

CHEMICAL REACTION EQUATION

1. INTRODUCTION

- ✂ Change is the law of nature. Scientist classifies these changes as physical changes and chemical changes. When a chemical change occurs. A chemical reaction is said to have taken place.
- ❖ **Physical change:-** A change in which the physical properties of the substance changes but the chemical composition does not change. The substance is restored to its original state as soon as the cause of change is withdrawn.
- ❖ **Chemical change:-** In a chemical change, at least one the reacting substance changes into a new substance with a different composition. The new substance can be changed back to the original substance even if the cause of change is withdrawn.
- ❖ **Difference between physical & chemical change:-**

S.No.	Physical change	Chemical change
1.	The identity of the substance is maintained.	The identity of the original substance is completely lost.
2.	The change is temporary, the substance returns to its original state as the cause of. change is withdrawn	The change is permanent.
3.	No new substance is produced.	A new substance is always produced.
4.	Heat change may or not occur.	Heat change may occur.
5.	Only the physical state or some of the physical properties of the substance are changed.	The substance after the change cannot come back to its original state even when the cause of change is withdrawn.

- ❖ **Chemical reaction:-** The processes, in which a substance or substance undergo a chemical change to produce new substance or substance, with entire new properties, are known as chemical reaction. The nature and identity of products totally changes from the reactants. Observations which determines whether the chemical reaction has taken place or not.
 - (a) Chemical reaction must be associated with change in temperature i.e. Heat should be either evolved or absorbed.
 - (b) The reaction must occur between fixed quantities of the reactants.
 - (c) The chemical reaction should follow the law of conservation of mass.
 - (d) The products obtained must have properties different from those of the reactants.

- ✂ **Example** – (i) When potassium nitrate is heated, it gives potassium nitrite and oxygen.
 (ii) When sodium reacts with water sodium hydroxide is produced and hydrogen gas is liberated.

As description of a chemical reaction in a sentence from quote long so when it is written in short form by using word and some signs (+ for addition & arrow (→) to show the direction), than it is called **Word equation**.

- ❖ **Word equation:** - A chemical equation which represents a chemical reaction briefly in word is called word equation.

Ex. – For the example (ii) the word equation is

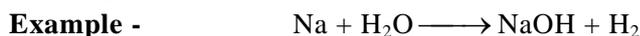


- ❖ **Reaction:-** The substance or substance which takes part in a chemical reaction are called reactants.
- ❖ **Products:-** The new substance or formed as a result of a chemical reaction are produces.
 in the above reaction sodium & water and sodium hydroxide & hydrogen are products.

RULES FOR WRITING A WORD EQUATION

- (i) The substance taking part in chemical reaction reactants are always written in the left hand side of arrow.
- (ii) The substance formed after the chemical reaction, products are written on the right hand side of arrow.
- (iii) A plus sign (+) is put between the reactants or between the products. If their number is two more.
- (iv) An arrow (→) is put between the reactants and products, the arrow shows the direction of the reaction in which the reaction proceeds. The arrow is read as “to yield “ or “from”.

In the word equation when symbol and chemical formula of the reactants and products are used then it is called as chemical equation.



i.e. A chemical equation is a statement that describes a chemical reaction in terms of symbol and formula. In this equation the law of conservation of mass is not obeying. Such chemical equation is called skeletal equation or unbalanced equation.

A chemical equation expressed symbol and formulae, such that the number of atoms of different elements towards the side of the reactants is not equal to the number of atoms if the products are called skeletal equation or unbalanced equation.

To make this equation meaningfully, this equation is balanced then it is called balance chemical equation

Charge Table

-1 Charge	Formula	-2 Charge	Formula	-3 Charge	Formula
Name of Ion		Name of Ion		Name of Ion	
Bromide ion	Br^-	Oxide ion	O^{2-}	Nitride ion	N^{3-}
Chloride ion	Cl^-	Sulphide ion	S^{2-}	Phosphide ion	P^{3-}
Fluoride ion	F^-			Boride ion	B^{3-}
Iodide ion	I^-				
Hydrogen carbonate	HCO_3^-	Carbonate ion	CO_3^{2-}	Phosphate ion	PO_4^{3-}
Hydrogen sulphate or (bisulphate ion)	HSO_4^-	Manganate ion	MnO_4^{2-}	Arsenite ion	AsO_4^{3-}
Hydroxide ion	OH^-	Thiosulphate ion	$\text{S}_2\text{O}_3^{2-}$	Arsenite ion	AsO_3^{3-}
Nitrate ion	NO_3^-	Silicate ion	SiO_3^{2-}		
Chlorate ion	ClO_3^-	Sulphate ion	SO_4^{2-}	Phosphite ion	PO_3^{3-}
Nitrite ion	NO_2^-	Sulphite ion	SO_3^{2-}	Borate ion	BO_3^{3-}
Permanganate ion	MnO_4^-	Chromate ion	CrO_4^{2-}	Ferricyanide ion	$[\text{Fe}(\text{CN})_6]^{3-}$
Acetate ion	CH_3COO^-	Dichromate ion	$\text{Cr}_2\text{O}_7^{2-}$		
Cyanide ion	CN^-	Hydrogen phosphate ion	HPO_4^{2-}		
Hypophosphite ion	H_2PO_2^-	Oxalate ion	$\text{C}_2\text{O}_4^{2-}$		-4 Charge
Meta aluminate ion	AlO_2^-			Carbide ion	C^{4-}
	+1 Charge			Ferrocyanide ion	$[\text{Fe}(\text{CN})_6]^{4-}$
Ammonium ion	NH_4^+				

One which contains an equal number of atoms of each element on both side of the equation.

Balancing chemical equation:-

The simple equations are balance by “hit and trial method”. Which is done in following steps?

Step (i) – Count the no. of atoms of various elements on both sides of the equation



Element	No. of atoms in reactants (LHS)	No. of atoms in products (RHS)
Fe	1	3
H	2	2
O	1	4

Step (ii) – Start balancing with the compound Which contains maximum number of atoms. It may be reactant or product. In that compound select the element which has maximum number of atoms.

According to this rule Fe_3O_4 has maximum number of atoms & oxygen has 4 atoms so it is selected.

