

AP Chemistry Review

Dear Parents,

Help your child stay on top of his learning game during the holiday season. Winter vacation means a well-deserved break from homework. But before you know it, the holidays will be over and it will be time for the first semester final exams.

To prepare for a smooth re-entry and a successful AP Chemistry exam, encourage your child to practice the equations and multiple choice questions from the links provided in this PowerPoint presentation and the free responses from the packets distributed in class.

May peace and joy be yours
during this wonderful season and
the coming New Year!

Mrs. Paul

Atomic Structure and Periodicity

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/apquiz.html> (Topics 1, 2, 3, 7)
- **Double Replacement Reaction:**
<http://dwb4.unl.edu/AP2/>
- **Color of Ions:**
<http://www.champaignschools.org/staffwebsites/reidda/colors%20of%20common%20substances.htm>

Bonding: General Concepts

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/apquiz.html> (Topics 8)
- **Single Replacement Reaction:**
<http://dwb4.unl.edu/AP2/>

Stoichiometry

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/appquiz.html> (Topics 4, 5)
- **Anhydrides** : <http://dwb4.unl.edu/AP2/>

Gases

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/apquiz.html> (Topics 6)
- **Oxidation-Reduction Reactions:**
<http://dwb4.unl.edu/AP2/>

Liquids and Solids

- **AP Multiple Choice Quizzes**

<http://www.adriandingleschemistrypages.com/appquiz.html> (Topics 12)

Solutions

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/appquiz.html> (Topics 17)
- **Decomposition Reactions:**
<http://dwb4.unl.edu/AP2/>

Thermochemistry and Thermodynamics

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/apquiz.html> (Topics 9)
- **Addition Reactions:** <http://dwb4.unl.edu/AP2/>

Organic Chemistry

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/apquiz.html> (Topics 11)
- **Organic Reactions:** <http://dwb4.unl.edu/AP2/>

Nuclear Decay

- **AP Multiple Choice Quizzes**
<http://www.adriandingleschemistrypages.com/apquiz.html> (Topics 10)
- **Mixed Reactions:** <http://dwb4.unl.edu/AP2/>

Free Response Review

- Free Responses 1999 #2, 4-8
- Free Responses 2000 #3-7, 6 (a,b,c)
- Free Responses 2001 #2-5, 3 (a,b,c), 8

Multiple Choice Review

- **1984**
- **1989**
- **1994**
- **1999**
- **2002**
- **2008**

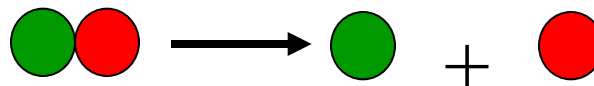
AP Chemistry Exam Review

Predicting Reactions: Question #4

Five General Types of Reactions

1) Decomposition:

- A reaction that breaks apart one compound into simpler substances, (usually two elements or an element and a smaller compound.)



Remember that “HONClBrIF” elements are diatomic when alone!!

Categories of Decomposition (and Composition) Reactions

a) carbonates \rightarrow metallic oxide + CO_2



b) chlorates \rightarrow metallic chloride + O_2



c) hydroxides \rightarrow metallic oxide + H_2O



d) oxy acids \rightarrow nonmetal oxide + H_2O



e) binary compounds \rightarrow 2 elements

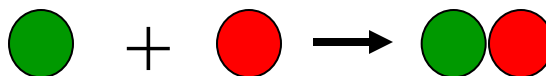


- Every time you try to write the formula for a new compound, you must look up the charges of the ions and cross them if they are different!!
- Balance it AFTER you get all the correct formulas written first!
- Don't forget about the HONClBrIF's!

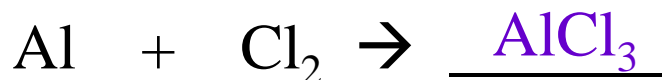
General Types of Reactions (*Continued*)

2) Composition: (sometimes called “Combination” or “Synthesis”)

- A reaction of two substances, typically a metal and a nonmetal to form one compound.
- It is the opposite of decomposition. (The same categories of reactions from above apply, just in reverse.)

