



## Chapter - I Chemical Reaction and Equation

# Chemistry → Study composition, structure and properties of matter, is called chemistry.

~~#~~ ~~Physical change~~ →

# Physical change → A process in which new substance are not formed, is called physical change. Ex. → change in state of matter.

# Chemical change → A process in which new substance are formed, is called chemical change. Ex. → Burning of paper, etc.

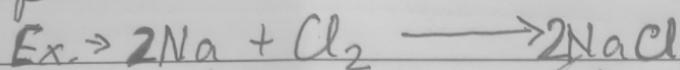
# Chemical reaction → A process in which new substance are formed with new physical and chemical properties, is called chemical reaction.

Ex. → Hydrogen and oxygen react to form water.



⇒ Reactant → Substances which are ~~not~~ participation or react in a chemical reaction, are called reactants.

⇒ Product → Substances which are formed in a chemical reaction, are called products.

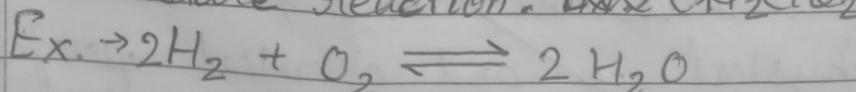


LHS - Reactants

RHS - ~~not~~ Products

⇒ Irreversible reactions → Reactions which cannot be reversed are called irreversible reactions. Ex. → Milk to curd is formed but curd to ~~milk~~ milk is not formed. → Milk → Curd

⇒ Reversible reactions → Reactions which can be reversed are called reversible reaction.

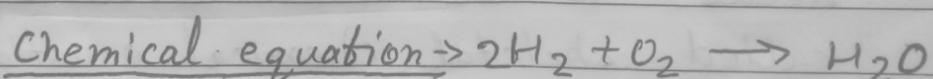


## # Characteristics of chemical reaction

- (i) Change in colour
- (ii) Change in State
- (iii) Evolution of gas
- (iv) Change in temperature.

## # Chemical Equations → Representation of chemical reaction in terms of formula or symbol of elements, are called Chemical equation.

Chemical reaction → Hydrogen and Oxygen react to form water

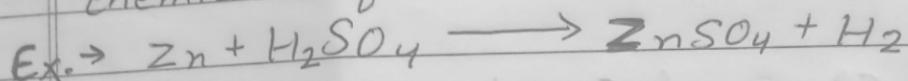


### ⇒ Advantages of chemical equation →

- ① It makes easy to study a reaction with a single glance.
- ② Requires less time and efforts as compare to chemical reaction.
- ③ Give additional information also which a chemical reaction does not.

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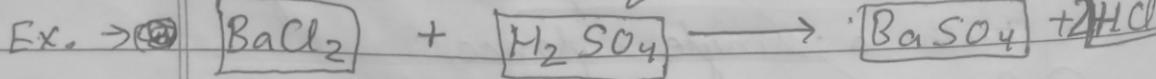
⇒ Balanced Chemical equation → Equations having equal number of atoms on reactants side as well as product side, are called balanced chemical equations.



⇒ Unbalanced Chemical equations →

Equations having unequal number of atoms on reactants side and product side, are called unbalanced chemical equations. It needs to be balanced. It is also called skeletal chemical equations.

⇒ Balancing → Method in which we balance the <sup>chemical</sup> equations, called balancing

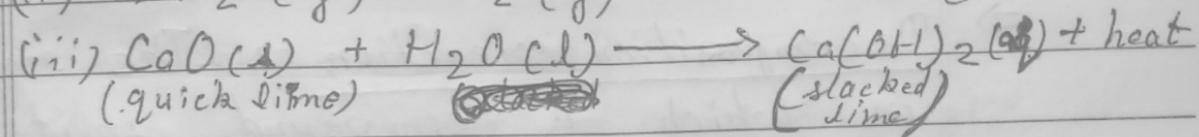
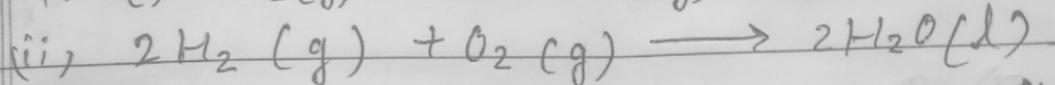
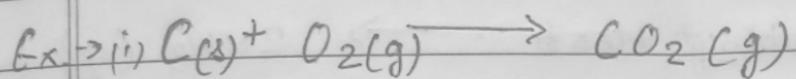


Elements LHS	RHS
Ba 1	1
Cl 2	1
H 2	1
S 1	1
O 4	4



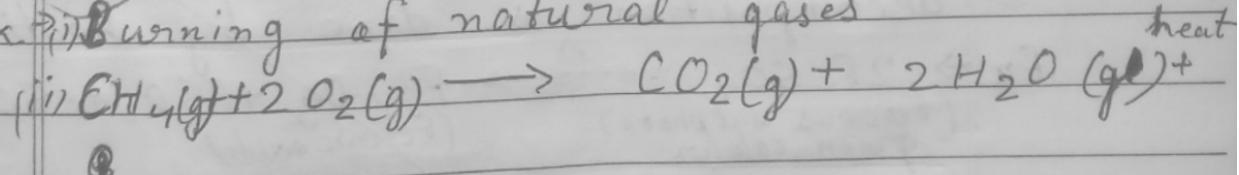
## # Types of reaction

⇒ ~~Combination reaction~~ → The reactions in which two or more reactant combine to form single ~~more~~ product are called combination reactions.