S.No.	Atoms of oxygen	In reactant	In products
1	Initial	1	4
2	To balance	1x4	4

So the partly balance equation is



Step (iii) – Fe and H are not balanced in the above reaction so the above reaction repeat the above process for both i.e.

S.No.	Atoms of Hydrogen	In reactants	In products
1	Initial	8	2
2	To balance	8	2x4

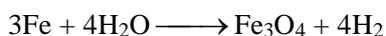
Now the equation becomes as



Step (iv) – Balance the Iron atoms similarly.

S.No.	Atoms of Iron	In reactants	In products
1	Initial	1	3
2	To balance	1x3	3

Now the equation is



Step (v) – Finally check the correctness of the balanced equation by counting the number of atoms on both sides of the equation.

Element	No. of atoms in Reactants	No. of atoms in products (RHS)
Fe	3	3
H	8	8
O	4	4

Step (vi) – To make chemical equation more informative physical states of the reactants and products are mentioned as for solid (s), liquid (l), gas (g) and for aqueous solution of reactant or product (aq) is written.

Now the equation become as



Symbol (g) with water is written to show is used in the form of steam in this equation.

If a gas is evolved in a reaction it can be show by the symbol (↑) after the formula i.e. arrow pointing upwards e.g.

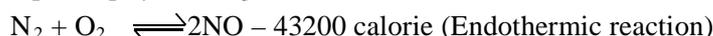
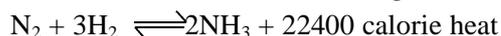


The symbol (↓) or ppt is be written for precipitate.

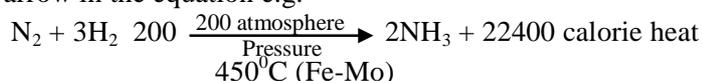


Reversible reaction is represented by (\rightleftharpoons) symbol and irreversible reaction by (\rightarrow) symbol.

The heat evolved in chemical reaction is written on the right side by putting positive (+) sign and heat absorbed in the chemical reaction is written on the right hand side by putting negative (-) sign.



Sometimes the reaction conditions, such as temperature, pressure, catalyst etc. are written above or below the arrow in the equation e.g.



❖ **Exothermic reaction:-** The reaction in which heat is liberated (or given out) is called an exothermic reaction



❖ **Endothermic reaction:-** The reaction in which heat is absorbed (or taken in) is called an endothermic reaction



The reaction with + Heat term on the product be are called exothermic reaction, while those with – Heat term on the product side are called endothermic reactions.



During respiration, the digested food get oxidised and the energy is released. That is why, it is coasid ered as an exothermic reaction.

❖ Balance of chemical equation is necessary because no matter (hence, no atom) is lost or gained during a chemical reaction.

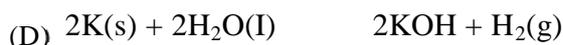
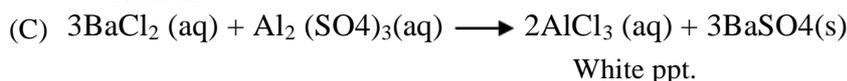
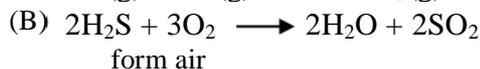
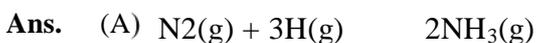
Q.1 Transfer the following statement into chemical equation and then dioxide.

(A) Hydrogen gas combines with nitrogen to form ammonia

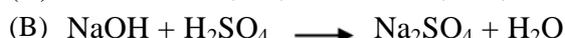
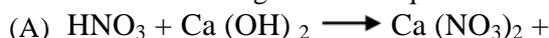
(B) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

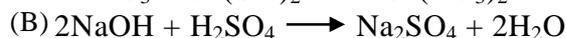
(C) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

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



Q.2 Balance the following chemical equations.





Q.3. Write the balance chemical equation for the following reactions.

(A) Calcium hydroxide + Carbon dioxide \longrightarrow Calcium carbonate + water

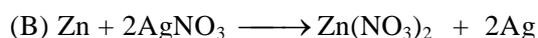
(B) Zinc + Silver nitrate \longrightarrow Zinc nitrate + Silver

(C) Aluminium + copper chloride \longrightarrow Aluminium chloride + copper

(D) Barium chloride + Potassium sulphate \longrightarrow Barium sulphate + Potassium chloride.



Calcium carbon calcium
hydroxide dioxide carbonate



zinc silver nitrate zinc nitrate silver



Aluminium copper aluminium copper
Chloride chloride



Barium potassium barium potassium
Chloride sulphate sulphate chloride

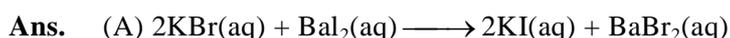
Q.4 Write the balance chemical equation for the following and identify the type of reaction in each case –

(A) Potassium bromide(aq) + Barium iodide(aq) \longrightarrow Potassium iodide(aq) + Barium bromide(s)

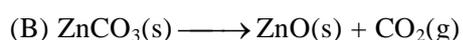
(B) Zinc carbonate (s) \longrightarrow Zinc oxide (s) + Carbon(g)

(C) Hydrogen(g) + Chloride(g) \longrightarrow hydrogen chloride(g)

(D) Magnesium (s) + Hydrochloride acid(aq) \longrightarrow Magnesium chloride(aq) + Hydrogen(g)



This reaction is a decomposition reaction



This reaction is a double-displacement reaction.

Q.5 Why should a magnesium ribbon be cleaned before burning in air?

Ans. Magnesium reacts with the constituent gases of the atmosphere to form various compounds which get deposited over its surface. The ribbon is cleaned before burning to remove the layer of these compounds so that pure magnesium can burn in air.

❖ **Types of chemical reaction:-** Chemical reaction occurs as a result of breaking and making of bonds resulting in surface. The ribbons is before burning to remove the layer of these compounds so that reactions are classified in different types. They are –

(1) **Combination reaction or synthesis reaction**

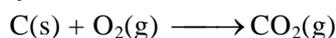
(2) **Decomposition reaction/Analysis reaction**

(3) **Displacement reaction**

(4) **Double displacement reaction/ Metathesis reaction**

(5) **Oxidation and Reduction reaction.**

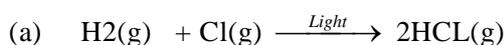
- (1) **Combination reaction:-** The reaction in which two or more substance combine to form a single new substance are called combination or synthesis reaction.



