Double Replacement (Solubility) Reactions

$$AgNO_3(aq) + NaCl(aq) \rightarrow NaNO_3(aq) + AgCl(s)$$

Jan 22-7:09 PM

Chemical Reactions

Objectives:

1. I can predict products of double replacement reactions.
2. I can determine products of a double replacement reaction via solubility chart.
3. I can identify the type of reaction (SR, DR, Combustion, Decomposition, Composition)
4. I can balance all types of chemical reactions.

Double Replacement Reactions

Solubility: ability to dissolve

Soluble: dissolved as ions (aqueous)

Insoluble: not dissolved (solid, liquid, gas)

precipitate: solid formed in a reaction

Jan 24-9:55 PM

Pre—Quiz for Double Replacement Reactions

1. sodium silicate

Write the ions

Na^{+1} SiO_3^{-2}

Balance the formula

Na_2SiO_3

9. $FePO_4$

Write the ions

Fe^{+3} PO_4^{-3}

Write the name

Iron (III) phosphate

Pre—Quiz for Double Replacement Reactions Name_____ hour___

1. sodium silicate **2. potassium chloride** **3. ammonium oxide** **4. iron (III) sulfate**

Write the ions

Na^{+1} SiO_3^{-2} _____ _____ _____ _____ _____ _____

Balance the formula

Na_2SiO_3 _____ _____ _____

5. manganese (II) phosphate **6. aluminum hydroxide** **7. magnesium sulfide** **8. Copper (I) carbonate**

Write the ions

_____ _____ _____ _____ _____ _____ _____ _____

Balance the formula

_____ _____ _____ _____

9. $FePO_4$ **10. K_3N** **11. $Ca(C_2H_3O_2)_2$** **12. $Zn(NO_2)_2$**

Write the ions

Fe^{+3} PO_4^{-3} _____ _____ _____ _____ _____ _____

Write the name

Iron (III) phosphate _____ _____ _____

13. Ca_3P_2 **14. CuO** **15. $Al_2(C_2O_2)_3$** **16. $Ni(ClO_2)_2$**

Write the ions

_____ _____ _____ _____ _____ _____ _____ _____

Write the name

_____ _____ _____ _____

Jan 23-9:34 AM

Solubility Chart - how do we know if a precipitate forms?

check solubility chart

1. $BaBr_2$
2. $AgCl$
3. Na_2S
4. $CaCO_3$
5. Ag_3BO_3
6. $PbCl_2$
7. $PbCl_4$
8. $NaC_2H_3O_2$

Soluble Ionic Compound		**Important Exceptions**
Compounds containing	$C_2H_3O_2^-$, ClO_3^-, NO_3^-	None
	Cl^-, Br^-, I^-	Compounds of Ag^+, Hg_2^{+2}, and Pb^{+2}
	SO_4^{-2}	Compounds of Ca^{+2}, Sr^{+2}, Ba^{+2}, Hg_2^{+2}, and Pb^{+2}
Insoluble Ionic Compounds		**Important Exceptions**
Compounds containing	S^{-2}	Compounds of NH_4^+, the alkali metals (like Li, Na, K) cations, and Mg^{+2}, Ca^{+2}, Sr^{+2}, and Ba^{2+}
	CO_3^{-2}, BO_3^{-3}, SO_3^{-2}, CrO_4^{-2}, AsO_4^{-3}, PO_4^{-3}----	Compounds of $NH_4^+$and the alkali metals (like Li, Na, K) cations
	OH^-, O^{-2}	Compounds of the alkali metals (like Li, Na, K) cations, and Ca^{+2}, Sr^{+2}, and Ba^{2+}

Jan 23-9:49 AM

soluble	vs.	insoluble
dissolved as ions aqueous (aq)		-drives reaction -not dissolved- s,l,g **solid(s)** **check solubility chart** precipitate - solid formed in a reaction **liquid(l)** **check for water** formed in **or gas(g)** (we won't do this one)