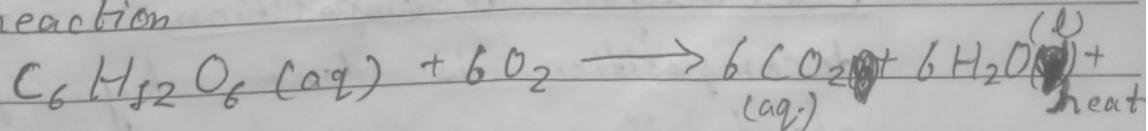


⇒ Exothermic reaction → Reactions in which heat is released alongwith formation of products are called exothermic reactions.

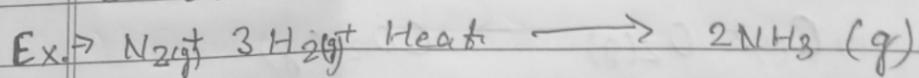
Ex - (i) Burning of natural gases



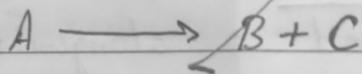
(iii) Respiration is also an exothermic reaction



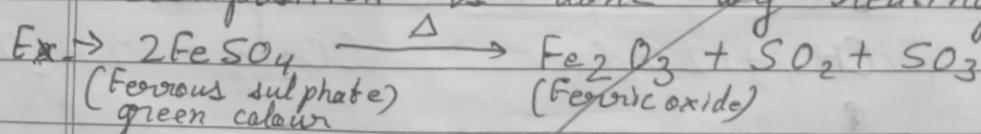
→ Endothermic reaction → The reactions which require energy in the form of light, heat or electricity to break reactants are called endothermic reactions.



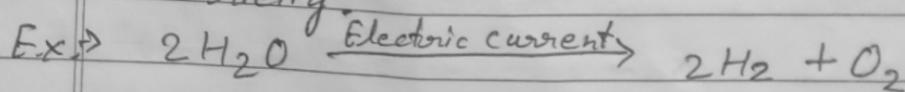
→ Decomposition reaction → The reactions in which a compound splits into two or more simpler substances are called decomposition reaction.



→ Thermal decomposition reaction → When decomposition is done by heating.



→ Electrolytic decomposition → when decomposition is done by passing electricity.



⇒ Photo  
when  
the  
Ex.  $\rightarrow 2\text{Ag}$

⇒ Displ  
react  
elem  
elem  
displ  
Ex.  $\rightarrow$

⇒ Double  
in w  
by  
two

Ex.  $\rightarrow \text{Na}_2$

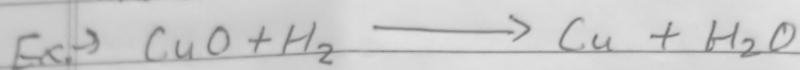
⇒ Oxide  
oxig  
ator

Ex.  $\rightarrow 2\text{C}$

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<p>reactions the form icity to led</p>	<p>⇒ <u>Photolytic decomposition reaction</u> → when decomposition is done by in the presence of sunlight.</p> <p>Ex. <math>\rightarrow 2\text{AgCl} \xrightarrow{\text{sunlight}} 2\text{Ag} + \text{Cl}_2</math></p>
<p>13 (g)</p> <p>e reactions splits into substances reaction.</p>	<p>⇒ <u>Displacement reaction</u> → The <del>chemical</del> reactions in which more reactive element displaces less reactive element from its salts, are called displacement reaction.</p> <p>Ex. <math>\rightarrow \text{Fe} + \text{CuSO}_4 \longrightarrow \text{FeSO}_4 + \text{Cu}</math></p>
<p>bition → when heating. <math>\text{O}_2 + \text{SO}_3</math></p>	<p>⇒ <u>Double displacement reaction</u> → A reaction in which new compounds are formed by mutual exchange of ions between two compounds.</p> <p>Ex. <math>\rightarrow \text{Na}_2\text{SO}_4 + \text{BaCl}_2 \longrightarrow \text{BaSO}_4 + 2\text{NaCl}</math></p>
<p>→ when passing <math>+ \text{O}_2</math></p>	<p>⇒ <u>Oxidation</u> → It is a process of gaining oxygen during a reaction by an atom, molecule or ion.</p> <p>Ex. <math>\rightarrow 2\text{Cu} + \text{O}_2 \longrightarrow 2\text{CuO}</math></p>

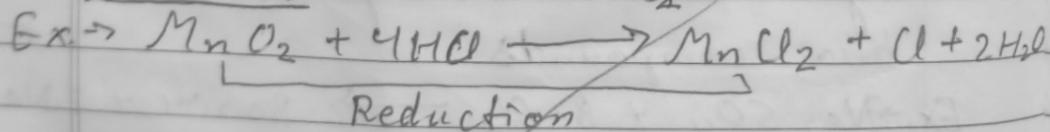
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⇒ Reduction → It is the gain of electron or a decrease in the oxidation state of an atom by another atom, an ion or a molecule.



In this reaction  $\text{CuO}$  is reduced to  $\text{Cu}$  and  $\text{H}_2$  is oxidised to  $\text{H}_2\text{O}$ , in other words one reactant gets oxidised while the other gets reduced such reactions are called oxidation-reduction reaction or redox reaction.

