

Precipitation

Chemical Reactions Lab

Ionic Solubility

- In general, ionic compounds are soluble in water
- Then again, some are not
- There is a set of general rules for solubility

General Rules for Solubility

<u>Ion</u>	<u>Solubility</u>	<u>Exceptions</u>
NO_3^-	soluble	none
ClO_4^-	soluble	none
Cl^-	soluble	except Ag^+ , Hg_2^{2+} , * Pb^{2+}
I^-	soluble	except Ag^+ , Hg_2^{2+} , Pb^{2+}
SO_4^{2-}	soluble	except Ca^{2+} , Ba^{2+} , Sr^{2+} , Hg^{2+} , Pb^{2+} , Ag^+
CO_3^{2-}	insoluble	except Group IA and NH_4^+
PO_4^{3-}	insoluble	except Group IA and NH_4^+
-OH	insoluble	except Group IA, * Ca^{2+} , Ba^{2+} , Sr^{2+}
S^{2-}	insoluble	except Group IA, IIA and NH_4^+
Na^+	soluble	none
NH_4^+	soluble	none
K^+	soluble	none

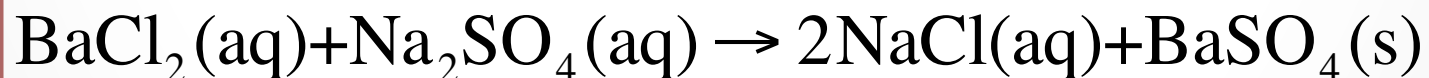
*slightly soluble

Precipitation Reaction

- When mixing two aqueous solutions, there is a possibility that a combination of ions will form an insoluble compound
- Use solubility table to determine if any combination will form an insoluble solid
- If both products are soluble, then there is “no reaction”

Molecular Equation

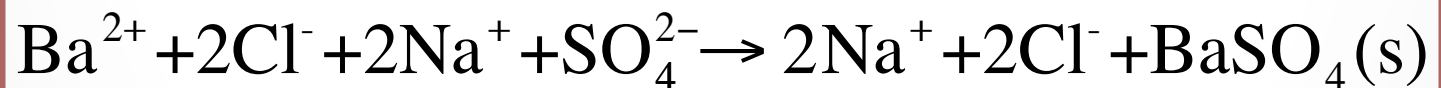
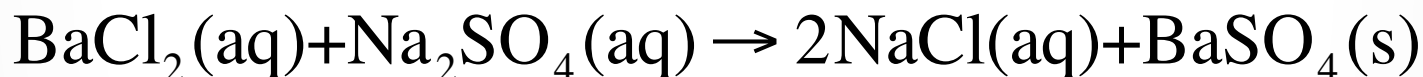
- Full chemical equation of both reactants and both products, with physical state listed
- To predict products, switch cations in reactants
- Ex. Write a molecular equation for the reaction between $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq})$



- BaSO_4 is a solid according to solubility rules

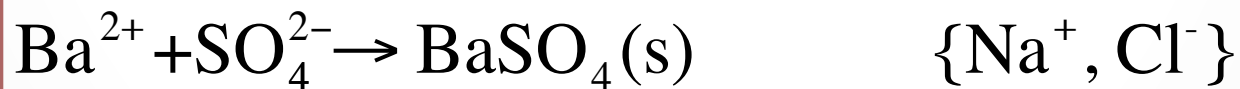
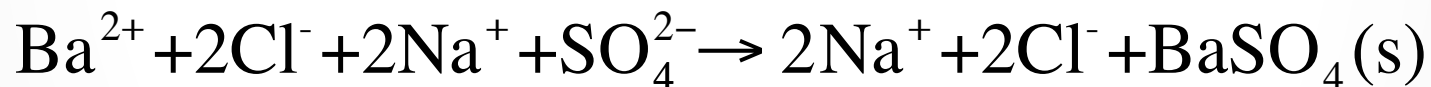
Ionic Equation

- Break down of the molecular equation
- Break apart any aqueous compound into its individual ions



Net Ionic Equation

- Leaves out the extra information from the ionic equation
- The ions that do not change from reactants to products are left out of net ionic equation



- Na^{+} and Cl^{-} are left out, known as “**spectator ions**”

Example #1

Write the molecular equation, ionic equation, and net ionic equation for the reaction between $\text{AgNO}_3(\text{aq})$ and $\text{BaCl}_2(\text{aq})$.

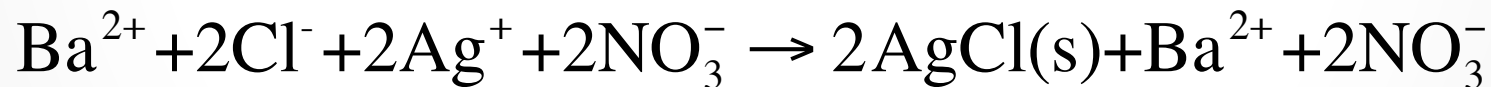


Example #1 Solved

- First determine the formulas and solubility of the products
- Molecular equation:



- Ionic equation:



- Net ionic equation:



Example #2

Write the molecular equation, ionic equation, and net ionic equation for the reaction between KOH(aq) and $\text{PbCl}_2(\text{aq})$.

Example #3

Write the molecular equation, ionic equation, and net ionic equation for the reaction between $\text{NH}_4\text{Cl}(\text{aq})$ and $\text{Na}_2\text{SO}_4(\text{aq})$.