

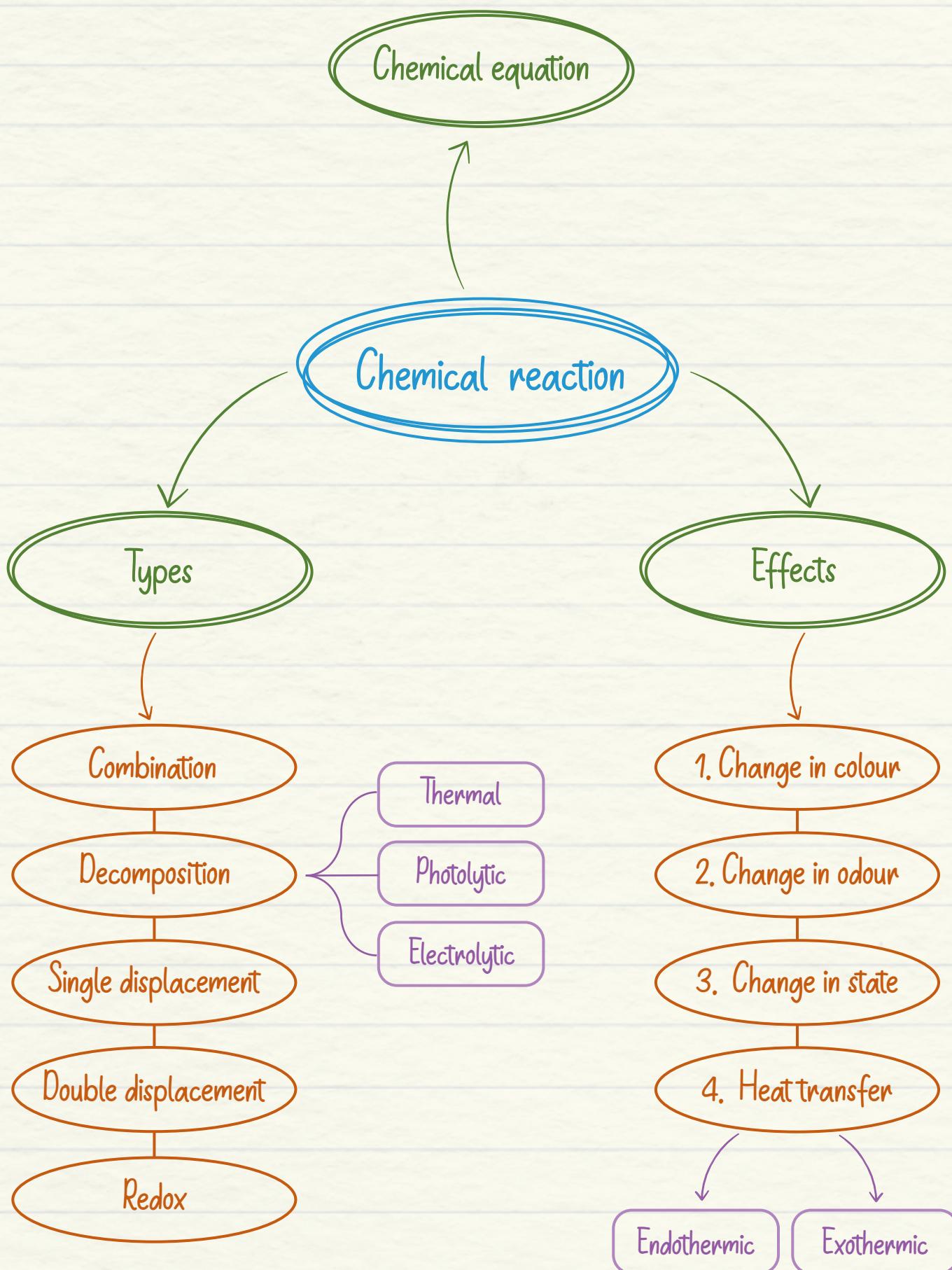
C H E M I S T R Y



POST CLASS NOTES

# Chemical Reactions and Equations



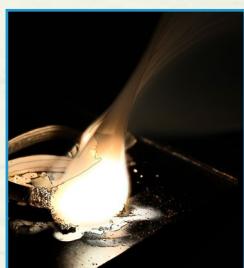


# Chemical Reaction



- One or more participating substances transform to give new substances
- Involves a chemical change