Jan 23-8:40 AM

Double Replacement Reactions

2 compounds exchange ions to produce 2 new compounds

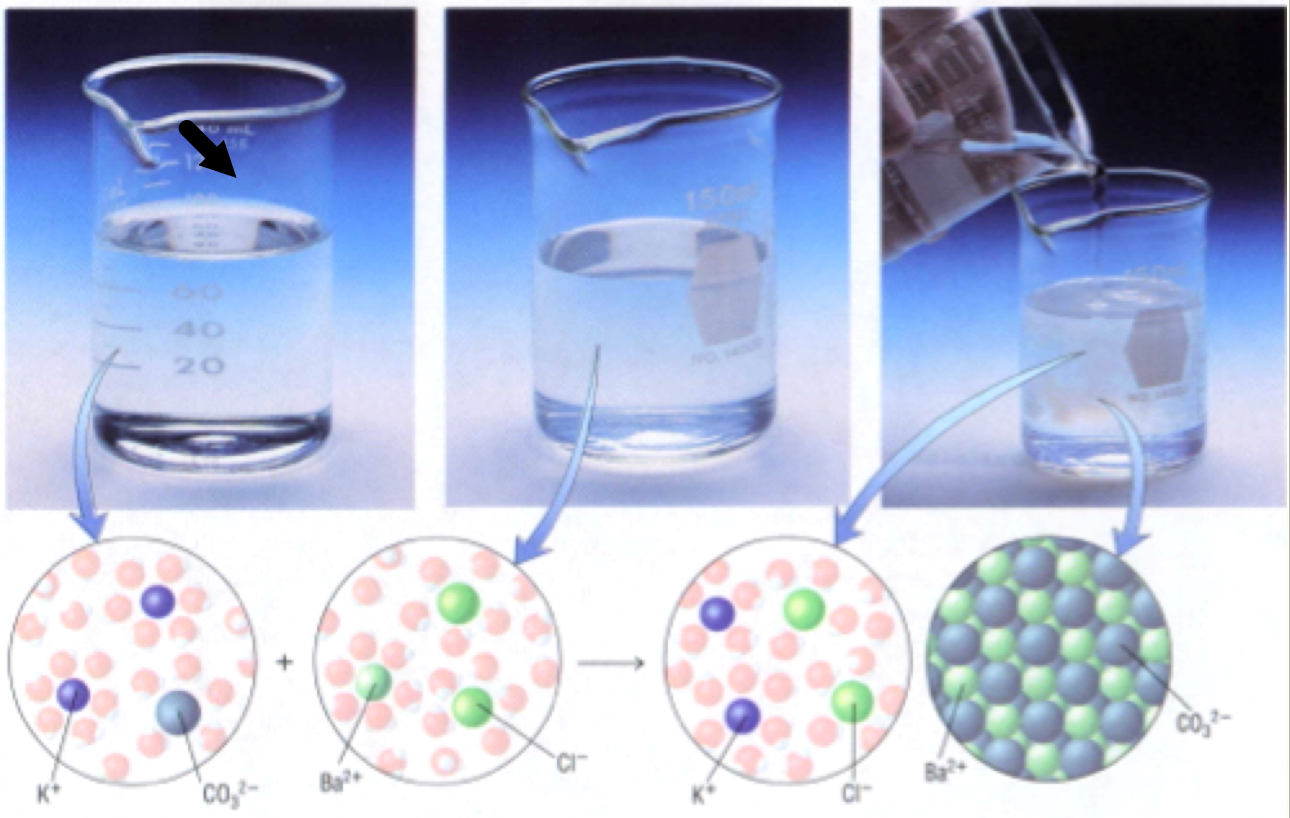
Switching partners

General form:

AB + CD ⟶ AD + CB

$CaCO_3$ + 2 HCl → $CaCl_2$ + H_2CO_3

$PbCl_2 + 2KI \longrightarrow 2KCl + PbI_2$

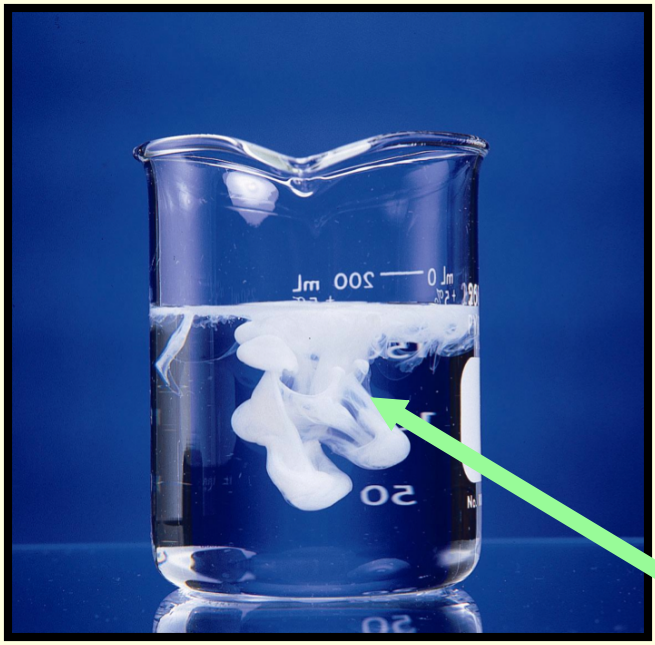


K_2CO_3 (*aq*) Potassium carbonate + **$BaCl_2$ (*aq*)** Barium chloride ⟶ **2 KCl (*aq*)** Potassium chloride + **$BaCO_3$ (*s*)** Barium carbonate

Dec 8-8:43 PM

Double replacement

Formation of a solid: AgCl



$AgNO_3(aq) + NaCl(aq) \quad NaNO_3(aq) + AgCl(s)$

Dec 8-8:05 PM

double replacement:

1. **Switch partners**
   always write cation, then anion
2. **Balance each formula** according to their charges
   Ionic charges do not change in reaction
   use subscripts
3. **Balance the whole equation**
   use coefficients
4. **Check solubility**
   Check for solid (chart), liquid or gas

sodium sulfide + aluminum bromide

Jan 12-7:56 AM

1.Switch partners
(look up ions)

sodium sulfide + aluminum bromide →

always write cation, then anion

2.Balance each formula according to their charges
Ionic charges do not change in reaction
use subscripts

sodium sulfide + aluminum bromide → sodium bromide + aluminum sulfide
Na^{+1} S^{-2} Al^{+3} Br^{-1} Na^{+1} Br^{-1} Al^{+3} S^{-2}

3. Balance the whole equation
use coefficients

$Na_2S + AlBr_3 \rightarrow NaBr + Al_2S_3$

4. Check solubility on chart

$3\ Na_2S + 2\ AlBr_3 \rightarrow 6\ NaBr + Al_2S_3$

Check for solid on solubility chart

Check for liquid - HOH (water)

Check for gas - we will not do these reactions

Jan 23-8:17 AM

Practice:

1. $Na_3PO_4(aq) + MgCl_2(aq)$

2. $AgNO_3(aq) + Cu(NO_3)_2(aq)$

3. $AgNO_3(aq) + K_2CrO_4(aq)$

4. $AgNO_3(aq) + NaCl(aq)$

Jan 7-9:23 AM

lead (II) chloride + potassium iodide ⟶ potassium chloride + lead (II) iodide

Pb^{2+} Cl^{1-} K^{1+} I^{1-} Pb^{2+} Cl^{1-} K^{1+} I^{1-}

$PbCl_2 + KI \longrightarrow KCl_{(aq)} + PbI_{2\,(ppt)}$

Dec 8-8:53 PM

Neutralization Reactions

- Acid + Base salt + water
- **H*X*** + ***B*OH** → ***BX*** + **HOH**

- Examples:
- **H**Cl + Na**OH** ⟶ NaCl + **HOH**
- $\mathbf{H_2}SO_4$ + 2K**OH** ⟶ K_2SO_4 + 2**HOH**
- $\mathbf{2H_3}PO_4$ + 3Ca(**OH**)$_2$ ⟶ $Ca_3(PO_4)_2$ +6**HOH**

Dec 8-8:55 PM