

## 2. THE MAGIC OF CHEMICAL REACTION



### Syllabus -

- ✦ Chemical equations
- ✦ Types of chemical reactions
- ✦ Oxidation and reduction
- ✦ Neutralization

### Introduction-

- In last year we have studied about the reactant, products and chemical reaction.
- We have also studied about physical and chemical changes/properties of substances.
- In day today life we observe many chemical changes such as conversion of milk into curd, Ripening of fruits, fermentation of idli and dosa etc.
- We observe that these changes are permanent.
- Similarly we observe about conversion of water into ice, sublimation of iodine crystals by heating, evaporation of petrol, melting of iron etc.
- In these changes change is temporary.
- Original substance can be obtained by easy method.
- In this chapter we are going to study about chemical changes in detail.

### Q.1 Rewrite the following statements by selecting the correct option.

- 1) Silver nitrate solution is added to sodium chloride solution. The reaction is a ----- reaction.
- 2) Calcium carbonate is heated. The reaction is a ----- reaction.

- 3) During a chemical change, the ----- are permanently converted into ----- products.
- \*4) The chemical formula of POP is -----.
- 5) An electric bulb has a filament made of element called -----.
- 6) The yellow oily leftover stains turn red / orange because of -----.
- 7) Chemical reaction involves breaking and making of the bonds between the atoms to produce -----.
- \*8) The chemical reaction during which  $H_{2(g)}$  is lost is termed as -----.
- 9) When oil and fats are oxidised or even allowed to stand for a long time, they become -----.
- \*10) The chemical reactions in which heat is liberated are called ----- reactions.
- \*11) Corrosion can be prevented by using -----.
- 12) The chemical formula of rust is -----.
- \*13) When acids and alkalis react together, ----- and ----- are formed.

- Ans:**
- |                           |                         |
|---------------------------|-------------------------|
| 1) double displacement    | 3) reactants, new       |
| 2) decomposition          | 4) $2CaSO_4 \cdot H_2O$ |
| 3) tungsten               | 5) tungsten             |
| 4) neutralization         | 6) new substances       |
| 5) Oxidation              | 7) rancid               |
| 6) exothermic             | 8) antirust             |
| 7) $Fe_2O_3 \cdot x H_2O$ | 9) salt, water          |

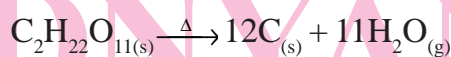
**Q. 2 Match the following.**

Column I	Column II
1) Combination reaction	a) $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
2) Double displacement reaction	b) $\text{C}_2\text{H}_{22}\text{O}_{11(s)} \xrightarrow{\Delta} 12\text{C}_{(s)} + 11\text{H}_2\text{O}_{(g)}$
3) Decomposition reaction	c) $\text{Cu} + \text{O} \rightarrow \text{CuO}$
4) Displacement reaction	d) $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$

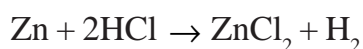
**Ans:** 1) Combination reaction -  $\text{Cu} + \text{O} \rightarrow \text{CuO}$

2) Double displacement reaction -  
 $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$

3) Decomposition reaction -



4) Displacement reaction -



\*2)

Reactants	Products	Types of Reactions
1) $\text{Fe} + \text{S}$	$\text{FeS}$	Oxidation
2) $\text{CuSO}_4 + \text{Zn}$	$\text{ZnSO}_4 + \text{Cu}$	Neutralization
3) $2\text{Cu} + \text{O}_2$	$2\text{CuO}$	Displacement
4) $\text{HCl} + \text{NaOH}$	$\text{NaCl} + \text{H}_2\text{O}$	Combination

**Ans:**

Reactants	Products	Types of Reactions
1) $\text{Fe} + \text{S}$	$\text{FeS}$	Combination
2) $\text{CuSO}_4 + \text{Zn}$	$\text{ZnSO}_4 + \text{Cu}$	Displacement
3) $2\text{Cu} + \text{O}_2$	$2\text{CuO}$	Oxidation
4) $\text{HCl} + \text{NaOH}$	$\text{NaCl} + \text{H}_2\text{O}$	Neutralization

3)

Column I	Column II
1) Preparation of ghee from vegetable oil	a) Slow reaction
2) NaOH dissolves in water	b) Nickel as catalyst
3) Zinc is added to $\text{CuSO}_4$	c) Exothermic reaction
4) Rusting of iron	d) Colourless solution

**Ans:** 1) Preparation of ghee from vegetable oil - Nickel as catalyst

2) NaOH dissolves in water - Exothermic reaction

3) Zinc is added to  $\text{CuSO}_4$  solution - Colourless solution

4) Rusting of iron - Slow reaction

**Q.3 State whether the following statements are TRUE or FALSE.**

1) When oils and fats are allowed to stand for a long time, they become rancid.

