Name: **Answer Key**

Chemistry 30

Unit 4: Solutions

Assignment 5 – Net Ionic Equations and Precipitation Reactions

1. Use a Table of Solubilities to predict whether or not the following compounds are soluble in water.

Compound	Soluble (yes or no)
CaI_2	**yes**
$MgSO_4$	**yes**
$AlPO_4$	**no**
$Pb(NO_3)_2$	**yes**
Ag_2SO_4	**no**
$Ca(OH)_2$	**no**

2. Write formulas for the following compounds, and using a Table of Solubilities predict whether or not the compound is soluble in water.

	Formula	**Soluble (y/n)**
a) potassium phosphate	**K_3PO_4**	**yes**
b) calcium carbonate	**$CaCO_3$**	**no**
c) copper(II) bromide	**$CuBr_2$**	**yes**
d) aluminum sulfide	**Al_2S_3**	**no**

3. What are spectator ions?

Ions that are present during a reaction but undergo no chemical change

4. For each of the following reactions, predict the products of the reaction. Be sure to write **balanced equations**.

   Then determine if any of the products forms a precipitate.

   - If no precipitate forms, write **NR** (for "No Reaction").
   - If a precipitate forms, write the **net ionic equation** for the reaction.

   a. $Mg(NO_3)_{2\ (aq)} + 2\ NaOH_{\ (aq)} \rightarrow$ **$Mg(OH)_{2(s)} + 2\ NaNO_{3\ (aq)}$**

      $Mg^{2+}_{\ (aq)} + 2\ OH^-_{\ (aq)} \rightarrow Mg(OH)_{2\ (s)}$

   b. $CuSO_{4(aq)} + FeCl_{3\ (aq)} \rightarrow$ **$CuCl_{2\ (aq)} + Fe_2(SO_4)_{3\ (aq)}$** **No Reaction**

   c. $K_2CO_{3\ (aq)} + Sr(OH)_{2\ (aq)} \rightarrow$ **$SrCO_{3\ (s)} + 2\ KOH_{\ (aq)}$**

      $Sr^{2+}_{\ (aq)} + CO_3^{2-}{}_{\ (aq)} \rightarrow SrCO_{3\ (s)}$

5. An aqueous solution contains a mixture of Ba^{2+}, Pb^{2+} and Ca^{2+}. Select the ONE negative ion listed below which could be used to separate Ba^{2+} from the other two positive ions in the mixture.

   A. Cl^- **Cl^- precipitates only with Pb^{2+}**

   B. S^{2-} **S^{2-} precipitates only with Pb^{2+}**

   C. OH^- **OH^- forms a precipitate with Pb^{2+} and Ca^{2+} but not with Ba^{2+}**

   D. PO_4^{3-} **PO_4^{3-} precipitates with all three cations**

   E. SO_4^{2-} **SO_4^{2-} precipitates with all three cations**

6. An aqueous solution containing the following cations:

   Ca^{2+} Ag^{+} Cu^{2+} K^{+}

   In order to separate them, the following solutions are available:

   Na_2S Na_2CO_3 NaBr

   If we wish to separate the cations by causing only one cation to precipitate out of solution as a time:

   - in what order should the solutions Na_2S, Na_2CO_3, and NaBr be added?
   - identify the three precipitates that form after the addition of those solutions.
   - which one cation will remain in solution?

	Ca^{2+}	**Ag^{+}**	**Cu^{2+}**	**K^{+}**
S^{2-}		ppt	ppt	
CO_3^{2-}	ppt	ppt	ppt	
Br^{-}		ppt		

ppt = forms a precipitate

1st add NaBr to form the precipitate AgBr. Ag^{+} ions are now removed from the mixture

2nd add Na_2S to form the precipitate CuS. Cu^{2+} are now removed from the mixture

3rd add Na_2CO_3 to form the precipitate $CaCO_3$. Ca^{2+} ions are now removed

The K^{+} ions will now be the only cations present in the original solution.