

Answer Key

09/24/25

Reactions in Aqueous Solutions

What is a solution? What is a solvent and a solute?

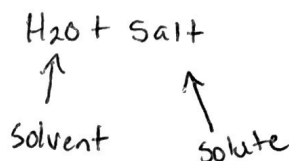
Solution = homogeneous mixture made up of 2+ pure substances

Solvent = present in greatest abundance (substance dissolved in)

Solute = present in smaller amount (dissolved in the solvent)

What is an aqueous solution? (aq)

The solvent is water



What is an electrolyte?

Electrolyte = Dissolves by dissociating (separating) into ions in a solution

What is a strong, weak, and nonelectrolyte?

Strong electrolyte = Dissociates completely (100%) into ions in a solution

Weak electrolyte = Dissociates partially (5-30%) into ions

Non-electrolytes = Dissolve w/o the separation of ions
↳ covalent compounds

Is CaCl_2 , HNO_3 , $\text{C}_2\text{H}_5\text{OH}$ a strong, weak, or nonelectrolyte?

Ionic

CaCl_2 = strong

Weak

NH_3 = weak

base

strong
acid

HNO_3 = strong

Weak

CH_3COOH = weak

covalent

$\text{C}_2\text{H}_5\text{OH}$ = Non

acid

Strong
base

KOH = strong

covalent

$\text{C}_6\text{H}_{12}\text{O}_6$ = Non

* Table on back of periodic table *

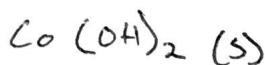
TABLE 4.1 Solubility Guidelines for Common Ionic Compounds in Water

Soluble Ionic Compounds		Important Exceptions
(aq)	Compounds containing NO_3^-	None
	$\text{C}_2\text{H}_3\text{O}_2^-$	None
	Cl^-	Compounds of Ag^+ , Hg_2^{2+} , and Pb^{2+}
	Br^-	Compounds of Ag^+ , Hg_2^{2+} , and Pb^{2+}
	I^-	Compounds of Ag^+ , Hg_2^{2+} , and Pb^{2+}
	SO_4^{2-}	Compounds of Sr^{2+} , Ba^{2+} , Hg_2^{2+} , and Pb^{2+}
Insoluble Ionic Compounds		Important Exceptions
(s)	Compounds containing S^{2-}	Compounds of NH_4^+ , the alkali metal cations, and Ca^{2+} , Sr^{2+} , and Ba^{2+}
	CO_3^{2-}	Compounds of NH_4^+ and the alkali metal cations
	PO_4^{3-}	Compounds of NH_4^+ and the alkali metal cations
	OH^-	Compounds of the alkali metal cations, and Ca^{2+} , Sr^{2+} , and Ba^{2+}

Classify the following compounds as soluble or insoluble in water:

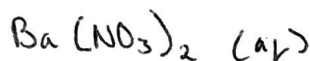


Cobalt (II) hydroxide



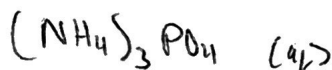
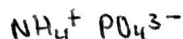
Insoluble (precipitate)

Barium nitrate



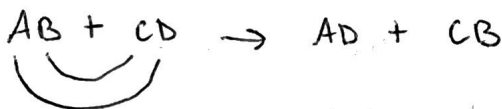
soluble

Ammonium phosphate



soluble

What is a double replacement reaction?

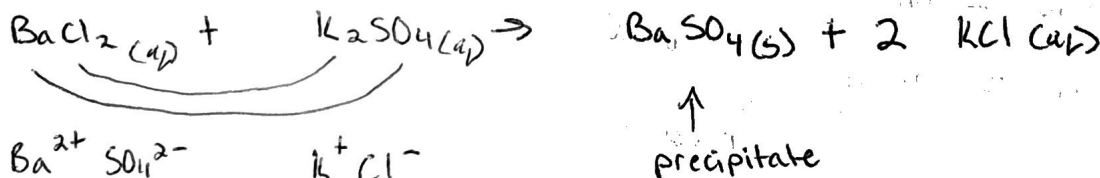


What is a precipitation reaction?

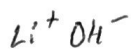
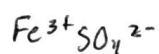
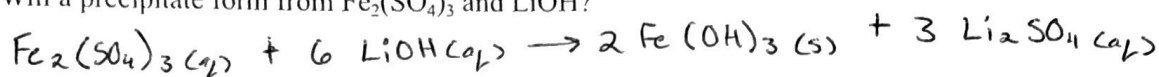
A double replacement rxn where 2 (aq) ionic compounds react to form a precipitate

2 aq solutions $\rightarrow$ solid

What is the precipitate of BaCl_2 and K_2SO_4 ? Write the balanced chemical equation.