## Examples

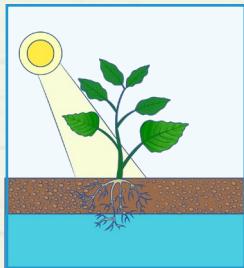


### Burning of magnesium

Magnesium, Oxygen



Magnesium oxide

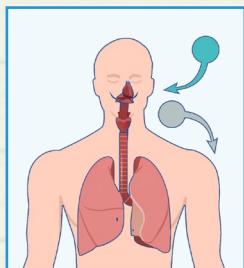


### Photosynthesis

Water, Carbon dioxide



Glucose, Oxygen



### Respiration

Glucose, Oxygen

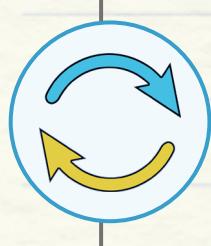


Carbon dioxide, Water

# Effects of Chemical Reaction

Chemical reactions involve one or more of the following:

## 1. Change in Colour

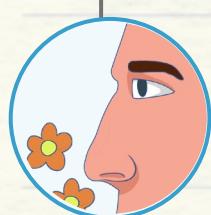


Rusting of iron



Leaves in fall

## 2. Change in Odour

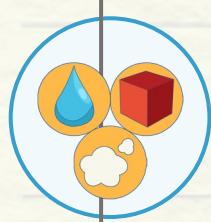


Cooked food



Spoiled fruit

## 3. Change in State



Formation of precipitate

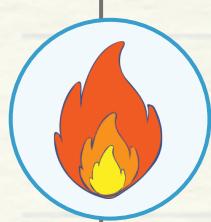
Mixing potassium iodide and lead nitrate



Evolution of gas

Decomposition of lead nitrate on heating

## 4. Heat Transfer



Cooking of food



Endothermic:  
Absorption of heat



Combustion



Exothermic:  
Evolution of heat



# Chemical Equation

Short-hand representation of a chemical reaction

Reactant 1 + Reactant 2 + ... → Product 1 + Product 2 + ...

## Examples

1. Burning of magnesium in oxygen is represented as:

Magnesium + Oxygen → Magnesium oxide      (Word equation)

$\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$       (Skeleton equation)

2. Photosynthesis is represented as:

Carbon dioxide + Water → Glucose + Oxygen      (Word equation)

$\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$       (Skeleton equation)

## Balanced Chemical Equation

Total number of atoms of each element on the reactant side

=

Total number of atoms of each element on the product side

Skeletal Equation	Balanced Equation
$\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$	$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
$\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$	$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$



## Skeleton Equation to Chemical Equation



1

Balance the equation



2

Mention physical state next to each formula



3

Mention reaction conditions above/below the arrow

Temperature  
Pressure  
Catalyst  
Light/hv  
Heat/  $\Delta$



4

Mention energy transfer

Endothermic:

+ Energy or Heat on reactant side

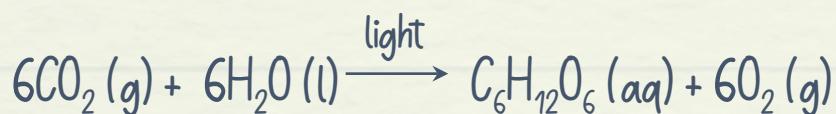
Exothermic:

