

Balancing Equations:

Reactants:

The left side of the word equation are reactants; the different reactants are separated by + sign.

Products:

The substances that are formed by the reactants are called the products written on the right side of the arrow; the different products are separated by a + ve sign.

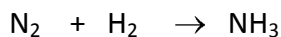
Coefficient:

The number before a symbol of an atom or molecule either before a reactant or a product.

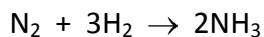
Word Equation



Skeleton Equation:



Balanced Equation:



Coefficient of Nitrogen is 1

Coefficient of Hydrogen is 3

Coefficient of NH_3 is 2

How to balance an equation:

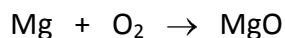
Trial and Error

Step 1

Write the word equation for the reaction
Magnesium + Oxygen \rightarrow Magnesium Oxide

Step 2

Write skeleton equation by replacing each name with a correct formula

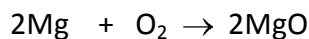


Step 3

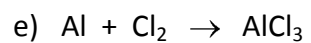
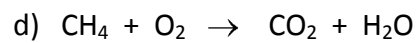
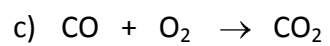
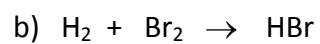
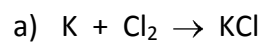
Count the numbers of atoms of each type in reactants and products

Step 4

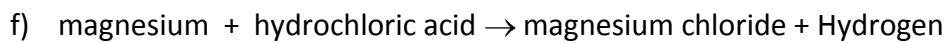
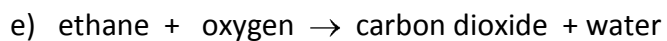
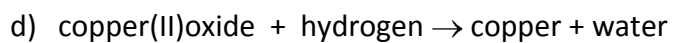
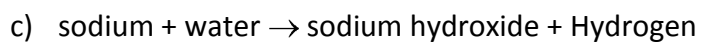
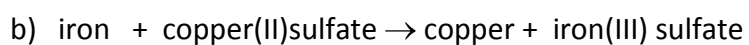
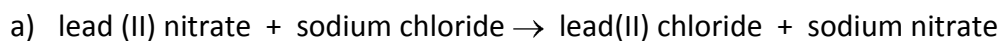
Multiply each of the formulas by the appropriate coefficients to balance the numbers of atoms



Balance the following equations using trial and error method:



For the following write the word equations, skeleton equation and then balance the equation:



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g) Sodium + Chlorine \rightarrow Sodium Chloride

h) Calcium carbonate (Heat) $\Delta \rightarrow$ Calcium Oxide + Carbon dioxide

i) Nitrogen + Hydrogen \rightarrow Ammonia

j) Methane + Oxygen \rightarrow Carbon dioxide + Water

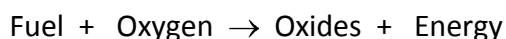
k) Sodium sulphate + Lead Nitrate \rightarrow Lead sulphate + Sodium nitrate

Types of Chemical reactions: 5 Types

- ❑ Combustion
- ❑ Synthesis
- ❑ Decomposition
- ❑ Single displacement
- ❑ Double displacement

Combustion:

A very rapid reaction of a substance with oxygen to produce substances called oxides. The substances usually undergoing combustion are called fuels.



Some examples of fuels:

Methane, Ethane, Butane (lighter gas), Gasoline, diesel, sugar, glucose,
All of the above burn in oxygen to produce the oxide (carbon dioxide), water and energy:

Combustion:

Complete combustion:

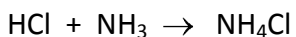
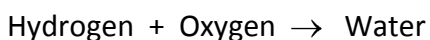
Complete combustion occurs when there is sufficient quantity of oxygen. The products are usually carbon dioxide and water

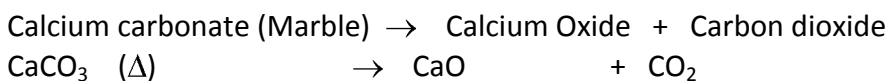
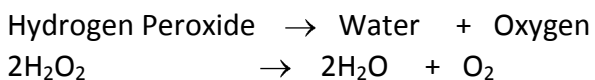
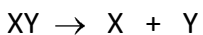
Incomplete combustion:

Incomplete combustion occurs when there is insufficient quantity of oxygen. The products are usually carbon, carbon dioxide, carbon monoxide and water, the ratio of the products depend on the amount of oxygen present.

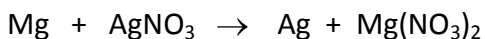
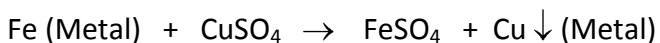
Synthesis reactions or Combination reactions

(Putting together):

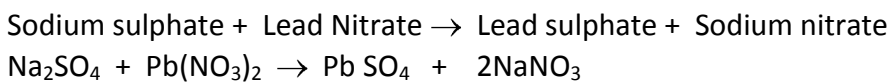
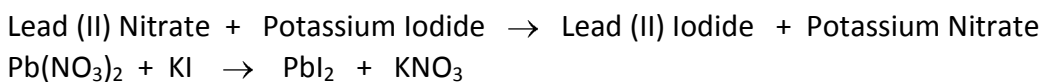
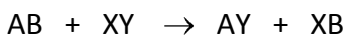


Decomposition Reaction (Taking Apart):**Single displacement Reactions:**

The reactants are usually an element and a compound and the element displaces an element from the compound.