Will a precipitate form from $\text{Fe}_2(\text{SO}_4)_3$ and LiOH ?



precipitate

Yes, a precipitate will form

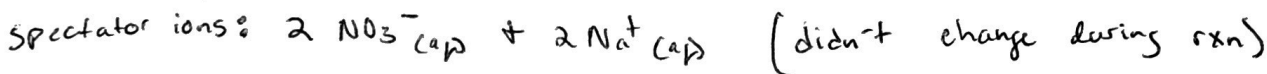
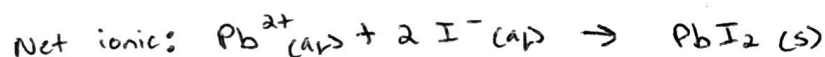
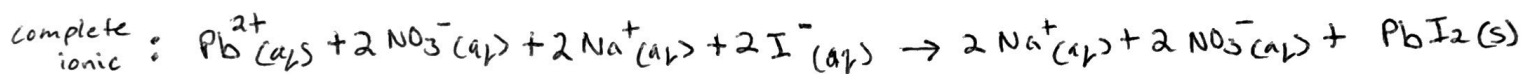
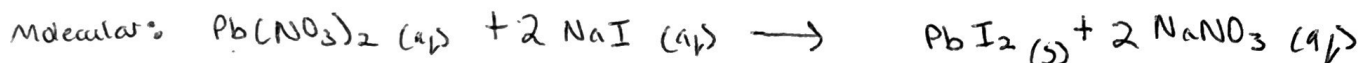
What is a molecular equation? What is a complete ionic equation? What is a net ionic equation?

Molecular: Balanced chemical equation

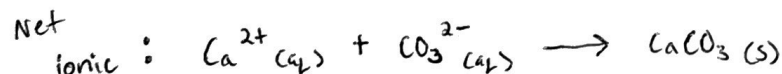
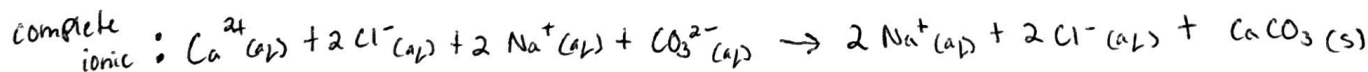
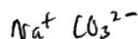
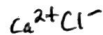
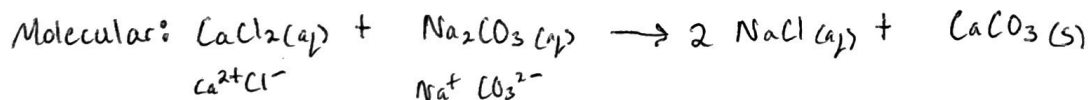
Complete ionic: Shows all ions separated (strong electrolytes dissociated into ions)

Net ionic: Chemical species from the complete ionic that changed during the rxn

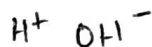
Write the molecular, complete ionic, and net ionic equation for lead (II) nitrate and sodium iodide. Precipitation rxn



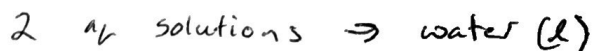
Write the molecular, complete ionic, and net ionic equation for calcium chloride and sodium carbonate. Precipitation



What is an acid-base neutralization reaction?



A double replacement rxn that involves the transfer of H^+ from an acid to a base



Strong acids and bases completely dissociate in water. strong electrolytes

Weak acids and bases partially dissociate in water. weak electrolytes

H^+ Acids are called proton donors



OH^- Bases are called proton acceptors

Give examples of strong acids and bases.

Strong acids: HCl , HBr , HI , $HClO_3$, $HClO_4$, HNO_3 , H_2SO_4

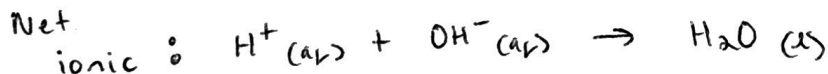
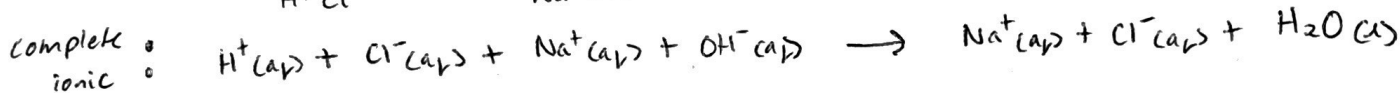
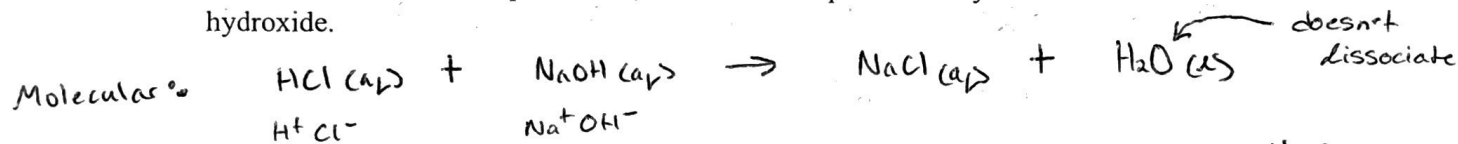
Strong bases: $LiOH$, $Ca(OH)_2$ (Group 1 or 2 metal + hydroxide (OH^-))

Give examples of weak acids and bases.

Weak acids: CH_3COOH , HF

Weak bases: $Pb(OH)_2$, $Cu(OH)_2$, NH_3 $H_2O = \text{water} = H_2O$

Write the molecular, complete ionic, and net ionic equation for hydrochloric acid and sodium hydroxide.



Write the molecular, complete ionic, and net ionic for phosphorous acid and potassium hydroxide.

