

Unit 7: Chemical Equations

Name: _____

Evidence of a chemical reaction:

A reaction has occurred if the chemical and physical properties of the reactants and products differ.

For a reaction to occur, particles of reactants must collide, and with sufficient energy →

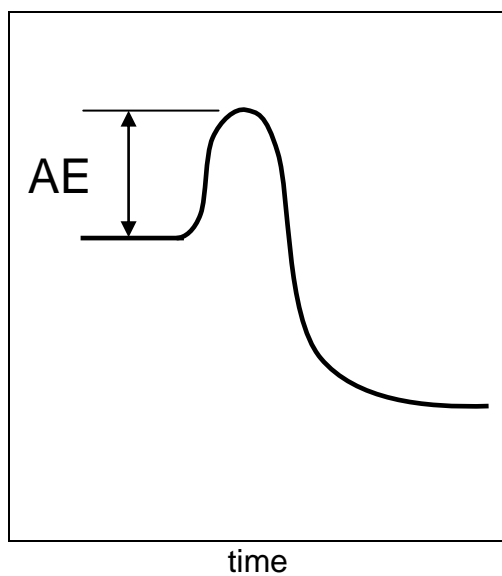
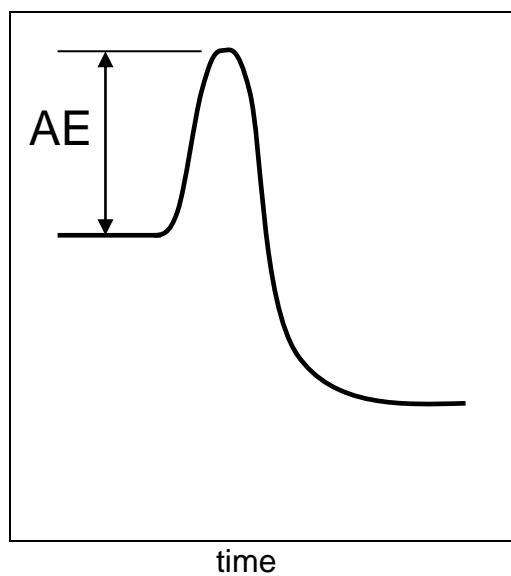


activation energy:

Chemical reactions release or absorb energy.

catalyst: speeds up reaction ^{w/o}/being consumed

...



Examples:

Reaction Conditions and Terminology

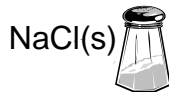
Certain symbols give more info about a reaction.

(s) = solid

(l) = liquid

(g) = gas

(aq) = aqueous (dissolved in H₂O)



More on aqueous...

-- "soluble" or "in solution" also indicate that a substance is dissolved in water (usually)

-- acids are aqueous solutions

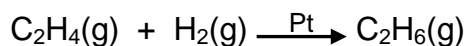
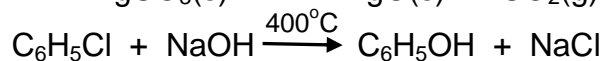
Other symbols...

—————> means "yields" or "produces"

Δ means heat is added to the reaction

Temp. at which we perform rxn. might be given.

The catalyst used might be given.



precipitate: a solid product that forms in an aqueous solution reaction

Factors that influence the rate of a reaction	To make reaction rate increase...
concentration of reactants	
particle size	
temperature	
mechanical mixing	
pressure	
catalyst	use one
nature of reactants	N/A

In a reaction:

Balancing Chemical Equations

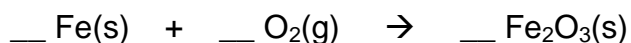
EX. solid iron reacts with oxygen gas to yield solid iron (III) oxide

If all coefficients are 1...

If we change subscripts...

Changing a _____ changes the substance. To balance, only modify _____.

Right now, _____ don't enter into our "balancing" picture.

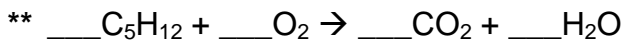
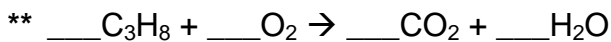
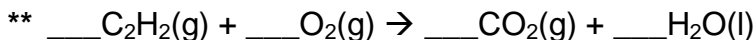
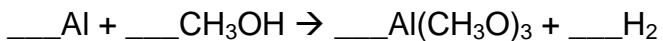
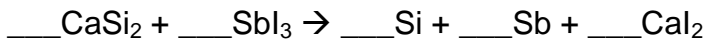
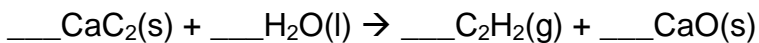


Hint: Start with most complicated substances first and leave simplest substances for last.

solid sodium reacts ^w/oxygen to form solid sodium oxide

Aqueous aluminum sulfate reacts ^w/aqueous calcium chloride to form a white precipitate of calcium sulfate. The other compound remains in solution.

Methane gas (CH₄) reacts with oxygen to form carbon dioxide gas and water vapor.



** =

Write equations for the combustion of C_7H_{16} and C_8H_{18} .