⇒ Redox reaction (oxidation-reduction reaction) → ~~Redox~~ ~~Oxidation~~ ~~Reduction~~



Reduction

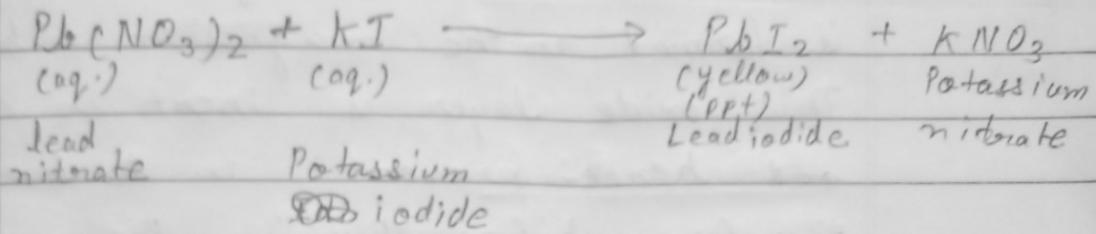
⇒ Redox reaction → The reaction in which the reduction and oxidation takes place simultaneously, is called a Redox reaction



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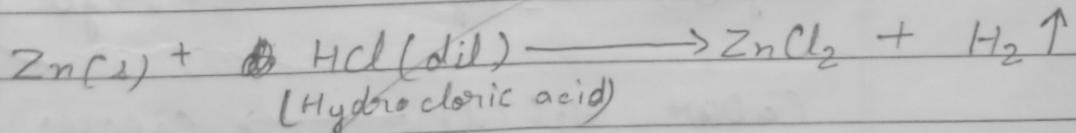
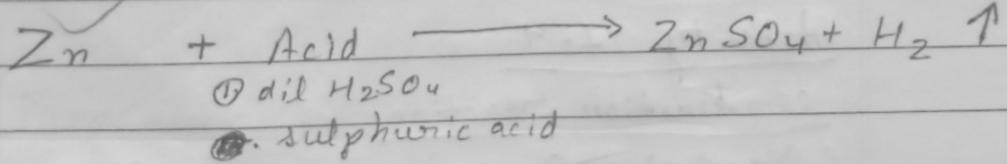
### Activity - I.2



### Observation

- ① Change in Colour  
Yellow colour obtained
- ② formation of precipitate of  $\text{PbI}_2$

### Activity - I.3



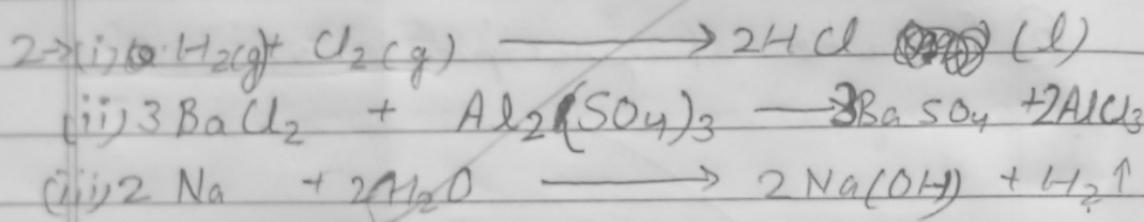
### Observation

- ① Bubbles surrounds the Zn granules
- ② Bubbles is of  $\text{H}_2$  gas
- ③ The ~~hot~~ conical flask becomes hot, the reaction is exothermic



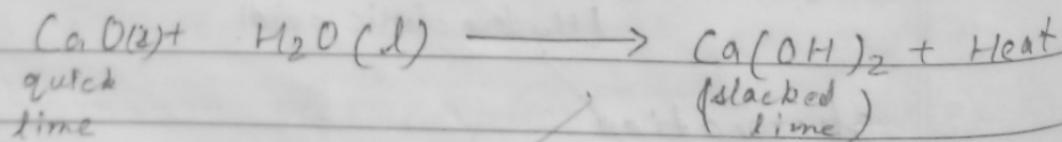
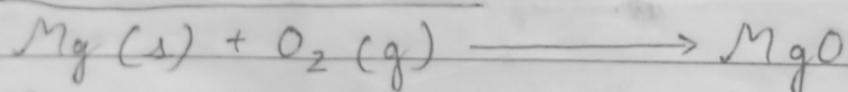
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Pg-6-1 → With the time a layer of oxide is formed on the magnesium ribbon. This oxide layer is inert in nature and hence prevent  $\text{Mg}$  burning. therefore before burning the magnesium ribbon is cleaned with sandpaper to remove the inert layer.