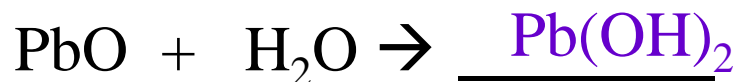


Examples:



2 elements binary compound

→



metallic + → hydroxide

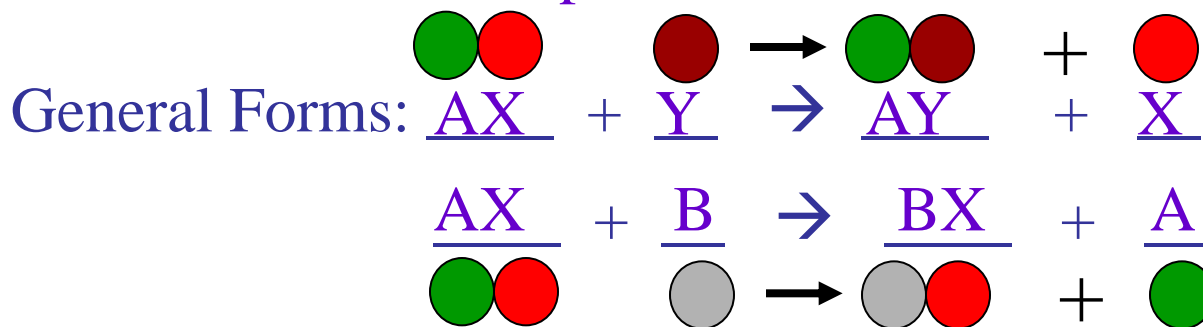
water

oxide

General Types of Reactions (*Continued*)


3) Single Replacement (or RedOx Reactions):

- A reaction between one compound and one element that produces a different compound and element.



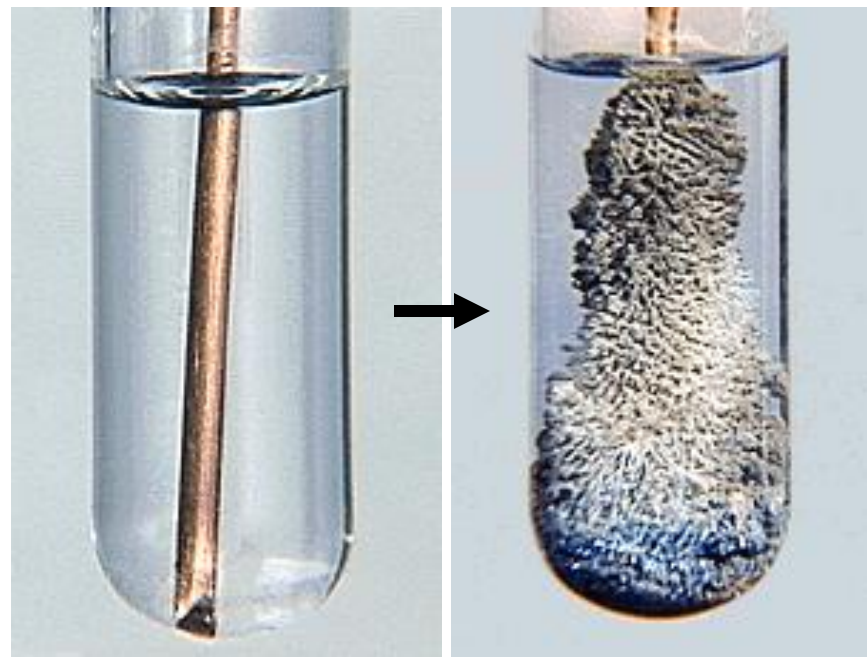
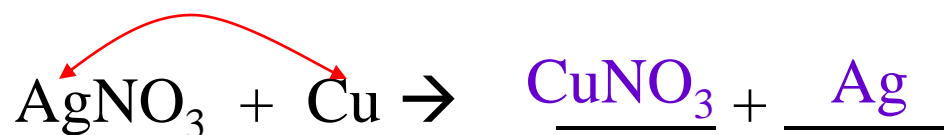
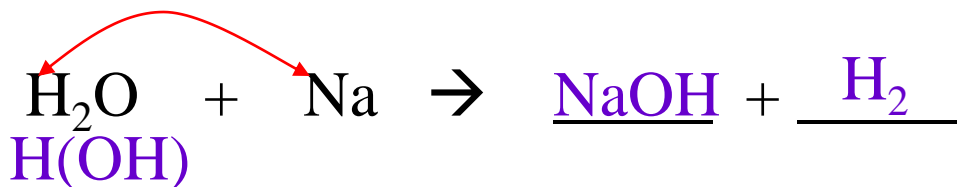
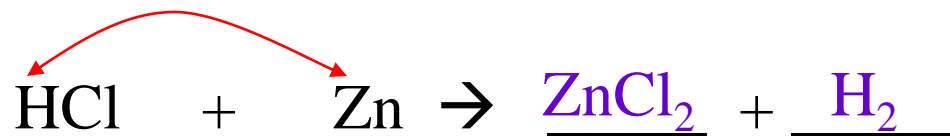
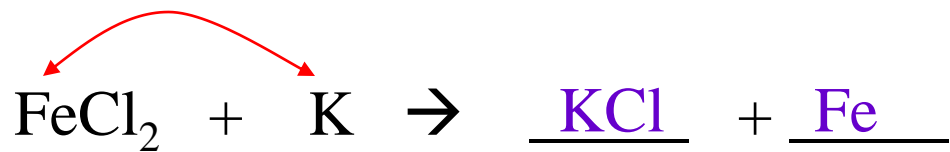
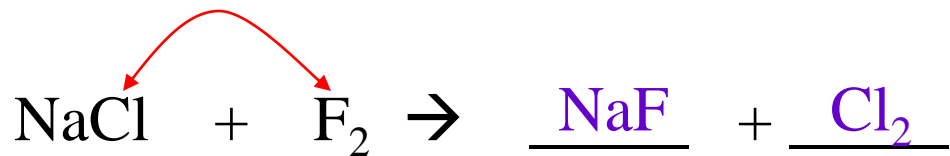
- The element that is trying to replace the other must be more reactive than the one it is replacing.
- You can use the *Activity Series* or the *Standard Reduction Potentials* to see if the reaction will happen.
- Higher up = more reactive
- Elements from Li to Na can displace hydrogen in water to form a metallic hydroxide and H₂ gas.