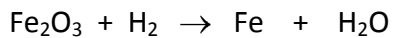
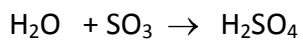
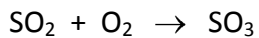
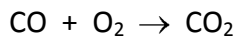
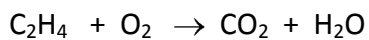
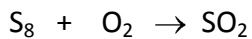
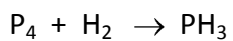
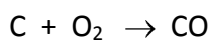
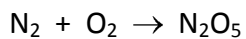
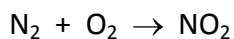
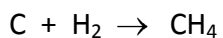
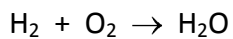
**Double displacement Reactions:**

This reaction occurs when elements from different compounds exchange places.

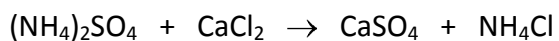
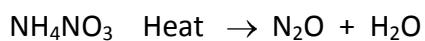
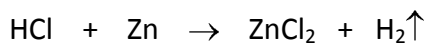
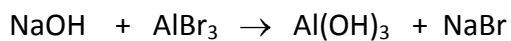
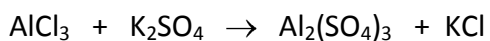
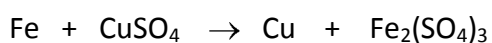
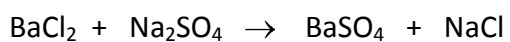
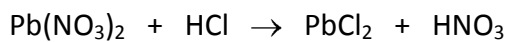
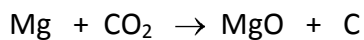


Balancing of Equations Work Sheet:

Balance the following equations and identify the type of reaction. e.g. combustion, synthesis, single or double displacement. (*Recalling - Practice Balancing*)



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Factors Affecting Rates of Reaction:

Kinetic Molecular Theory:

- ❑ Matter is made up of small particles.
- ❑ They are in constant motion.
- ❑ They collide with each other constantly
- ❑ The collisions depend on temperature and concentration.
- ❑ Collisions can lead to formation of products

Factors Affecting Rates of Reaction:

- ❑ Temperature:
- ❑ Concentration
- ❑ Surface Area
- ❑ Catalyst

Temperature:

With rise in temperature the molecules and atoms move faster therefore the chance of them colliding with each other increase. So the chance of changing to new products increase.

Concentration

When the concentration is high the chances of molecules colliding is high. So they can easily change into products.

Surface Area

Greater the surface area greater is the number of molecules exposed. The chance of reactants interacting is also higher. This again increases the rate of reaction.

Catalyst

- ❑ A catalyst is a substance that alters the rate of a reaction without itself undergoing any change.
- ❑ A positive catalyst increases the rate of reaction.
- ❑ A negative catalyst decreases the rate of the forward reaction.
- ❑ The catalyst is a substance that is regenerated at the end of the reaction.

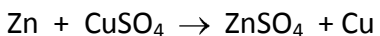
Single displacement and its application

Reactivity series or Activity Series

Arrangement of metals in the decreasing order of their reactivity is known as reactivity series.

A more reactive metal in the series (placed higher in the reactivity series) would displace a metal lower in the series when in the combined state.

E.g. Zn would displace Cu from Copper sulphate

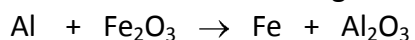


Metallurgy

Knowledge of the reactivity of the metals is exploited in the profitable extraction of metals from its ores. This is also known as metallurgy.

Aluminium being more reactive than Iron could displace Iron from Iron (III) oxide.

Also called "thermite" process used to fill cracks in large machinery in industry.



Prevention of Corrosion

Reactivity of metals can also be used for prevention of corrosion of certain metals.

Coating iron with a more reactive metal can prevent rusting of iron.

Galvanization

Coating of Iron by Zinc is known as Galvanization

Zinc being more reactive reacts in preference to Iron with oxygen to form an oxide

Sacrificial protection

A large chunk of Magnesium is usually attached to the bottom of ships to prevent corrosion of iron from which the ship is made. This is known as sacrificial protection. Magnesium is more reactive than iron so Mg would react in preference to Iron. This prevents protection of iron.

Alloys:

These are solid solutions of two or more metals. The solutions are homogenous.

The properties of pure metals can be altered by addition of other metals.

Copper is added to gold to make it stronger.

Combinations of metals are based on the property desired for the alloy.

Steel, brass, bronze, 22carat gold etc are examples of alloys.

Double displacement and its application

Prediction of precipitation:

The solubility of ionic solids in water varies, if they are completely soluble they form homogenous solutions.

On mixing two homogenous solutions a double displacement reaction may occur and if one of the substances formed has less solubility it would form an insoluble compound called a precipitate. A precipitate settles to the bottom of the test tube.

The formation of a precipitate may be used as an indication for the formation of a compound. This is used to detect the presence of different ions in solution.

Qualitative and Quantitative tests

These tests are sometimes referred to as qualitative test i.e. to determine the ions present or quantitative tests to determine the quantity of the substance present.