❖ **Combination reaction are not their common type:-**

- (i) Combination of two elements to form a

Compound eg.



- (ii) Combination of an element and compound to form a new compound.

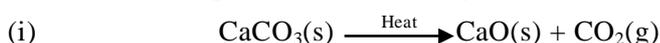


- (iii) Combination of two compounds to form a new compound:-



- (2) **Decomposition reaction:-** The reaction in which a single compound breaks up into two or more simpler substances are known as decomposition reaction. The decomposition reaction generally takes place when energy in some forms such as heat, electricity or light is supplied to the reactants.

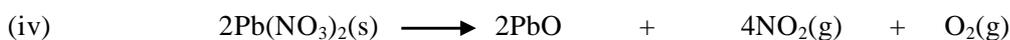
(a) **Decomposition reactions by heat (Thermal decomposition)**



(Lime stone) (Quick lime)

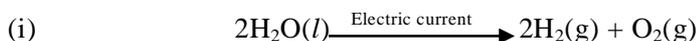


(Ferrous sulphate) (ferric oxide)

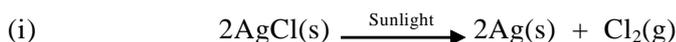


(Lead nitrate) (Lead oxide) (Nitrogen dioxide)

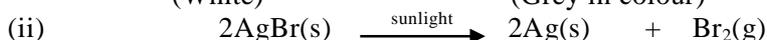
(b) **Decomposition by electricity (Electrical decomposition or Electrolysis)**



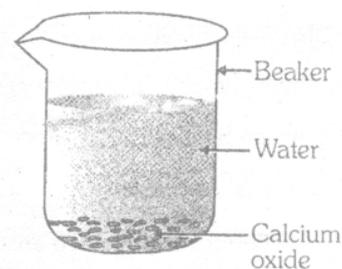
(c) **Decomposition by sunlight (Photochemical decomposition)**



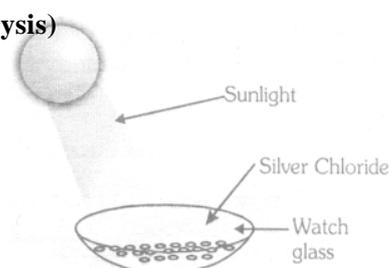
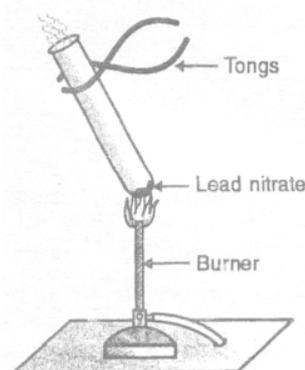
(Silver chloride) (Silver) (chloride)
 (White) (Grey in colour)



(Silver bromide) (Silver) (Bromine)



Formation of slaked lime by the reaction of quicklime with water

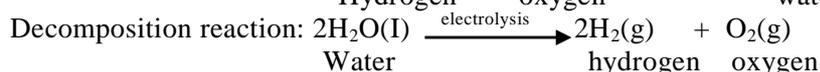
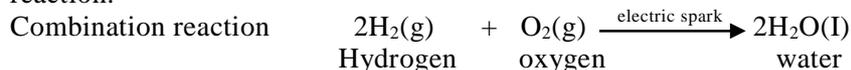


Photochemical decomposition of silver chloride to grey silver metal

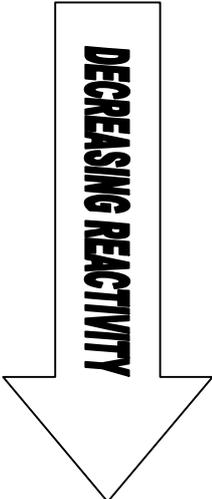
The decomposition of a compound with light is called **photolysis**.

Note:- All the decomposition reaction requires energy i.e. these reactions are **Endothermic reactions**. These reactions are used in extractions of metals.

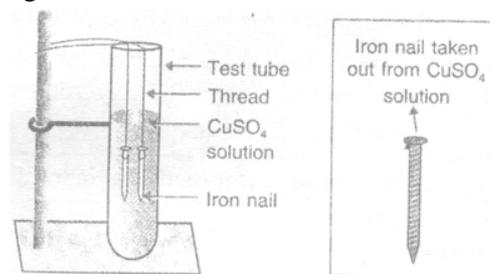
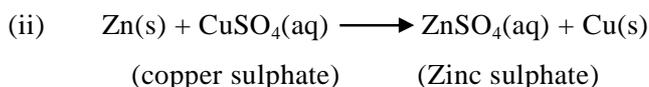
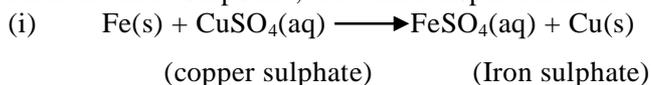
Decomposition reaction is called opposite of combination reaction. This can be supported by the following reaction:



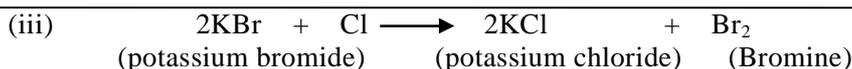
Activity Series of hydrogen and Common Metals

Potassium	K	Most Reactive  Least Reactive
Sodium	Na	
Barium Ba		
Calcium	Ca	
Magnesium	Mg	
Aluminium	Al	
Zinc	Zn	
Iron	Fe	
Nickel Ni		
Tin	Sn	
Lead	Pb	
Hydrogen	H	
Copper	Cu	
Mercury	Hg	
Silver Ag		
Gold Au		

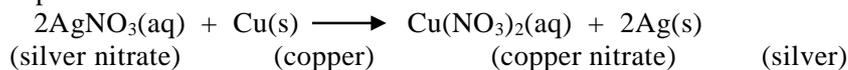
(3) **Displacement reactions:-** The chemical reaction in which one element takes the place of another element in a compound, are called displacement reaction e.g. -



Iron, zinc and are more reactive element than so they displace copper from its compounds.