## Activity - 1.4

## Combination reaction

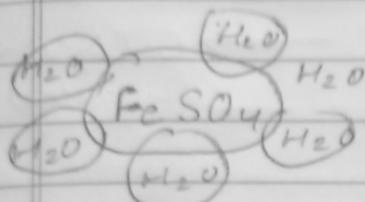


## observation

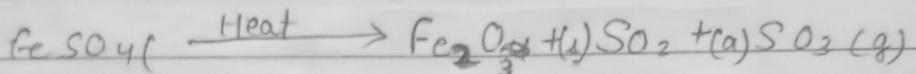
- ① Hissing sound
  - ② container becomes hot
  - ③ Exothermic reaction
  - ④ white washing

### Activity - f.5

of oxide  
ribbon  
in nature  
burning.  
magnesium  
sandpaper



— water of crystallisation



(l)  $\text{BaSO}_4 + 2\text{AlCl}_3$   
 $\text{BaSO}_4 + 2\text{AlCl}_3 \rightarrow \text{Ba}(\text{Al}_2\text{O}_4)_2 + \text{H}_2\text{S}\text{O}_4$  or  $\text{Al}_2\text{O}_3$

observation

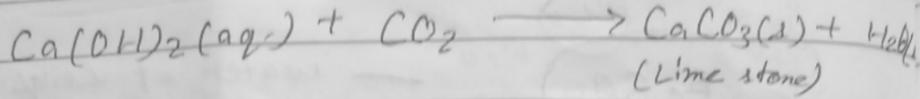
- ① The colour of a crystal was green before heating it changes to brown after heating due to evaporation of water of crystallisation.
- ② Pungent smelling gas was evolved.

### Precaution

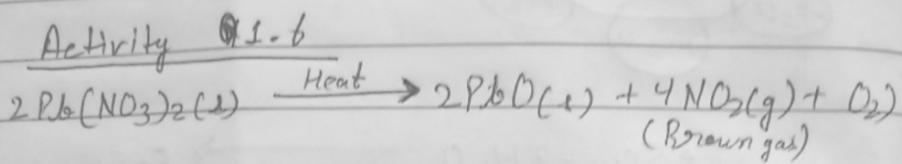
- ③ Do not point the mouth of boiling test tube at your neighbour or yourself



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Activity  
Photoly



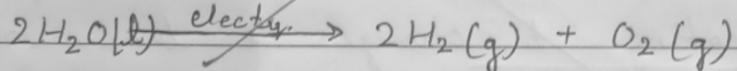
DNA  
2 AgCl

Q → why?  
Ans. → We know

approximate  
AgCl  
effect on pH  
1 ✓  
Activity

Activity - I. 7

Electrolytic decomposition of water



Anode - Oxidation

- Add of negative atom

Cathode - Reduction

blue  
yellow

CuSO<sub>4</sub>  
(Blue colour)

Hydrogen gas is produced in more amount because the ratio of hydrogen and Oxygen atom in one molecule of water ( $\text{H}_2\text{O}$ ) is 1:2 (O:H).

since, the number of hydrogen atom is more that's why the amount of hydrogen is more.

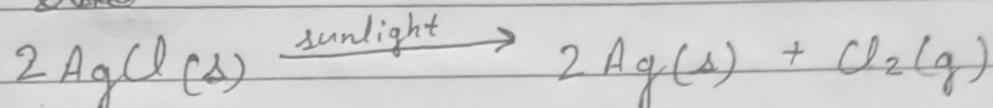
Observation  
(i) Colour  
light green  
(ii) Iron n

Heat

H<sub>2</sub>O(l)Activity - I.8

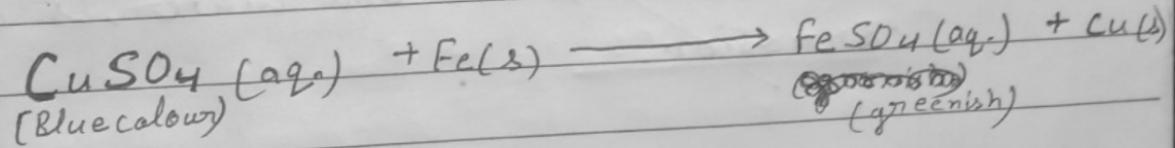
Photolytic decomposition of AgCl

Ques



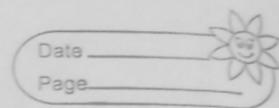
Q)  $\rightarrow$  why AgCl is stored in dark covered bottles?

Ans.  $\rightarrow$  We know that black colour absorbed light approximately. To prevent sunlight from AgCl we covered ~~the~~ bottles so that ~~the~~ photolytic decomposition is not done <sup>with</sup> AgCl.

Activity - I.9Observation

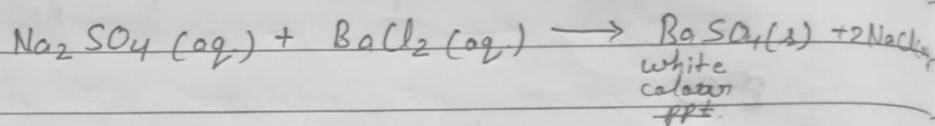
- (i) Colour of CuSO<sub>4</sub> changes from blue to light green.
- (ii) Iron nail becomes brown in colour.

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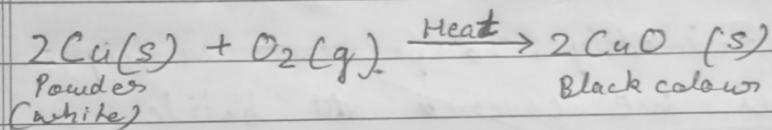
### Activity - 1.10

P.g.-10 →  
BaCl<sub>2</sub>



This  
and

### Activity - 1.11

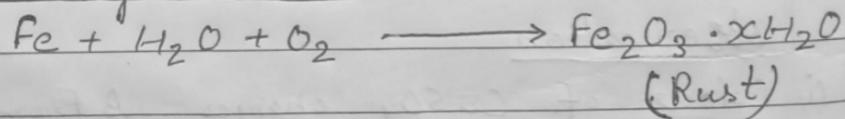


o-1 > A solu  
for  
formu  
(ii) write  
'x' n

~~Activity 1.11~~ → Corrosion → Eating away of metals with the action of air and water, is called corrosion

Ans → (i) Q  
(ii) C

### Rusting of iron



(Brownish colour)

P.g. - 13-10  
I → 10  
sulph  
sulph  
displa  
That,

⇒ Rancidity → When fat or oil containing food materials get oxidised, this process called rancidity.