Activity Series

Two Activity Series			
Metals	Decreasing Activity	Halogens	
lithium		fluorine	
potassium		chlorine	
calcium		bromine	
sodium		iodine	
magnesium			
aluminum			
zinc			
chromium			
iron			
nickel			
tin			
lead			
HYDROGEN*			
copper			
mercury			
silver			
platinum			
gold			

Single Replacement Reactions

Examples: (Assume all reactions are in aqueous solutions!)



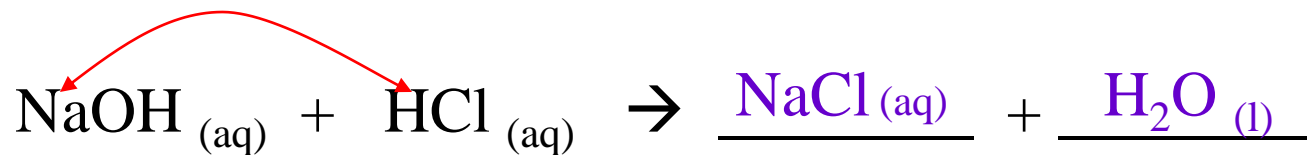
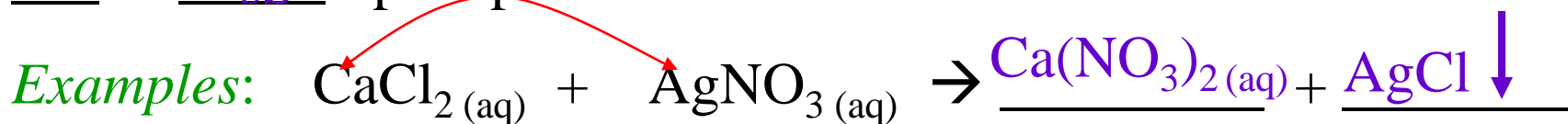
General Types of Reactions (*Continued*)

4) Double Replacement: (sometimes called “Ionic”)

- A reaction between two compounds that are dissolved in water that produces two compounds, one of which is insoluble.
- Water or a gas may be one of the two compounds being produced.



- You must use the *Solubility Chart* to see which product is the precipitate.
- I or sS = precipitate



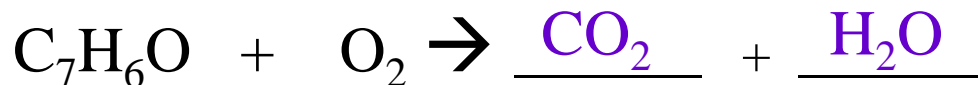
Double Replacement Reaction



General Types of Reactions (*Continued*)

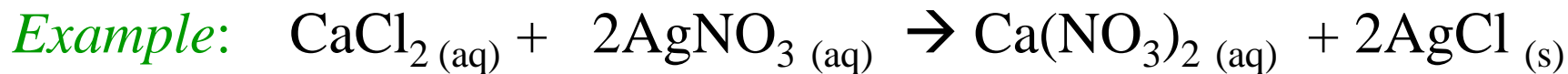
5) Combustion:

- A reaction between a Carbon/Hydrogen (and sometimes Oxygen) compound with O₂.
- The products are **always** the same... CO₂ + H₂O
- This reaction is too easy!! Don't miss it!