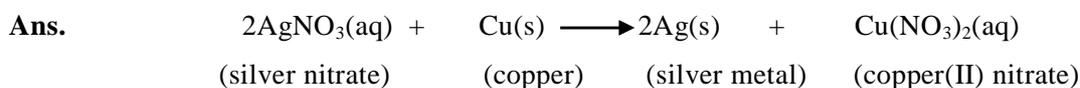


(iv) Copper displacement silver from silver nitrate.



Q.6 In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal.

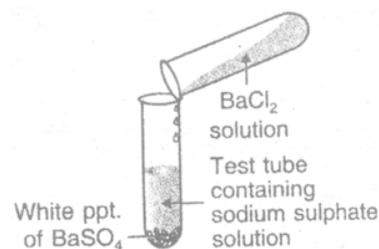
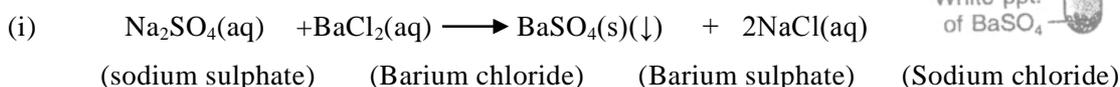
Write down the reaction involved.



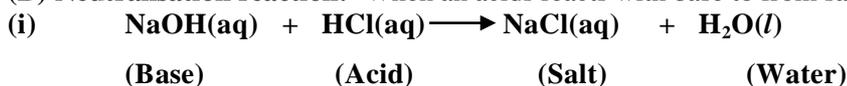
(4) Double displacement reaction :- The reactions in which two compounds react to form two different compounds by mutual exchange of ions, are called double displacement reactions. These reactions are also called as **Metathesis reaction**.

❖ **Two common types of double displacement reactions are –**

(A) Precipitation reaction:- Any reaction that produces a precipitate, (the insoluble substance formed), is called precipitation reaction e.g.-



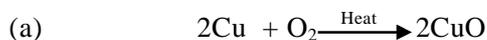
(B) Neutralisation reaction:- When an acid reacts with base to form salt and water by exchange of ions e.g.



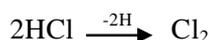
(5) Oxidation and Reduction reactions or Redox reaction:-

❖ **Oxidation:-**

(i) The addition of oxygen to an element or compound.

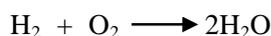


(ii) Removal of hydrogen from a compound is known as oxidation.



❖ **Reduction:-**

(i) The addition of hydrogen to an element or compound



(ii) Removal of oxygen from a compound.



❖ **Oxidation agent:-** The substance which gives oxygen or removes hydrogen for oxidation is called oxidizing agent and the substance which gains oxygen during reaction is said to be oxidised.

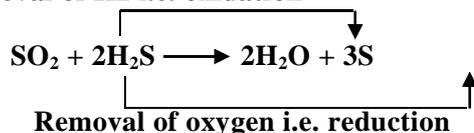
❖ **Reducing agent:-** The substance which gives hydrogen or removes oxygen for reduction is called reducing agent. The substance which gains hydrogen during reaction is said to be reduced.

Those reactions in which oxidation and reduction (both) occur simultaneously are called **redox** reactions.

In the name Redox the term 'red' stands for reduction and 'OX' stands for oxidation.



Removal of H₂ i.e. oxidation



Example

- SO₂ is reduced to sulphur, so it is oxidation agent.
- H₂S is oxidation to sulphur, so it is reducing agent.

It should be noted that substance which undergoes oxidation acts as reducing agent whereas the substance undergoes reduction act as oxidation agent.

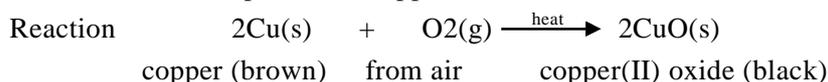
There is an another concept of oxidation and reduction in terms of metal and nonmetals. This is as follows -

- The addition of nonmetallic element (or removal of metallic element) is called oxidation.
- The addition of metallic element (or removal of nonmetallic element) is called reduction.

Q.7 A shiny brown coloured element 'X' on heating in air become black in colour. Name the element 'X' and the black coloured compound formed.

Ans. An element on heating in air changes in its oxide. The brownish element which form black oxide is copper. So, Name of the element Copper(Cu)

Name of black compound: Copper(II) oxide,(CuO)

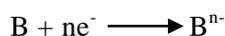


ELECTRONIC CONCEPT FOR OXIDATION AND REDUCTION

❖ **Oxidation** – The loss an electron by atoms or ions is called oxidation.

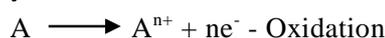


❖ **Reduction:-** The gain of an electron by an atoms or ion is called reduction.

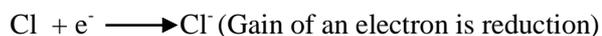
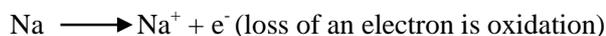


The atoms B gains n' electrons to become negatively charged ion Bⁿ⁻, it is called anion.

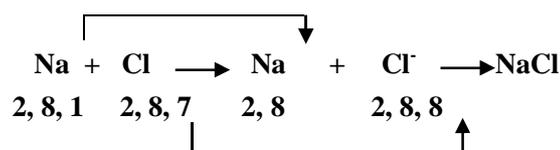
Oxidation and reduction reactions occurs simultaneously and are called as redox reactions. Only oxidation or only reduction is called half reaction. i.e.



in this process sodium loess one electron and oxidation to Na⁺, chloride gains this electron and is reduced to Cl⁻



Loss of an electron i.e. oxidation



Gain of an electron i.e. reduction

- ❖ **Effects of oxidation reaction in everyday life:-** Oxidation has damaging effect on metal as well as on food. The damaging effect of oxidation on metal is studied as corrosion and that on food is studied as rancidity. The two common effect of oxidation reaction are as

(i) Corrosion of metal (ii) Rancidity of food

- (i) Corrosion of metal:-** Corrosion is the process of deterioration of metal as a result of its reaction with air, moisture and acids. (Present in environment) surrounding it.