2) Respiration is a physical change.

3) According to the law of constant proportion, the total mass of the reactants is equal to the total mass of the products.

4) Antioxidants are used to prevent oxidation of food containing fats and oils.

5) The reaction between iron sulphide and dilute sulphuric acid is exothermic.

6) The pale yellow silver bromide turns grey when exposed to sunlight.

7) Rusting of iron is a fast reaction.

8) The speed of chemical reaction depends on the catalyst used in the chemical reaction.

9) Copper articles exposed to moist and polluted air get corroded.

10) Milk is set into curd is or chemical change.

11) Glucose combines with water in our body and provides energy.

**Ans.** 1) **True**

2) **False** : Respiration is a chemical change.

3) **False** : According to the law of conservation mass, the total mass of the reactants is equal to the total mass of the products.

4) **True**

5) **True**

- 6) True
- 7) False : Rusting of iron is a slow reaction.
- 8) True                      9) True
- 10) True
- 11) False : Glucose combines with oxygen in our body and provides energy.

**Q.4 Define / Explain the following terms.**

**1) Galvanizing**

**Ans :** It is a process in which iron objects are coated with a layer of zinc to prevent their rusting.

**2) Exothermic reactions**

**Ans :** The reactions in which heat is evolved are called exothermic reactions.

**3) Corrosion**

**Ans :**



The slow process of decay or destruction of a metal due to the effect of air, moisture, acids, alkalies, or other chemicals on it, is called corrosion.

**\*4) Rancidity**

**Ans :** Rancidity is a chemical process in which edible oils or fats get oxidized over a period of time and become inedible is called rancidity.

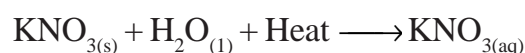
**\*5) Endothermic reactions**

**Ans :**



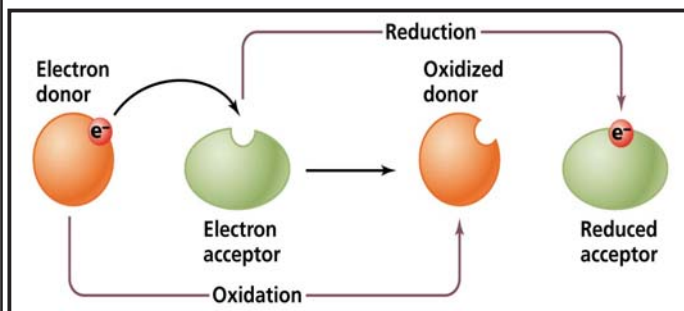
The reactions in which heat is absorbed are called endothermic reactions.

When  $\text{KNO}_{3(s)}$  dissolves in water, there is absorption of heat during the reaction and the temperature of solution falls.



**\*6) Redox reactions**

**Ans :**



The chemical reactions in which oxidation and reduction takes place simultaneously are called redox reactions.

**Q.5** Answer each of the following in one sentence.

1) What are edible oils?

Ans :



Edible oils are compounds of alcohols and organic acids (carboxylic acids). The compounds formed are known as esters of carboxylic acids.

2) What is meant by a word equation?

Ans : The simple form of representation of chemical reaction in words is known as word equation.

3) What is meant by nascent oxygen?

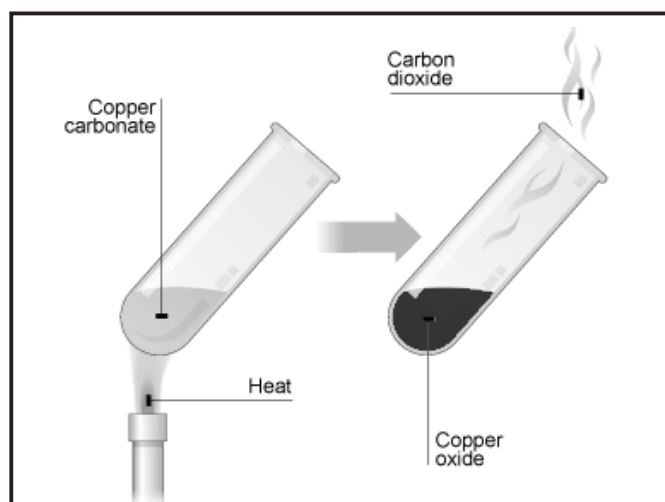
Ans : Nascent oxygen is the oxygen that is in atomic form (i.e. not in the molecular form of  $O_2$ ) which is freshly released in a chemical reaction.