Classifying Reactions → four types

synthesis: simpler substances combine to form more complex substances

oxygen + rhombic sulfur → sulfur dioxide

sodium + chlorine gas → sodium chloride

decomposition: complex substances are broken down into simpler ones

lithium chlorate → lithium chloride + oxygen

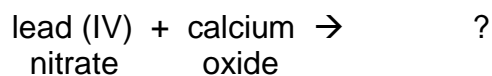
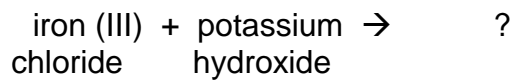
water → hydrogen gas + oxygen gas

single-replacement: one element replaces another

chlorine + sodium → sodium + bromine
bromide chloride

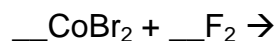
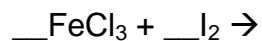
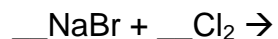
aluminum + copper (II) → ?
sulfate

double-replacement:

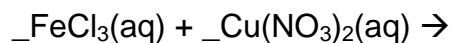
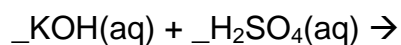
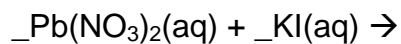
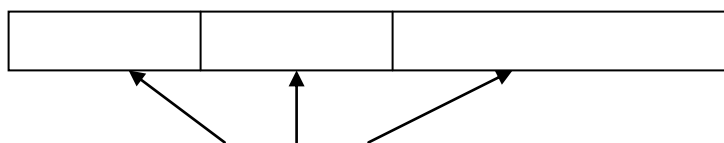


How do we know if a reaction will occur?

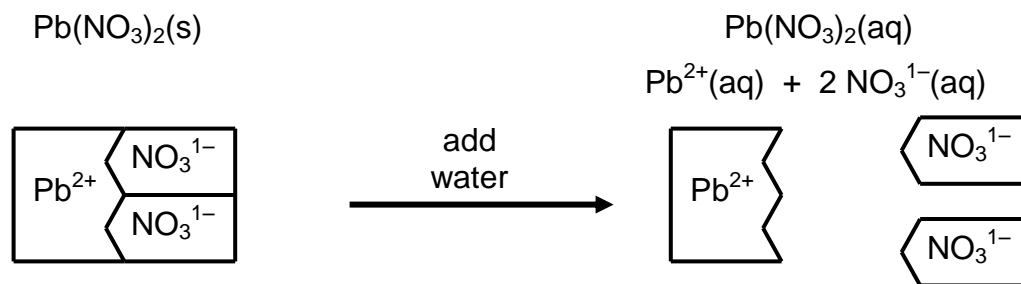
For single-replacement reactions, use Activity Series. In general, elements above replace elements below.



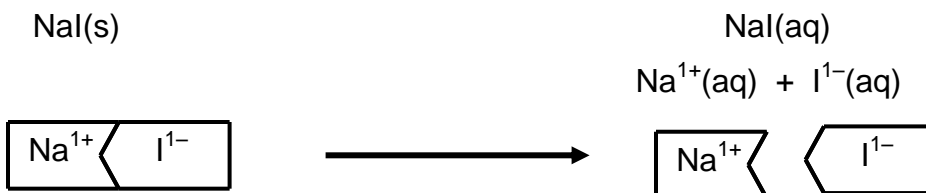
For double-replacement reactions, reaction will occur if any product is:



Ions in Aqueous Solution



dissociation:

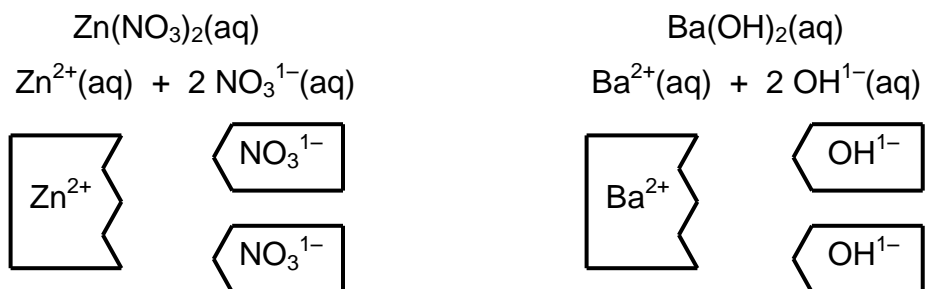


Mix them and get...

Balance to get overall ionic equation...

Cancel spectator ions to get net ionic equation...

Mix together $\text{Zn}(\text{NO}_3)_2(\text{aq})$ and $\text{Ba}(\text{OH})_2(\text{aq})$:



Mix them and get...

Balance to get overall ionic equation...

Cancel spectator ions to get net ionic equation...

Polymers and Monomers

polymer: a large molecule (often a chain) made of many smaller molecules called monomers

Polymers can be made more rigid if the chains are linked together by way of a cross-linking agent.

Monomer

Polymer

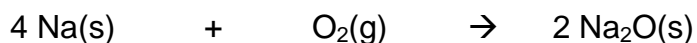
amino acids.....

nucleotides (^w/N-bases A,G,C,T/U).....

styrene.....

PVA.....

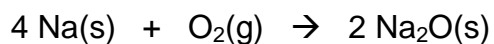
Quantitative Relationships in Chemical Equations



Particles			
Moles			
Grams			

**

When going from moles of one substance to moles of another, use coefficients from balanced equation.



How many moles oxygen will react with 16.8 moles sodium?

How many moles sodium oxide are produced from 87.2 moles sodium?

How many moles sodium are required to produce 0.736 moles sodium oxide?