The corrosion causes damage to building, bridges, ships and many other articles especially made of iron.

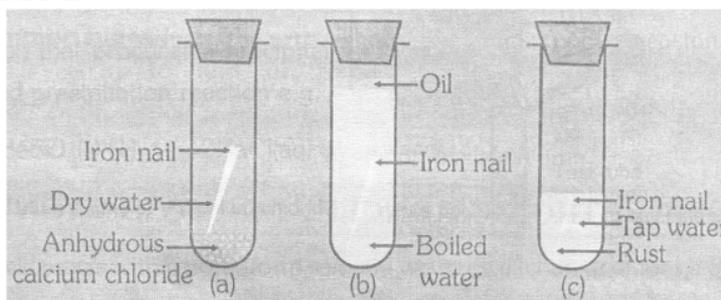
Rust: iron corrode readily when exposed to moisture and gets covered with a brown flaky substance called rust. It is called of iron, Rust is a hydrogen Iron (III) oxide $\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$

Rusting of iron takes place under the following conditions.

- (a) Presence of air (or oxygen)
- (b) Presence of water (or moisture)

It has been observed that

- (a) Presence of impurities in the metal speed up the rusting process. Pure iron does not rust.



- (b) Presence if electrolytes in water also speed up the process of rusting

- (c) The position of the metal in the electrochemical series determines the extent of corrosion. More the reactivity of the metal, the will be more possibility of the metal getting corroded. Other examples of corrosion are –

- (i) **Copper reacts with moist carbon dioxide in the air and slowly loses its shiny brown surface and acquires a green coating of basis copper carbonate.**
- (ii) **Silver articles become black after sometime when exposed to air because it reacts with sulphur to from a coating of a silver sulphide.**
- (iii) **Lead or stainless steel loses their lustre due to corrosion.**

Unreactive metal such as gold, platinum, palladium, titanium etc. do not corrode.

- ❖ **Rancidity:-** Fresh foods containing fats and oils smell and test pleasant but when it remains exposed in air for a long time it's smell and taste change to unpleasant. It is said that the food has become rancid.

OR

It is due to the oxidation of fats and oils, butter, ghee, boiled rice etc. after prolonged exposure to air i.e. The condition produced by the aerial oxidation of fats and oils in food marked by unpleasant smell and taste is called rancidity.

❖ **Prevention of rancidity:-**

(i) Rancidity can be prevented by adding antioxidants to food containing fats oils. Antioxidants are reducing agents so when they are added to food it do not get oxidation easily and hence do not turn rancid. The two common anti-oxidants are –

(a) **BHA (Butylated Hydroxy Anisole)**

(b) **BHT(Butylated Hydroxyl Toluene)**

Vitamin-E and vitamin –C (ascorbic acid) are the two antioxidants occurring in natural fats.

(ii) Rancidity can be prevented by packaging food in refrigerator.

(iii) It can be restarted by keeping food in refrigerator.

(iv) It can also be retarded by storing food in sir tight containers.

(v) It can be retarded by storing foods away from light.

ROUND UP

- When one or more substance (elements or compounds) undergo a chemical change, with the absorption or release of energy, so as to form one or more products, the changes taking place collectively is called **chemical reaction**.
- A chemical equation which represents a chemical reaction briefly in word is called **word equation**.
- The substance / substance which take part in a chemical reaction are called **reactants**.
- The new substance / substance formed as a result of chemical reaction are called **products**.
- A statement that describes a chemical reaction in terms of formulae, such that the number of atoms of different elements toward the side of reactants is not equal to number of atoms of same elements toward the side products is called **skeletal equation**.
- A chemical equation in which number of atoms of each element is same on the sides of reactants and products is called **balance chemical equation**.
- A balance chemical equation which symbolically represents the physical state of reactants and products is called **complete chemical equation**.
- When two element or compounds react chemically, to form a single new compounds, then chemical reaction is called **chemical combination reaction**.
- A chemical reaction which process with the release of heat energy is called **exothermic reaction**.
- When a chemical compound decomposes on heating or absorbing some kind of energy, so as to form two or more substance (elements or compounds) then the chemical reaction which takes place is called **chemical decomposition reaction**.
- When chemical compound decomposes on heating, so as to form two or more substance (element of compounds), then the reaction is called **thermal decomposition reaction**.
- Chemical reaction which proceeds on with the absorption of heat energy is called **endothermic reaction**.
- Chemical reaction in which a compound decomposes into simpler substance on the absorption of light energy is called **photo-decomposition reaction**.
- A decomposition reaction which takes place with the absorption of electric energy is called **electrochemical reaction**.

- When a more active element displaces less active element from its aqueous ionic compound, the reaction. Which takes place is called **chemical displacement reaction**.
- A chemical reaction in which two compounds in their aqueous solution, react by exchanging their ions/radicals, to form two new compounds is called **chemical double displacement reaction**.
- When the aqueous solution of two ionic compounds react by exchanging their ions/radicals to form two or more new compounds, such that one of the products formed is an insoluble salt, and hence forms precipitate is said to be precipitation reaction.
- When an aqueous solution of an acid reacts with a base (alkali) by exchanging their ions/radicals to form salt and water as the only products, the reaction which takes place is called **neutralization reaction**.
- **Oxidation** of a substance takes place, when it gains oxygen or loses hydrogen.
- **Reduction** of a substance takes place, when it gains hydrogen or loses oxygen.
- Formation of a layer of undesired compounds, such as metallic oxides and metallic hydroxide on the surface of metals is called **corrosion of metals**.
- The slow conversion of iron into its hydrated ferric oxide, in the presence of moisture and air is called rusting.
- The flaky, non-sticking brown powder formed on the surface of iron, when iron is exposed to moist air is called **rust**.
- The process due to which fats and other cooked materials go bad at room temperature is called **rancidity**.

SOLVED QUESTIONS

1. What is the basis of a balanced chemical equation ?

Or

State the law on which a balance chemical equation is based.

Or

State the law of conservation of mass.

Or

On what basis is a chemical equation balance ?