CuS

P.g-10 →



+ 2 NaCl(aq)

This is a double displacement reaction.  
and exothermic reaction.

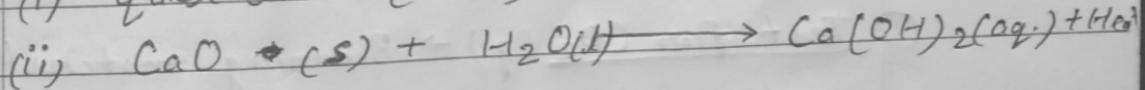
Q-1) A solution of a substance 'x' is used for whitewashing.

(i) Name the substance 'x' and write its formula.

(ii) Write the reaction of the substance 'x' named in (i) above with water.

with

Ans → (i) quick lime ( $\text{CaO}$ )



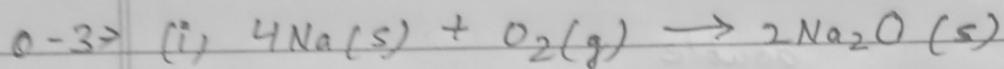
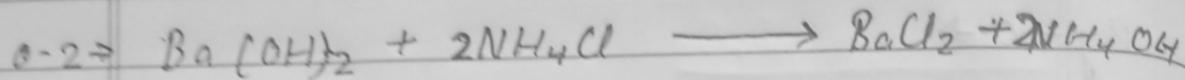
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P.g.-13-①

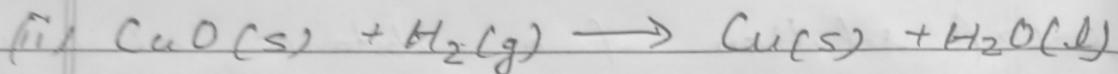
I → because iron nail react with copper sulphate solution and form ferrous sulphate and copper in which iron displaces copper and colour of copper

II → ferrous sulphate is greenish.  
That's why colour changed.





In this reaction Na is oxidised and O<sub>2</sub> getting reduced.



In this reaction H<sub>2</sub> getting oxidised and CuO getting reduced.

### Decomposition of $\text{CaCO}_3$

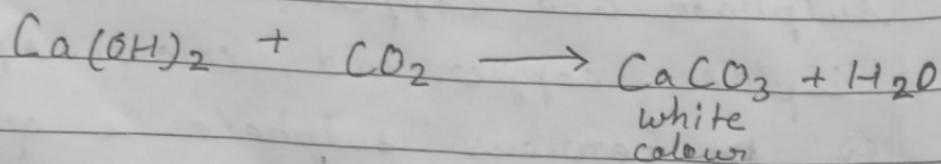
Calcium Carbonate



$\Rightarrow$

① Test for  $\text{CO}_2(\text{g}) \rightarrow$  Burning matchstick get extinguish on keeping it at the mouth of test tube

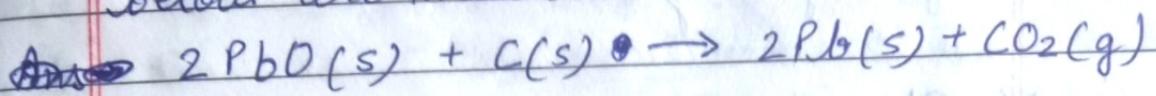
②  $\text{CO}_2$  gas when passed through lime water it turns lime water milky





## Exercises

Q-3 → Which of the statements about the reaction below are incorrect?



Ans → option-(i) (a) and (b)

Q-4 → What is a balanced chemical equation? Why should chemical equations be balanced?

Ans → Equations having equal numbers of atoms on reactants side as well as product side are called balanced chemical equation.

Chemical equations should be balanced because unbalanced chemical equations break the law of conservation of mass. So it need to be balanced.

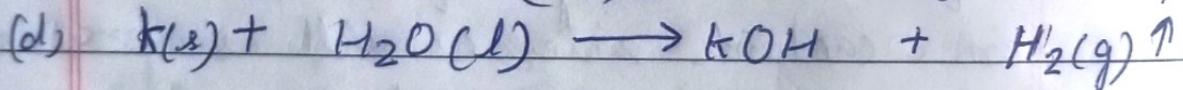
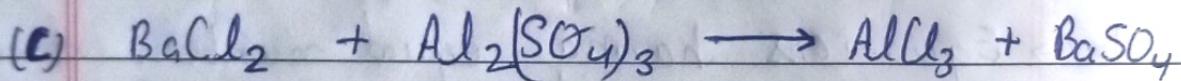
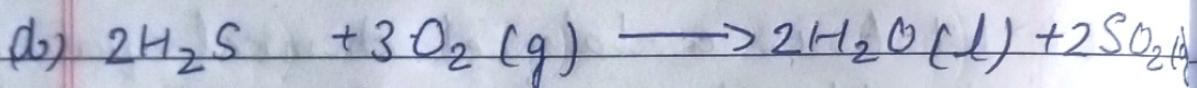
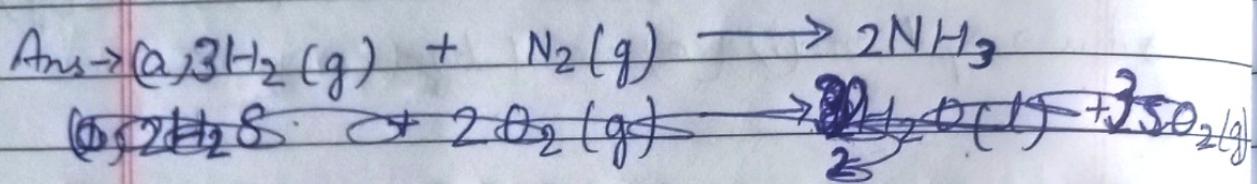
Q-5 → Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