4) What happens in endothermic reactions?

Ans : In endothermic reactions, the reactants absorb heat to form products.

5) What is meant by 'thermal decomposition'?

Ans :



Thermal decomposition is the process in which a substance is chemically broken down by heat.

6) Write the physical states of the reactants and products in  $CaS + 2HCl \longrightarrow CaCl_2 + H_2S$

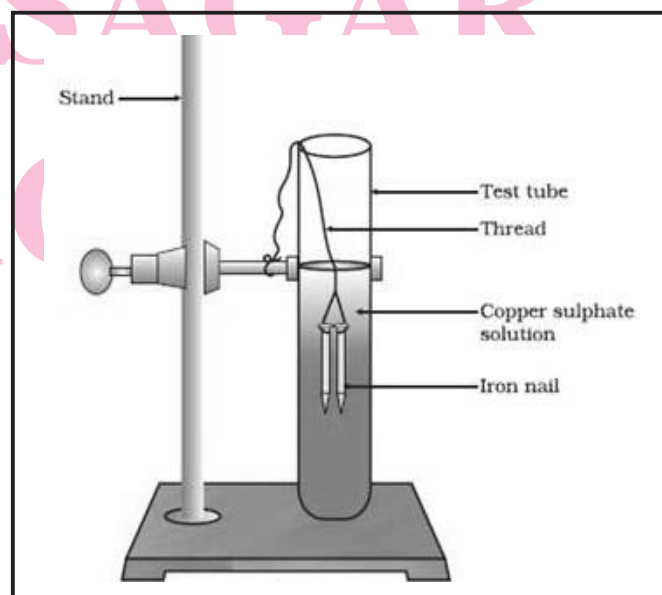
Ans :  $CaS_{(s)} + 2HCl_{(l)} \longrightarrow CaCl_{2(s)} + H_2S_{(g)}$   
 Calcium Hydrochloric Calcium Hydrogen  
 sulphide acid chloride sulphide

7) Name of catalyst used in the conversion of edible oils into solid fats.

Ans : Powdered nickel is used as a catalyst in the conversion of edible oils into solid fats.

8) What happens in a displacement reaction?

Ans :



In a displacement reaction, a more reactive element displaces another element, having less reactivity, from its compound.

**Q.6** Give Scientific reasons :

\*1) Edible oil is not allowed to stand for a long time in an iron or tin container.

Ans : i) When edible oils are left exposed to air for long period of time, they become rancid (i.e. the oils get oxidized).

- ii) Rancid oils have a foul odour and unpleasant taste.
- iii) Thus, rancid oil is of no use.
- iv) Edible oil is not allowed to stand exposed to air for long to avoid rancidity.

2) **When we use a soap to wash the yellow stains of turmeric, the stains turn into red.**

Ans: i) Turmeric is a natural indicator and it functions by producing red coloured compounds when it comes into contact with alkaline substances.

- ii) Soaps have alkaline substances in it.
- iii) While washing, the alkaline components of the soap react with the components of turmeric and form a red coloured substance.

\*3) **Grills of doors and windows are always painted before they are used.**

Ans: i) Usually grills of doors and windows are made of iron.

ii) Iron objects get rusted on exposure to moist air.

iii) Since air always contains moisture, iron grills get rusted.

iv) Painting iron objects prevents rusting, hence iron grills of doors and windows are painted before they are used.

4) **Respiration is considered to be an exothermic reaction.**

Ans:



i) When digestion of food takes place, carbohydrates present in food are broken down to form glucose.

ii) During respiration, the glucose combines with oxygen in our body and provides energy. Hence respiration is considered as an exothermic reaction.

\*5) **Potassium ferrocyanide is stored in dark-coloured bottles and kept away from sunlight.**

Ans: i) Potassium ferrocyanide gets decomposed when exposed to bright light.

ii) The dark colours of the bottles absorb a lot of energy from the light passing through it.

iii) If stored in dark-coloured bottles, it does not get enough light energy to decompose.

iv) Hence, potassium ferrocyanide is stored in dark-coloured bottles and kept away from sunlight to prevent its decomposition.