Ans. The basis of balanced chemical equation is the law of conservation of mass. Mass can neither be created nor destroyed in a chemical reaction.

2. Would you can call digestion of food in our body a chemical change?

Ans. Yes. It is a chemical change.

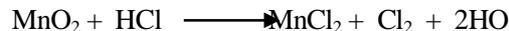
3. Balance the following chemical equation:



Ans. Balance chemical equation is



4. Balance the following chemical equation:

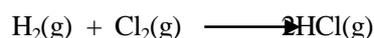


Ans. Balance chemical equation is



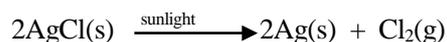
5. Write a combination reaction in which two gases combine.

Ans. Hydrogen and chloride gases combine to form hydrogen chloride.



6. What change in colour is observed when white silver chloride is left exposed to sunlight? What type of chemical reaction is this ?

Ans. When silver chloride is exposed to sunlight, the white colour of silver chloride changes to grey colour. This is a photochemical decomposition reaction.



7. Why do we apply paint on iron articles ?

Ans. We apply paint on iron article to protect them from corrosion.

8. How can you help your mother in keeping the fried items so they do not develop a bad smell and their shelf life is increased?

Ans. Since we cannot pack the fried object in the atmosphere of nitrogen at home we can increase the shelf life by keeping them in airtight containers. In this way do not come in contact with oxygen. Their shelf can further be increased by keeping them in fridge at low temperature.

9. A solution of a substance 'X' is used for white washing.

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

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

Ans. (i) Calcium oxide or quick lime, its formula is CaO.



Quick lime water Slaked lime

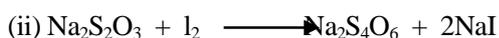
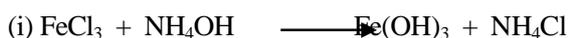
10. Write any two limitations of a chemical equation.

Ans. A chemical equation does not provide the following information:-

(i) Whether the reaction is fast, slow or instantaneous i.e. the rate of the reaction is not shown by a chemical equation.

(ii) Whether the reaction goes to completion or stopped in between i.e. the extent to which a reaction takes place is not known from a chemical equation.

11. Balance the following equation:



12. Distinguish between an exothermic and an endothermic reaction. Amongst the following reactions, identify the exothermic reaction and the endothermic reaction:

(i) Heating coal in air to form carbon dioxide.

(ii) Heating limestone in a lime kiln to form quick lime.

Ans. Exothermic reactions are those reaction in which heat is evolved

Endothermic reactions are those which involve absorption of heat.

(i) Heating coal in air to form carbon dioxide is an exothermic reaction.

(ii) Heating limestone in a kiln to form quick lime is an endothermic reaction.

13. What is an oxidation reaction? Give an example of oxidation reaction. Is oxidation an exothermic or an endothermic reaction?

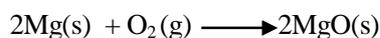
Ans. Reaction involving additions of oxygen are classified as oxidation reactions. For example magnesium reacts with oxygen to form magnesium oxide.



Oxidation reaction are generally exothermic nature.

14. Those reactions in which oxidation and reduction occur simultaneously, are called redox reactions. In these reactions one substance is oxidation and another substance gets reduced.

Ans. When a magnesium ribbon burns to form a white ash, magnesium metal is oxidized in this reaction because it combined with oxygen to form magnesium oxide.



15. In the reaction:



Identify the oxidising and reducing agents.

Ans. MnO_2 loses oxygen, therefore it is reduced, thus it acts as an oxidizing agent.

HCl loses hydrogen. It itself is oxidized, thus it acts as a reducing agent.

In the above reaction.

MnO_2 is oxidizing agent.

HCl is reducing agent.

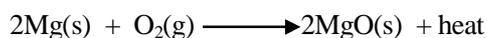
16. Give an example of a decomposition reaction. Describe an activity to illustrate such a reaction by heating.

Ans. Calcium carbonate decomposes on heating and forms calcium oxide and carbon dioxide.



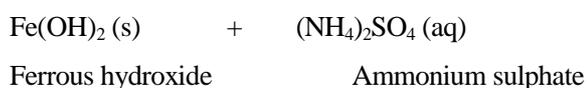
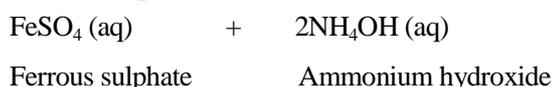
17. Define a combination reaction. Give one example of a combination reaction which is also exothermic.

Ans. Reaction in which two or more substances combine to form a new compound are called combination reactions. An example of this type of reactions is the combustion of magnesium in air, where magnesium combines with oxygen to form magnesium oxide, it is an exothermic reaction also.



18. Dilute solution of ammonium hydroxide is added to aqueous solution of ferrous sulphate. Ferrous hydroxide is formed. What is the type of this reaction? Write chemical equation.

Ans. It is a double decomposition reaction.



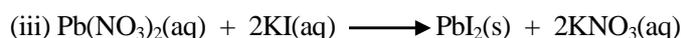
19. (i) What is observed when a solution of potassium iodide is added to a solution of lead nitrate taken in a test tube?

(ii) What type of reactions is this?

(iii) Write a balanced chemical equation to represent the above reaction.

Ans. (i) A yellow precipitate of lead iodide will be formed.

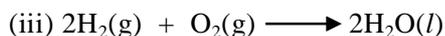
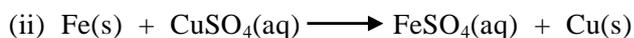
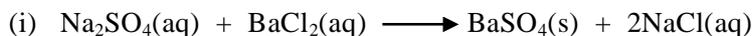
(ii) This is a double displacement reaction.



20. Why does the blue colour of copper sulphate solution change to green colour when an iron nail is dipped? Write chemical equation.

5. Identify the type of reaction in the following examples ;

[CBSE Delhi 2008]



Ans. (i) It is an example of double displacement reaction.

(ii) It is an example of displacement reaction.

(iii) It is an example of combination reaction.

