

Tuesday, September 11, 2012
12:12 PM



Reactions

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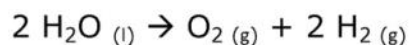
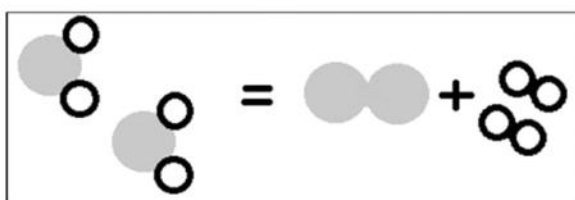
Chemical reactions

Observations that may indicate that a reaction has occurred include:

- New substance (product) is formed
- Reactants consumed
- Formation of a gas or precipitate
- Colour change
- Involvement of energy (gets hot or cold, light, etc...)

When a reaction occurs, bonds between atoms break and new bonds form

Ex. Water → hydrogen + oxygen



The law of conservation of mass

- The total mass of all reactants before a chemical reaction equals the total mass of all products after the reaction
- Must include gases in a closed system (sealed container)

Components of a chemical reaction

Reactants: all chemicals consumed in a reaction

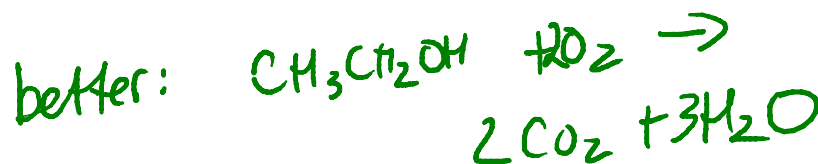
Products: any substance formed in a reaction

Word Equations

Reactants → Products

Ex. Ethanol burns in air to produce carbon dioxide and water vapour

ethanol + oxygen → carbon dioxide + water



read pg 105-106
do Q 1-6

→

Chemical Equations

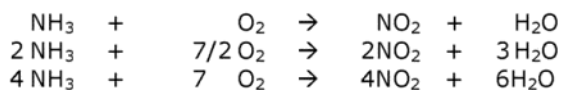
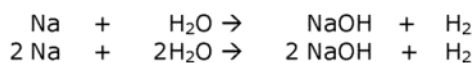
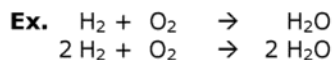


do! & 1-6

Chemical Equations

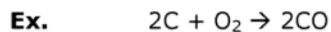
The same number and kinds of atoms must be shown before and after a reaction.

- a) Write correct formulae for all reactants and products
- b) Once correct formulae are written, you **cannot change the subscripts**
- c) Use **coefficients** in front of the formulae until each side is equal



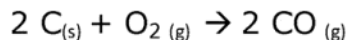
Coefficients are related to the relative numbers of molecules. or moles of molecules, of reactants and products in the reaction.

This is the **mole ratio**



For every mole of O_2 there are 2 moles of C used, and 2 moles of CO produced. For every C used, 1 CO is produced.

Show your Phases



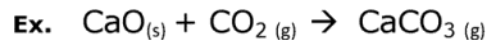
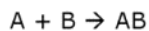
s = solid g = gas aq = aqueous l = liquid al = alcohol

Balancing Practice

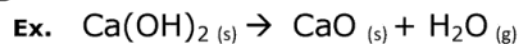
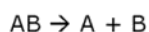
$\begin{matrix} 110 & - & 112 \\ \hline 7 & - & 56 \end{matrix}$

Types of Reactions (recall from sci 10)

Synthesis (or combination) reactions



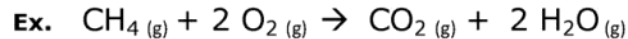
Decomposition reactions



Combustion reactions

carbon source + oxygen \rightarrow carbon dioxide + water

can be
metal \nearrow



Neutralization (acid-base) reactions

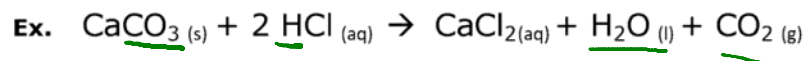
Acid + Base \rightarrow salt + water

$\text{HA} + \text{BOH} \rightarrow \text{BA} + \text{water}$

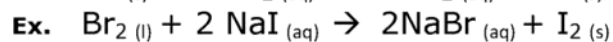
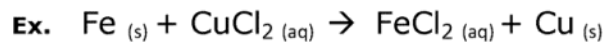
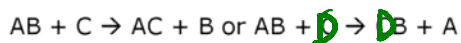


Carbonate reactions

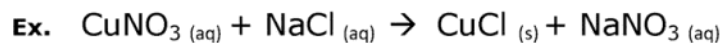
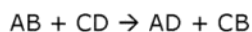
Carbonate salt + acid \rightarrow salt + water + carbon dioxide