+ Energy or Heat on product side

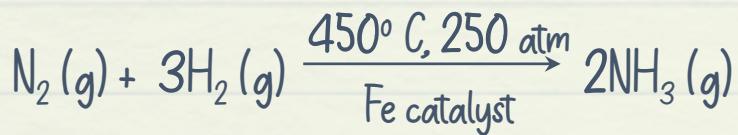
solid	(s)
liquid	(l)
gas	(g)
dilute	(dil.)
concentrated	(conc.)
aqueous	(aq.)
precipitate	(↓)
gas evolved	(↑)

Examples

1. Photosynthesis



2. Formation of Ammonia

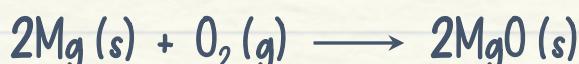




# Types of Chemical Reactions

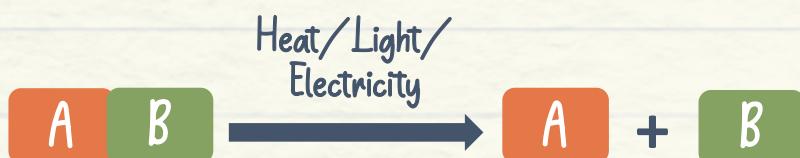
## 1. Combination Reaction

Two or more reactants give single product

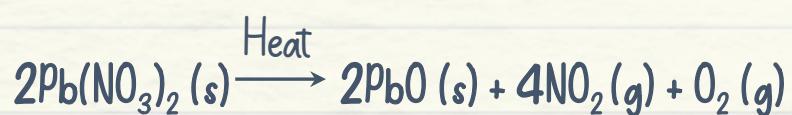


## 2. Decomposition Reaction

Single reactant breaks down into two or more products



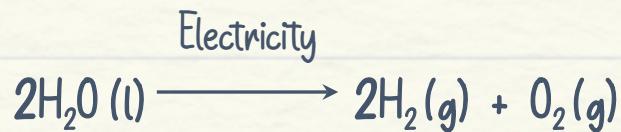
Thermal  
(in presence of heat)



Photolytic  
(in presence of light)

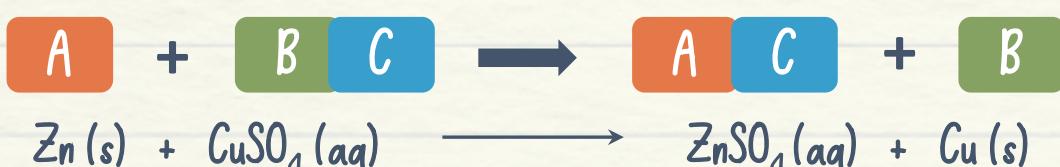


Electrolytic  
(in presence of electricity)



## 3. Single displacement reaction

An element displaces another element from its compound





## 4. Double displacement reaction

Exchange of ions between the reacting compounds



## 5. Redox (Reduction-Oxidation) reaction

Single reactant breaks down into two or more products

Oxidation:  
Gain of oxygen, or  
loss of hydrogen

Reduction:  
Loss of oxygen, or  
gain of hydrogen

Always occur simultaneously

Redox

One reactant undergoes reduction while, the other undergoes oxidation

Examples

Loss of oxygen: Reduction



Gain of oxygen: Oxidation

ZnO is reduced  
C is oxidised

Loss of oxygen: Reduction



MnO<sub>2</sub> is reduced  
HCl is oxidised

Loss of hydrogen: Oxidation



# Mind Map

## Chemical equation

Short-hand representation of chemical reactions using symbols and chemical formulae

Reactant → Product



## Chemical reaction

- Formation of new substance
- Involves chemical change

## Types

### Combination



Thermal



Electrolytic



Photolytic



### Decomposition



### Single displacement



### Double displacement



### Redox

One reactant undergoes reduction (addition of H or removal of O) while the other undergoes oxidation (addition of O or removal of H)

## Effects

### 1. Change in colour



### 2. Change in odour



### 3. Change in state



### 4. Heat transfer



Endothermic



Exothermic