6. Solid calcium oxide was taken in a container and water slowly to it

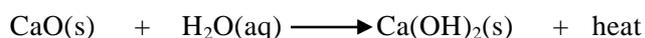
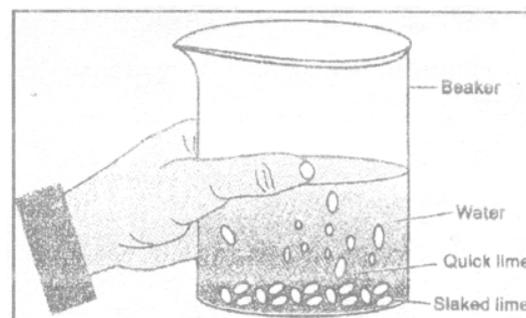
[CBSE All India 2008 Compt.]

(i) State two observation made in the experiment.

(ii) Write the name of the chemical formula of the product.

Ans. (i) Water will start boiling and hissing noise will be produced.

(ii) Calcium hydroxide (slaked lime) will be formed.



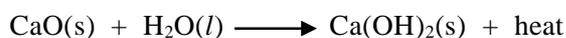
Calcium oxide

Calcium hydroxide

7. A house wife wanted her house to be white washed. She bought 10 kg of quick lime from the market and dissolved in 30 litres of water, she noticed that the water started boiling even when it was not being heated. Give reason for her observation. Write the corresponding equation and name the product formed.

[CBSE Delhi 2008 Compt.]

Ans. A suspension of slaked lime also called calcium hydroxide is formed when water is added to quick lime.



(Slaked lime)

Since the reaction is highly exothermic, the solution started although it was being heated. The suspension of lime is allowed to cool for some time, preferably overnight. It then decanted and the liquid obtained is used for white washing.

EXERCISE - 1

(A) OBJECTIVE TYPE QUESTIONS

- Which of the following is not a decomposition reaction?
 (A) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$ (B) $2\text{KClO}_3 \longrightarrow 2\text{KCl} + 3\text{O}_2$
 (C) Digestion of food in the body (D) $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$
- Which of the following a double displacement reaction?
 (A) $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$ (B) $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$
 (C) $\text{AgNO}_3 + \text{NaCl} \longrightarrow \text{AgCl} \downarrow + \text{NaNO}_3$ (D) $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$
- Which of the following is a displacement reaction?
 (A) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$ (B) $\text{CaO} + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O}$
 (C) $\text{Fe} + \text{CuSO}_4 \longrightarrow \text{FeSO}_4 + \text{Cu}$ (D) $\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$
- The reaction $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$ is a –
 (A) Decomposition reaction (B) Combination reaction
 (C) Double displacement reaction (D) Displacement reaction
- Which of the following is a decomposition reaction?
 (A) $\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$ (B) $\text{NH}_4\text{CNO} \longrightarrow \text{H}_2\text{NCONH}_2$
 (C) $2\text{KClO}_3 \longrightarrow 2\text{KCl} + 3\text{O}_2$ (D) $\text{H}_2 + \text{I}_2 \longrightarrow 2\text{HI}$
- Which of the following statement is substance?
 (A) In oxidation, oxygen in added to a substance.
 (B) In oxidation, Hydrogen is added to a substance.
 (C) Oxidation agent in oxidized.
 (D) Reducing agent is oxidized.
- Which of the following is a combination reaction –
 (A) Boiling of water (B) Melting of wax
 (C) Burning of petrol (D) None of these
- Which of the following is a redox reaction-
 (A) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$ (B) $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$
 (C) $\text{CaO} + 2\text{HCl} \longrightarrow \text{CaCl}_2 + \text{H}_2\text{O}$ (D) $\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$
- Which statement is correct about the following reaction?

$$\text{ZnO} + \text{CO} \longrightarrow \text{Zn} + \text{CO}_2$$
 (A) ZnO is being oxidized (B) CO is being reduced
 (C) CO₂ is being oxidized (D) ZnO is being reduced
- The reaction $\text{C} + \text{O}_2 \longrightarrow \text{CO}_2 + \text{Heat}$ is a –
 (A) Combination reaction (B) Oxidation reaction
 (C) Exothermic reaction (D) All of the above

11. Conversion of CaCO_3 into CaO as per following reaction is an example of-



- (A) Decomposition reaction (B) Reduction reaction
 (C) Oxidation reaction (D) None of these

12. $\text{Fe}_2\text{O}_3 + 2\text{Al} \longrightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$ This reaction is an example of –

- (A) Combination reaction (B) Double displacement reaction
 (C) Decomposition reaction (D) Displacement reaction

13. In reaction $\text{SO}_2 + 2\text{H}_2\text{S} \longrightarrow 2\text{H}_2\text{O} + 3\text{S}$ the reducing agent is-

- (A) SO_2 (B) H_2S (C) H_2O (D) S

14. Which of the following reaction is metathesis reaction?

- (A) $\text{FeCl}_3 + 3\text{NaOH} \longrightarrow \text{Fe}(\text{OH})_3 + 3\text{NaCl}$ (B) $\text{Zn} + \text{H}_2\text{SO}_4 \longrightarrow \text{ZnSO}_4 + \text{H}_2$
 (C) $2\text{CO} + \text{O}_2 \longrightarrow 2\text{CO}_2$ (D) $\text{N}_2 + \text{O}_2 \longrightarrow 2\text{NO}$

15. What happens when dil hydrochloric acid is added to iron fillings?

- (A) Hydrogen gas and Iron chloride are produced.
 (B) Chlorine gas and Iron hydroxide are produced.
 (C) NO reaction takes place.
 (D) Iron salt and water are produced.

16. When Iron nails are added to an aqueous solution of copper sulphate, a chemical change occurs, which of the following is not true about this reaction?

- (A) Blue colour of the solution fades. (B) Iron nails becomes brownish colour.
 (C) It is (A) displacement reaction. (D) Iron nails dissolves completely.

