_{sp}?

3) Using H_2S, what is the pH necessary to precipitate Cu^{2+} but not Zn^{2+} as sulfides? The solution is 0.05 M in each cation.

4) Using H_2S, what is the pH necessary to precipitate Ag^{+} but not Zn^{2+} as sulfides? The solution is 0.05 M in each cation.

5) Using H_2S, what is the pH necessary to precipitate Cd^{+2} but not Pb^{2+} as sulfides? The solution is 0.2 M in each cation.

6) Using H_2S, what is the pH necessary to precipitate Ag^{+} but not Cu^{2+} as sulfides? The solution is 0.15 M in each cation.

7) Using H_2S, what is the pH necessary to precipitate Cd^{+2} but not Co^{2+} as sulfides? The solution is 0.2 M in each cation.

8) Using H_2S, what is the pH necessary to precipitate Cu^{+2} but not Co^{2+} as sulfides? The solution is 0.05 M in each cation.

9) Using H_2S, what is the pH necessary to precipitate Pb^{+2} but not Co^{2+} as sulfides? The solution is 0.025 M in each cation.

10) Using H_2S, what is the pH necessary to precipitate Cu^{+2} but not Hg^{2+} as sulfides? The solution is 0.05 M in each cation.

11) Determine the molar solubility of Ag_2S.

12) Determine the molar solubility of of $Fe(OH)_2$.

13) Determine the molar solubility of AgOH.

14) Determine the molar solubility of $Al(OH)_3$.

15) Determine the molar solubility of CuS.

Use this link for K_{sp} values for Questions 16-25.

16) If 250 mL of 0.05M $AgNO_3$ were mixed with 150 mL of 0.001M HCl, would AgCl precipitate?

17) If 250 mL of 0.05M $HgNO_3$ were mixed with 150 mL of 0.001M HI, would HgI precipitate?

18) If 250 mL 0.05M $CuNO_3$ were mixed with 150 mL of 0.001M HI, would CuI precipitate?

19) If 50 mL of 0.05M $AgNO_3$ were mixed with 250 mL of 0.001M HI, would AgI precipitate?

20) If 50 mL of 0.05M $CuNO_3$ were mixed with 50 mL of 0.001M HI, would CuI precipitate?

21) If a solution is 0.05M in Al^{3+} and Fe^{2+} ions, what percent of Al^{3+} remains unprecipitated before $Fe(OH)_2$ precipitates following the addition of KOH to the solution?

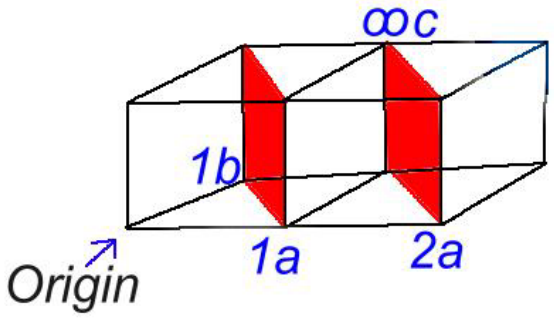
22) If a solution is 0.05M in Ag^{+} and Al^{3+} ions, what percent of Al^{3+} remains unprecipitated before AgOH precipitates following the addition of KOH to the solution?

23) If a solution is 0.05M in Ag^{+} and Fe^{2+} ions, what percent of Ag^{+} remains unprecipitated before $Fe(OH)_2$ precipitates following the addition of KOH to the solution?

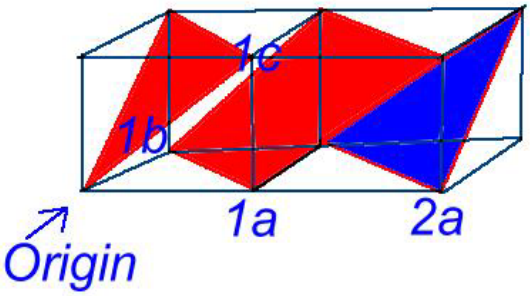
24) If a solution is 0.05M in Al^{3+} and Zn^{2+} ions, what percent of Al^{3+} remains unprecipitated before $Zn(OH)_2$ precipitates following the addition of KOH to the solution?

25) If a solution is 0.025M in Al^{3+} and Fe^{2+} ions, what percent of Al^{3+} remains unprecipitated before $Fe(OH)_2$ precipitates following the addition of KOH to the solution?

26) Using the following lattice, determine the Miller Indices for the planes.



27) Using the following lattice, determine the Miller Indices for the planes.



28) Solid Cu forms a face centered cubic lattice in its natural state. How many particles (atoms) of Cu are really in one primitive cube?

29) CsBr forms a body centered cubic lattice. How many particles are really in one primitive cube?

30) AgCl forms a simple cubic lattice. How many particles are really in one primitive cube?