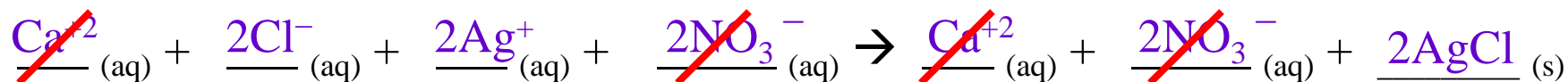


Writing Net Ionic Equations for Double Replacement Reactions

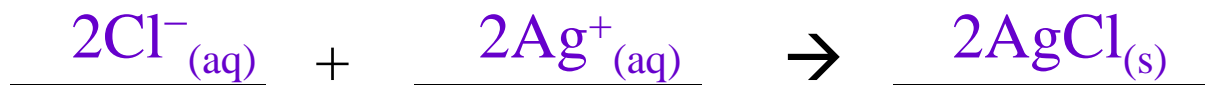
- A **“net ionic equation”** only shows the ions that were used to make the precipitate.
- Some ions were always dissolved in water. These are called “spectator ions”. (They don’t do anything, so we can ignore them.)



Ionic Equation Written as Ions Dissolved in Water:

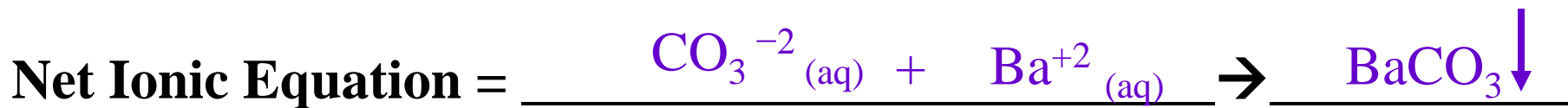
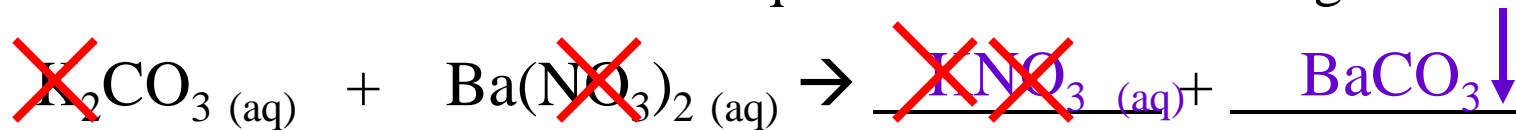


- Cancel out the spectator ions, and you are left with the Net Ionic Equation!



Writing Net Ionic Equations for Double Replacement Reactions

Practice Problem: Write the net ionic equation for the following reaction.



Flame Test Colors

Li^+	Deep red (crimson)
Na^+	Yellow
K^+	Violet
Ca^{2+}	Orange-red
Sr^{2+}	Red
Ba^{2+}	Yellow-green
Cu^{2+}	Blue-green

Aqueous Ion Colors

Cu^{1+}	Green
Cu^{2+}	Blue
Fe	Yellow to red-orange (depending on anion and charge of Fe); in rare cases, can form complex ion with a deep blue color
Fe^{2+}	yellow-green (depending on the anion)
Fe^{3+}	orange-red (depending on the anion)
Cr^{3+}	Violet ($\text{Cr}(\text{NO}_3)_3$) to Green (CrCl_3)
Ni^{2+}	Green
Mn^{2+}	Pink
MnO_4^-	Purple (Mn w/ +7 oxidation state is purple)
Pb^{3+}	blue-green (Pb^{2+} and Pb^{4+} are colorless)
V^{2+}	violet
V^{3+}	blue-green
CrO_4^{2-}	Yellow
$\text{Cr}_2\text{O}_7^{2-}$	Orange
$\text{Cu}(\text{NH}_3)_4^{2+}$	Dark Blue; produced when ammonia is added to Cu^{2+} solutions
FeSCN^{2+}	Red-brown, Wine-red to dark orange
CoCl_4^{2-}	Blue (Co^{2+} with HCl will form a CoCl_4^{2-} complex that is blue)
Co^{2+}	Pink
$\text{Ti}(\text{H}_2\text{O})_6^{3+}$	Purple

- Al, K, Li, Mg, Na, Ca, Ba, Sr, Zn are colorless aqueous ions and most of their solid salts are white.
- Transition element ions with partially filled *d* orbitals tend to release colored light.

Assorted Compounds

F_2	Pale-yellow gas
Cl_2	Green-yellow gas
Br_2	Red-brown liquid
I_2	Dark-violet vapor & dark metallic looking solid
S_8	Yellow, odorous solid
NO	Colorless gas; associated with reactions between metals and dilute HNO_3
NO_2	Brown gas; associated with reactions between metals and concentrated HNO_3
PbI_2	Bright yellow precipitate
Metallic sulfides	Sulfides of transition metals tend to be black
Fe_2O_3	Reddish brown (rust)
Metallic oxides	Oxides of colored transition metal ions tend to be colored

Acid-Base Indicators

- Phenolphthalein Colorless ($\text{pH} < 7$) to Pink ($\text{pH} > 8$; when OH^- is present)
- Red Litmus (paper) Turns purple-ish blue in alkaline solution
- Blue Litmus (paper) Turns pink-ish red in acidic solution