(B) FILL IN THE BLANKS

- The reaction $\text{CaCO}_3 \xrightarrow{\text{Heat}} \text{CaO} + \text{CO}$ is a reaction.
- The reaction in which hydrogen is added to the substance is calledreaction.
- Reaction in which hydrogen is added to a substance is calledreaction.
- The process of loss of an electron is known asand the process of gain of an electron is known as.....
- The species undergoing oxidation acts as a agent.
- The reducing agent undergoes of electrons.
- Formation of nitric oxide from nitrogen and oxygen is a reaction.
- The potato chips manufacturers use..... gas to flush the chips bags to prevent the chips getting oxidised.
- Reaction in which energy is absorbed is known as reaction.
- The reaction in which heat is given out along with products is known as reaction.
- Digestion of food in our body is an example of reaction.

CHEMICAL REACTION & EQUATION	ANSWER KEY	EXERCISE
<ul style="list-style-type: none"> Objective type questions 1.D 2.C 3.C 4.B 5.C 6.C7.C 8.B 9.D 10.D 11.A 12.D 13.B 14.A 15.A 16.D 		
<ul style="list-style-type: none"> Fill in the blanks 1. Decomposition 2. Oxidation 3. Reduction 4. Oxidation, reduction 5. Reducing 6. loss 7. combination 8. Nitrogen 9. Endothermic 10. Exothermic 11. Combustion 		

EXERCISE - 2

(C) **VERY SHORT ANSWER QUESTIONS**

- Is it possible to have combustion without oxygen?
- Can a double displacement reaction be a redox reaction?
- What happens when a strip of zinc is dipped in a copper sulphate solution?
- Is copper more reactive than iron? Give a reaction in support of your answer-
- In which type of reaction does an exchange of partner takes place?
- (Based on activities)
Why a dilute acid is added to water during electrolysis of water?
- Name the product obtained on cathode electrolysis of water is
- Is the volume of gases produced during electrolysis of water is same? If not than what is the ratio in between then?
- What will happens if silver bromide is kept for some time in sunlight?
- Write name of three metals which do not corrode?
- Name two antioxidants which are usually added to fat and oil containing foods to prevent rancidity.

(D) **MATCH THE FOLLOWING**

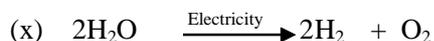
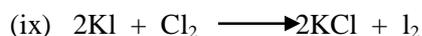
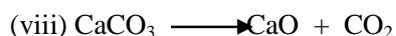
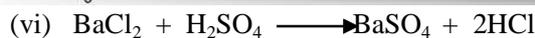
1.

	Column A		Column-B
	Types if chemical reaction		Chemical equation
(A)	Combination reaction	(i)	$\text{Zn} + \text{H}_2\text{SO}_4 \longrightarrow \text{ZnSO}_4 + \text{H}_2$
(B)	Oxidation & reduction reaction	(ii)	$2\text{H}_2\text{O} \xrightarrow{\text{Electricity}} 2\text{H}_2 + \text{O}_2$
(C)	Decomposition reaction	(iii)	$\text{CaO} + \text{CO}_2 \longrightarrow \text{CaCO}_3$
(D)	Displacement reaction	(iv)	$\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$
(E)	Double displacement	(v)	$\text{BaCl}_2 + \text{Na}_2\text{SO}_4 \longrightarrow \text{BaSO}_4 \downarrow + \text{NaCl}$

(E) SHORT ANSWER QUESTIONS:-

- What do you mean by a precipitation reaction?
- Why should a magnesium ribbon be cleaned before burning in air/
- Write a balance chemical equation with symbols for the following reactions –
 - Solution of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.
 - Sodium hydroxide solution (in water) react with hydrochloric acid solution (in water) to produce sodium chloride solution and water.
- Write the balance equation for the following chemical reactions.
 - Hydrogen + chlorine \longrightarrow Hydrogen chloride.
 - Barium chloride + Aluminium Sulphate \longrightarrow Sodium hydroxide + Hydrogen.
 - Sodium + Water \longrightarrow Sodium hydroxide + Hydrogen.
- How can you say that respiration is an exothermic process/
 Name two biochemical reaction which are exothermic.
- Why blue colour of copper sulphate solution become faded when iron fillings are added to it?
- What happens when copper turings are added to silver nitrate solution?
- Why the solution of silver nitrate become blue in colour after some time when copper turnings are added to it ?
- A solution of a substance 'X' is used for while washing -
 - Name the substance 'X' and write the formula.
 - Write the reaction of the above substance 'X' with water.
- When is the amount of gas double in one of the test tube during the electrolytic decomposition of water? Name the gas?
 - Name the iron salt
 - Name the type of reaction that takes place during the heating of iron salt.
 - Write the chemical equation involved.
- Write one equation each for decomposition reactions where energy is supplied by heat, light and electricity.
- What is the difference between displacement and double displacement reactions? Write equation for these reactions.
- Classify each of the following reactions as combination, decomposition, displacement of double displacement reaction.
 - $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$
 - $2\text{KClO}_3 \xrightarrow{\text{Heat}} 2\text{KCl} + 3\text{O}_2$
 - $\text{Zn} + \text{CuSO}_4 \longrightarrow \text{ZnSO}_4 + \text{Cu}$
 Blue Colour less
 - $2\text{Pb}(\text{NO}_3)_2 \xrightarrow{\text{Heat}} 2\text{PbO}_{(s)} + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$
 - $\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$





CHEMICAL REACTION & EQUATION

ANSWER KEY

EXERCISE - 2

- Very short answer type**

1. No

2. No

3. Blue colour of solution fade up.

4. No, because iron more reactive metal than copper.



5. Double displacement reaction.

6. To increase the ionization of water.

7. Hydrogen gas

8. No, H_2 : O_2 (2: 1)

9. Photochemical reaction takes place.



10. Silver, Gold, Platinum.

11. (a) BHA (Butylated Hydroxy Anisole)

(B) BHT (Butylated Hydroxy Toluene)

- Match the following**

(A) \rightarrow (iii),(iv); (B) \rightarrow (ii),(iv); (C) \rightarrow (ii) ; (D) \rightarrow (i) ; (E) \rightarrow (v)**Short Answer**

14. (i) Combination reaction

(ii) Decomposition reaction

(iii) Displacement reaction

(iv) Decomposition reaction]

(v) In double displacement reaction \rightarrow Neutralization reaction

(vi) Double displacement reaction

(vii) Combination reaction

(viii) Decomposition reaction

(xi) Displacement reaction

(x) Decomposition reaction