6) **Silver articles turn black when exposed to air.**

Ans: i) Silver articles react with hydrogen sulphide present in the air and black silver sulphide gets deposited on them.

ii) Because of decomposition of silver sulphide, silver articles turn black when exposed to air.

\*7) **Iron articles rust readily whereas steel, which is also mainly made of iron, will not undergo corrosion.**

Ans: i) One of the properties of iron is that it reacts with oxygen in the presence of moisture and gets corroded by forming rust.

- ii) Air contains oxygen and moisture. Hence, iron readily rust when exposed to air.
- iii) Steel (stainless steel, not mild steel) is an alloy of iron having the property to resist corrosion including rusting.
- iv) Hence, stainless steel, though it contains iron, does not undergo corrosion.

**\*8) Physical states of reactants and products are mentioned while writing a chemical equation.**

- Ans:**
- i) The reactants and the products may be in solid, liquid, or gaseous states.
  - ii) A chemical equation makes use of chemical symbols to give a condensed statement of chemical changes.
  - iii) Using symbols to express the physical states of reactants and equation makes the equation very informative.
  - iv) Such details can help us understand the chemical changes.

**Q.7 Explain with balanced equation. What happens in each of the following.**

**1) Metallic sodium is added to ethanol.**

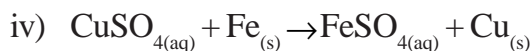
- Ans:**
- i) When metallic sodium is added to ethanol, sodium ethoxide is formed and hydrogen gas is evolved.
  - ii) 
$$2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \longrightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2 \uparrow$$

Ethyl alcohol	Sodium	Hydrogen
	ethoxide	gas

**2) A shiny strip of iron is dipped in the solution of copper sulphate.**

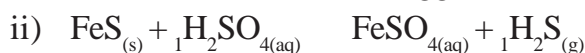
- Ans:**
- i) Iron, being more reactive, displaces copper from the solution.
  - ii) The immersed part of the iron strip gets covered with reddish-brown copper particles.

- iii) If the reaction continues for long, the blue colour of the original solution changes to green due to the formation of soluble ferrous sulphate.



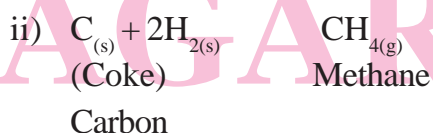
**3) Dilute sulphuric acid is poured over crushed iron sulphide.**

- Ans:**
- i) They react producing green-coloured solution of ferrous sulphate and hydrogen sulphide gas that has foul odour like that of rotten eggs.



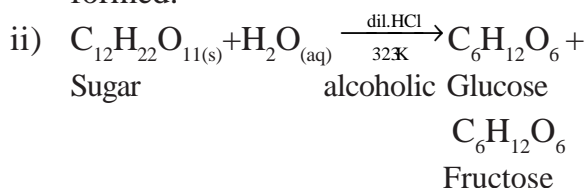
**4) A mixture of hydrogen and coke is heated.**

- Ans:**
- i) When a mixture of hydrogen and coke is heated, methane is formed.



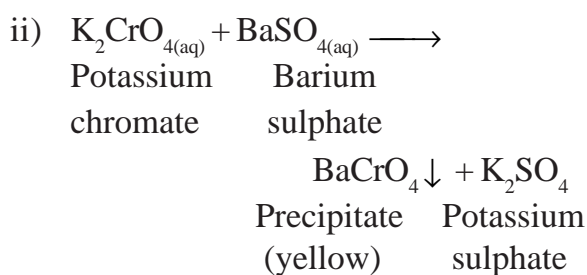
**5) Sucrose (sugar) is treated with dilute hydrochloric acid at 323 K.**

- Ans:**
- i) When sucrose (sugar) is treated with dilute hydrochloric acid at 323 K, one molecule of glucose and fructose are formed.



**6) Potassium chromate solution is added to barium sulphate solution.**

- Ans:**
- i) When potassium chromate solution is added to barium sulphate solution, yellow precipitate barium chromate is formed.