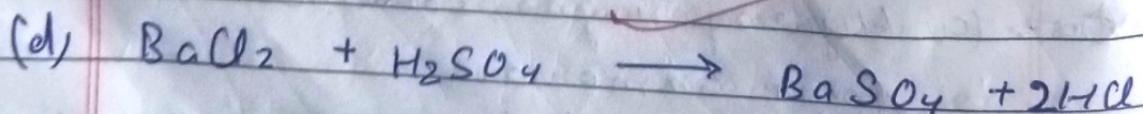
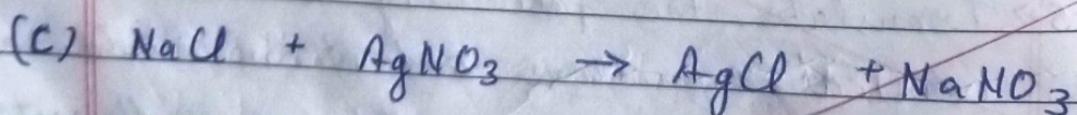
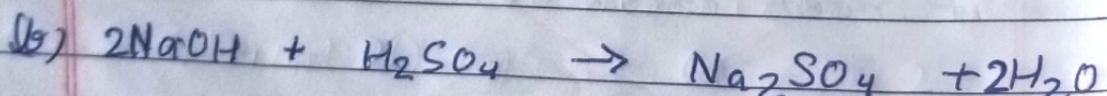
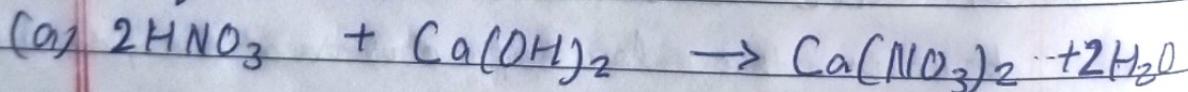
(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

(c) Barium ~~not~~ chloride reacts aluminium sulphate to give aluminium chloride and a precipitate of Barium ~~chloride~~ sulphate

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas



6) Balance the following chemical equations,



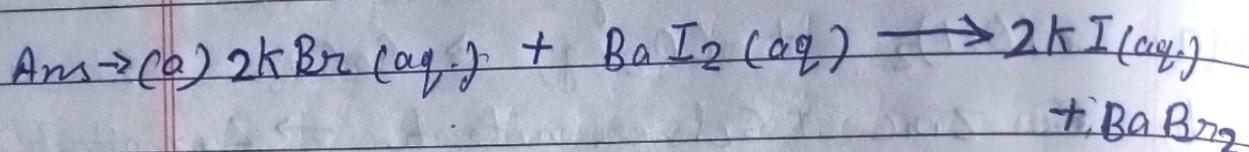
7) Write the balanced chemical equations for the following reactions.

- (a) ~~Ca(OH)<sub>2</sub>~~ + CO<sub>2</sub>(g) → CaCO<sub>3</sub> + 2H<sub>2</sub>O
- (b) Zinc + Silver nitrate → Zinc nitrate + ~~Silver~~
- (c) Aluminium + copper chloride → Aluminium chloride + copper
- (d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride
- ~~Answ:~~ Zn(s) + 2AgNO<sub>3</sub> → Zn(NO<sub>3</sub>)<sub>2</sub> + 2Ag(s)
- (e) 2Al(s) + 3CuCl<sub>2</sub> → ~~BaSO<sub>4</sub>~~ + ~~CO<sub>2</sub>~~  
~~2AlCl<sub>3</sub> + 3Cu(s)~~
- (f) BaCl<sub>2</sub> + K<sub>2</sub>SO<sub>4</sub> → BaSO<sub>4</sub> + 2KCl

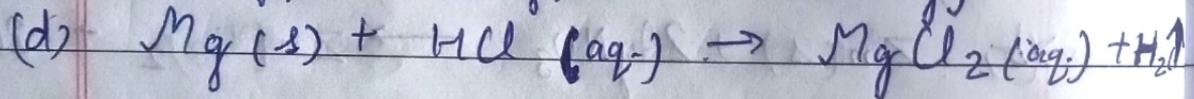
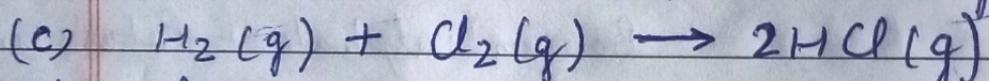
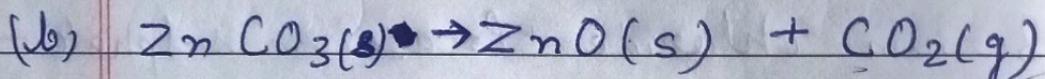
Q-8) Write the balanced chemical equation for the following and identify the type of reaction in each case.