Single Replacement reactions



Double replacement reactions



- Not all replacement reactions which can be written will occur. The element displacing must be more active than the element being replaced (see activity series in data booklet)

**Single replacement reactions, check activity series of common metals and non-metals (generally higher up on periodic table = more reactive)

**Double replacement reactions, check solubility in water

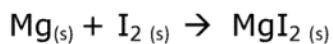
} next class

pg. 118 - # 65 & 66

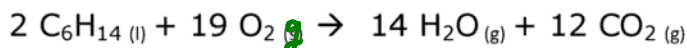
Predicting Products of a Reaction

The regularity that allows you to classify reactions into the above reaction types allows you to predict the results of reactions

Ex. $\text{Mg}_{(s)} + \text{I}_{2(s)} \rightarrow$ it has two elements reacting together – synthesis



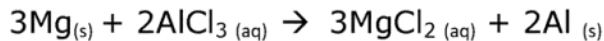
Ex. $\text{C}_6\text{H}_{14(l)} + \text{O}_{2(g)} \rightarrow$ it has oxygen and a carbon source – combustion



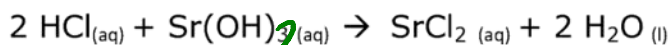
Ex. $\text{FeSO}_{4(aq)} + \text{K}_2\text{CO}_{3(aq)} \rightarrow$ it has two salts in solution – double replacement – but will it precipitate? (Check data booklet) ← *solubility table*



Ex. $\text{Mg}_{(s)} + \text{AlCl}_{3(aq)} \rightarrow$ a salt plus a metal – single replacement – but will there be a reaction? (Check data booklet) ← *activity series*



Ex. $\text{HCl}_{(aq)} + \text{Sr}(\text{OH})_{2(aq)} \rightarrow$ something with an "H" in front, and something with "OH" – neutralization



*Hw. W.S. pred prod.
pg 118 #67*

Energy relationships in Chemical Equations

Chemical reactions involve the breaking and formation of chemical bonds

Breaking bonds requires energy and **making** bonds releases energy ★

The symbol we use for energy change is ΔH – called **enthalpy**. Calculated as

$$\Delta H = H_{\text{products}} - H_{\text{reactants}}$$

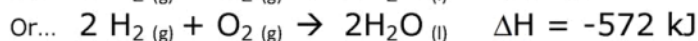
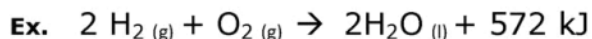
And measured in joules (or sometimes in kilojoules)

Exothermic Reactions

More energy is released than is required to break the bonds, meaning that the products are more stable than the reactants. Energy is lost within the system

Energy is released to the surroundings – surroundings heat up, so exothermic reactions appear hot to observers

Have a negative enthalpy ($\Delta H = -$)

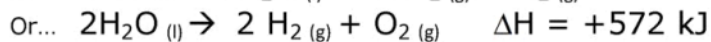


Endothermic Reactions

More energy is required to break the bonds than is released, meaning that the reactants are more stable than the products. Energy is gained within the system

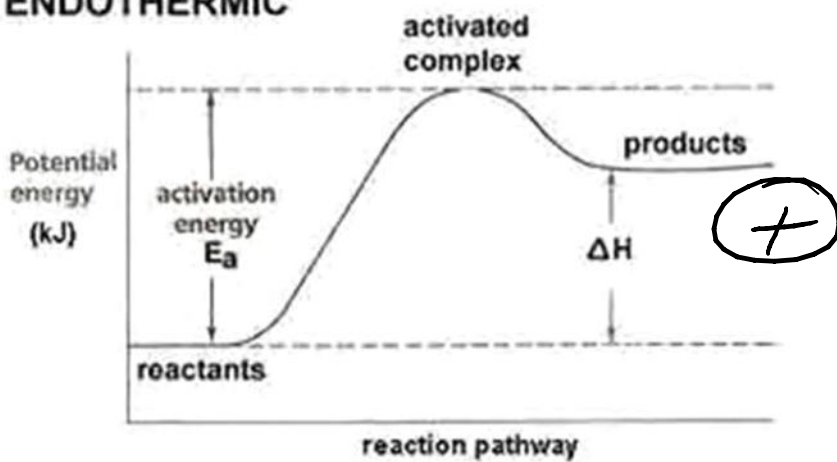
Energy is taken from the surroundings – surroundings get cold, so endothermic reactions appear cold to observers

Have a positive enthalpy ($\Delta H = +$)



Potential Energy Diagrams

ENDOTHERMIC



EXOTHERMIC

