Solubility #2

1. A solution contains SO_4^{2-} and Cl^-. Outline an experimental procedure to remove each ion individually from the solution, and identify the reagents used in the procedure.

① Add either $Ca(NO_3)_2$ or $Sr(NO_3)_2$ or $Ba(NO_3)_2$ allow it to settle ⟶ ppts SO_4^{2-}

② Add $CuNO_3$ to ppt Cl^-. Allow it to settle out

2. A solution is known to contain Cu^+, Be^{2+} and Sr^{2+} ions, each at a concentration of 0.20 M.

(a) What compound could be used to precipitate the Sr^{2+} while leaving the other two cations in solution?

Na_2SO_4

(b) Write the net ionic equation for the reaction.

$$Sr^{2+}(aq) + SO_4^{2-}(aq) \longleftrightarrow SrSO_4(s)$$

3. A solution contains Pb^{2+}, Mg^{2+}, and Sr^{2+}. Outline a procedure to isolate the precipitate $SrSO_4$ from this solution.

1) Use NaCl to ppt Pb^{2+} as $PbCl_2$

2) Use Na_2SO_4 to ppt $SrSO_4$

or

1) Use KOH to ppt both Pb^{2+} and Mg^{2+} as $Pb(OH)_2$ and $Mg(OH$

2) Use Na_2SO_4 to ppt $SrSO_4$

4. Write the formula of two materials (other than water) that could be added to a saturated solution of Ag_2CO_3 to increase the amount of Ag_2CO_3 that will dissolve.

$Ag_2CO_3 \longleftrightarrow 2Ag^+ + CO_3^{2-}$ or halide ion $Cl^- + Ag^+ \longleftrightarrow AgCl$

add something to remove Ag^+ or CO_3^{2-} eg Acid ⟶ $CO_3^{2-} + 2H^+ \longleftrightarrow$ $CO_2 + H_2$

5. A solution contains Ca^{2+}, Sr^{2+} and Pb^{2+} ions that must be separated.

(a) Identify an anion that could be used to remove **only** the lead ion by precipitation.

Cl^-, I^-, Br^-, S^{2-}

(b) Identify an anion that could be used to separate Ca^{2+} from Sr^{2+}.

OH^-

Key.

6. Use the table of solubilities to determine a scheme that allows the separation of Ba^{2+}, Cu^{2+}, and Br^- from each other.

(1) Add SO_4^{2-} to ppt Ba^{2+}

(2) Add S^{2-} to ppt Cu^{2+}

(3) Add Ag^+ to ppt Br^-

7. Use the table of solubilities to describe how you would separate Mg^{2+}, Ba^{2+} and Ag^+ from each other.

(1) Add NaCl $\longrightarrow$ $Ag^+ + Cl^- \longleftrightarrow AgCl$

(2) Add Na_2SO_4 $\longrightarrow$ $Ba^{2+} + SO_4^{2-} \longleftrightarrow BaSO_4$

(3) Add NaOH $\longrightarrow$ $Mg^{2+} + 2OH^- \longleftrightarrow Mg(OH)_2$

8. Use the table of solubilities to outline a scheme to separate a mixture of Li^+, Ag^+, Sr^{2+} and Fe^{3+} from each other.

(1) Add NaCl $\longrightarrow$ $Ag^+ + Cl^- \longleftrightarrow AgCl$

(2) Add Na_2S $\longrightarrow$ $2Fe^{3+} + 3S^{2-} \longleftrightarrow Fe_2S_3$

(3) Add Na_2SO_4 $\longrightarrow$ $Sr^{2+} + SO_4^{2-} \longleftrightarrow SrSO_4$

Li^+ is left.

9. A beaker contains OH^- ions and S^{2-} ions in solution both at a concentration of 0.10 M. You are asked to precipitate the OH^- ions while leaving the S^{2-} ions in solution.

(a) Which reagent could you use?

$Be(NO_3)_2$ ~ $Mg(NO_3)_2$ ~ $Ca(NO_3)_2$ ~ $Ba(NO_3)_2$

(b) Write the net ionic equation for the precipitation reaction.

$Be^{2+}_{(aq)} + 2OH^-_{(aq)} \longleftrightarrow Be(OH)_{2(s)}$