- (a) Potassium bromide(aq.) + Barium iodide(aq.)  
→ Potassium iodide(aq.) + Barium bromide(s)
- (b) Zinc carbonate(s) → Zinc oxide(s) + ~~Zinc~~  
Carbon dioxide(g)
- (c) Magnesium(s) + Hydrochloric acid(aq.)  
→ Magnesium chloride(aq.) + Hydrogen(g)
- (d) ~~Magnesium(s)~~ + Hydrochloric acid(aq.)  
→ Magnesium chloride(aq.) + Hydrogen(g)
- (e) Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)

~~Ans →  $KI(aq) + BaI_2(aq) \rightarrow$~~

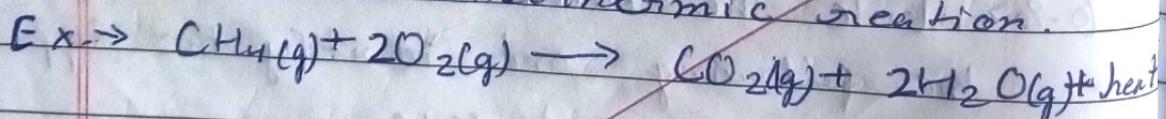


(b) ~~ZnO(s)~~



Q - 9 → What does one mean by exothermic and endothermic reactions? Give example

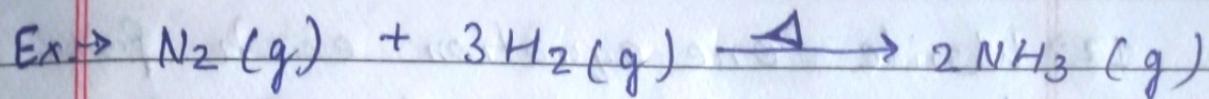
Ans → Exothermic reaction → Reactions in which heat is released along with the formation of products, are called exothermic reaction.



~~Endothermic reactions → Reactions which require energy in the form of light, heat or electricity to proceed.~~

P

Endothermic reactions → Reactions in which absorption of heat takes place, are called endothermic reactions.



Q-10  $\rightarrow$  Why is respiration considered an exothermic reaction? Explain.

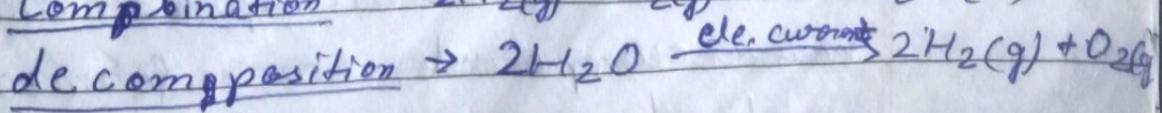
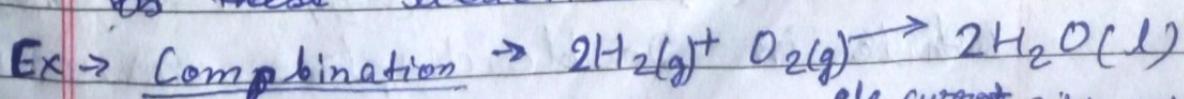
Ans  $\rightarrow$  Because during respiration a large amount of heat is released. ~~When~~ During Carbohydrates are broken down to form glucose. This glucose combines with oxygen in the cells ~~of~~ of our body and provides energy.

Q-11  $\rightarrow$  Why are ~~the~~ decomposition reactions called the opposite of combination reactions?

Write equations for these equations.

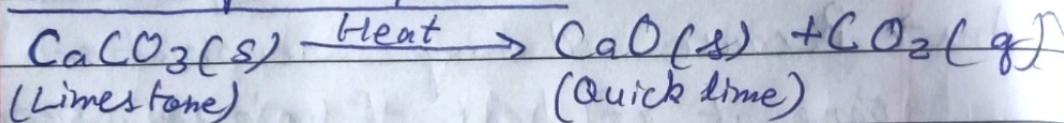
Ans  $\rightarrow$  ~~Because~~ In combination two or more reactants combine to form single product while, in decomposition reaction one reactant splits into two or more reactants.

~~As these reactions~~

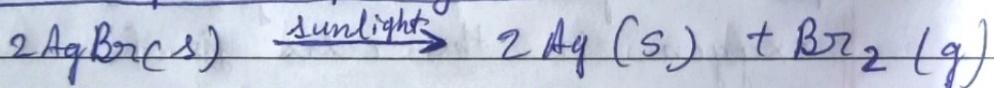


12) Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

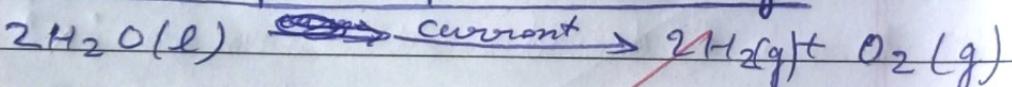
~~Ans~~ In the form of Heat



In the form of light



In the form of electricity



I3 → What is the difference between displacement reaction and double displacement reactions? Write equations for these reactions.

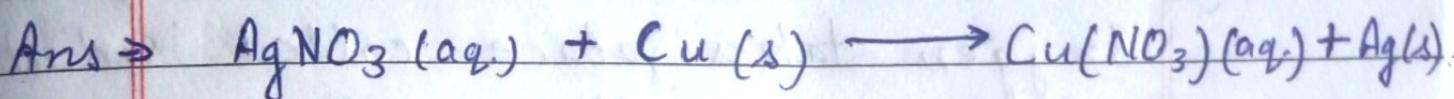
Ans → In displacement reaction highly reactive element displace lower reactive element from it.

$$\text{Ex. } \rightarrow \text{Zn(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{ZnSO}_4\text{(aq)} + \text{Cu}$$

while in Double displacement reactions new compounds are formed by mutual exchange of ion between two ~~com~~ compounds.

$$\text{Ex. } \rightarrow \text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$$

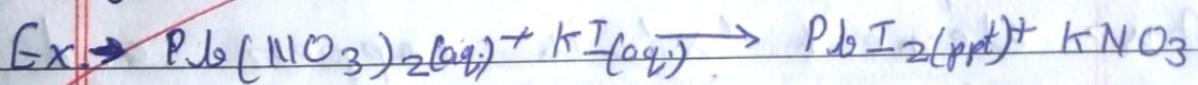
Q-14) In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.



Q-15) What do you mean by a precipitation reaction? Explain by giving examples.

Ans  $\rightarrow$  Reactions in which precipitate is formed, are called precipitation reaction.

Precipitation is a solid substance which settle down during the reaction.



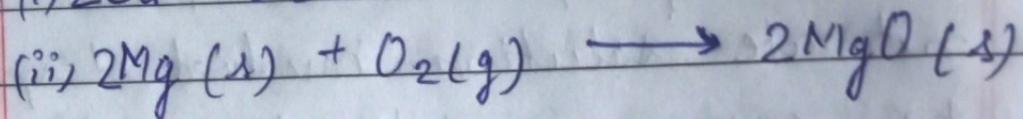
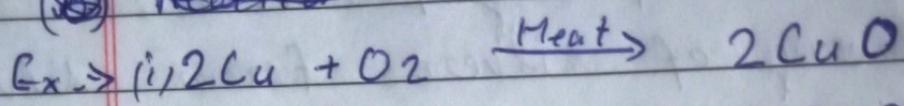
Q-16) Explain the following terms in terms of gain or loss of oxygen with two examples each.

(a) Oxidation

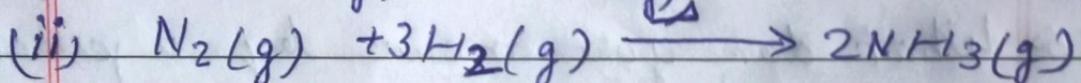
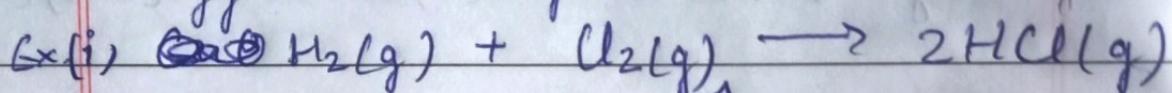
(b) Reduction

Ans  $\rightarrow$  (a) Reactions in which addition of oxygen atoms or removal of hydrogen atoms both takes place, are called oxidation.

(10) Reactions

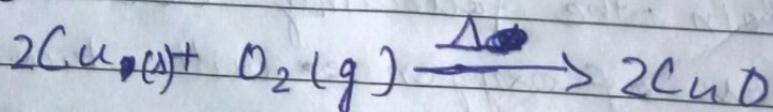


(b) Reactions in which removal of oxygen takes place, called reduction



Q-17  $\rightarrow$  A shining brown coloured element 'X'. on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Ans  $\rightarrow$  Element 'X' is copper and black coloured substance is CuO.



Q-18  $\rightarrow$  Why do we apply paint on iron articles?

Ans  $\rightarrow$  To prevent the contact of water ( $\text{H}_2\text{O}$ ) and oxygen ( $\text{O}_2$ ) from the iron articles so that iron does not corrode.

Q-19  $\rightarrow$  Oil and fat containing food items are flushed with nitrogen. Why?

Ans  $\rightarrow$  ~~To~~ To prevent the contact of oxygen ( $O_2$ ) from oil and fat containing food items. so that food items do not go rancid.

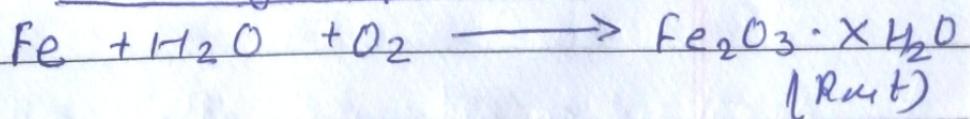
Q-20  $\rightarrow$  Explain the terms with one examples each.

~~Ans~~  $\rightarrow$  (a) Corrosion

(b) Rancidity.

Ans  $\rightarrow$  (a) ~~Eating~~ Eating away of metals by oxygen and ~~water~~ water. This process is called corrosion.

Ex  $\rightarrow$  ~~Rusting~~ Rusting of iron



(Brownish color)

(b) ~~When~~ fat and oil containing food items get oxidised, this process is called rancidity.