**7) Barium sulphate is heated with coke.**

- Ans:** i) Barium sulphate  $\text{BaSO}_4$  is reduced by loss of oxygen to barium sulphide ( $\text{BaS}$ ).
- ii) Coke (C) is oxidized (by gaining oxygen to Carbon monoxide (CO)).
- iii)  $\text{BaSO}_{4(s)} + 4\text{C}_{(s)} \rightarrow \text{BaS}_{(s)} + 4\text{CO}_{(g)}$

**8) Pellets of sodium hydroxide are added to water.**

- Ans:** i) Sodium hydroxide dissolves to form its solution and liberates heat which raises the temperature of the solution.
- ii) It is an exothermic reaction.
- iii)  $\text{NaOH}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow \text{NaOH}_{(aq)} + \text{heat}$

**9) Zinc powder is added to copper sulphate solution.**

- Ans:** i) When zinc powder is added to copper solution, more reactive zinc displaces less reactive copper from copper sulphate solution.
- ii)  $\text{CuSO}_{4(aq)} + \text{Zn}_{(s)} \rightarrow \text{ZnSO}_{4(aq)} + \text{Cu}_{(s)}$   
 Copper sulphate                      Zinc sulphate

**10) Hydrogen gas is passed over heated particles of copper oxide.**

- Ans:** i) Black-coloured oxide particles get coated with pinkish brown layer of metallic copper.
- ii) Copper oxide is reduced (loss of O) and hydrogen is oxidized (gain of O) to hot water vapour.
- iii)  $\text{CuO}_{(s)} + \text{H}_{2(g)} \rightarrow \text{Cu}_{(s)} + \text{H}_2\text{O}_{(g)}$

**11) Carbon dioxide is mixed with water vapour.**

- Ans:** i) When carbon dioxide is mixed with water vapour, carbonic acid is formed.
- ii)  $\text{H}_2\text{O}_{(g)} + \text{CO}_{2(g)} \rightarrow \text{H}_2\text{CO}_{3(l)}$   
 Water vapour      Carbon dioxide      Carbonic acid

**12) Cane sugar is heated.**

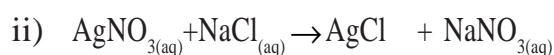
- Ans:** i) It gets charred to produce carbon in the form of blackcoloured sugar charcoal.
- ii) Water is set free in the form of hot vapours.
- iii)  $\text{C}_{12}\text{H}_{22}\text{O}_{11(s)} \rightarrow 12\text{C}_{(s)} + 11\text{H}_2\text{O}_{(g)}$

**13) Calcium carbonate is heated.**

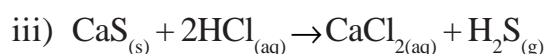
- Ans:** i) When calcium carbonate is heated to above  $1000^\circ\text{C}$ , it decomposes to form quicklime and carbon dioxide gas is evolved.
- ii)  $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2 \uparrow$   
 Calcium carbonate                      Quicklime

**14) Solution of silver nitrate is added to a solution of common salt.**

- Ans:** i) They react to produce a white precipitate of silver chloride and a colourless solution of sodium nitrate as a result of double displacement.

**15) Calcium sulphide is treated with dilute hydrochloric acid.**

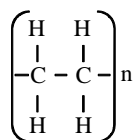
- Ans:** i) They react to form a colourless solution of calcium chloride.
- ii) Hydrogen sulphide gas, which has a foul odour, like that of rotten eggs is set free.

**16) Copper chloride is treated with a solution of potassium iodide.**

- Ans:** i) Double displacement reaction takes place in which brown precipitate of cupric iodide ( $\text{Cu}_2\text{I}_2$ ) and a solution of potassium chloride are formed.
- ii)  $2\text{CuCl}_{2(g)} + 2\text{KI}_{(aq)} \rightarrow \text{Cu}_2\text{I}_2 + 2\text{KCl}_{(aq)}$

17) Ethylene is subjected to a high temperature and high pressure.

Ans: i) Ethylene, also called ethene, undergoes polymerization to form polyethylene.



18) Silver bromide is exposed to sunlight.

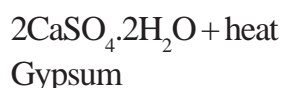
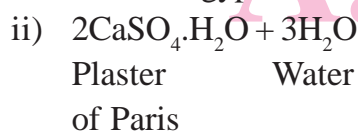
Ans: i) Pale yellow-coloured silver bromide is decomposed by the light energy to form metallic silver.

ii) Brownish fumes of bromine are given off.



19) Plaster of Paris is mixed with water.

Ans: i) When plaster of Paris is mixed with water it sets quickly into hard mass known as gypsum.

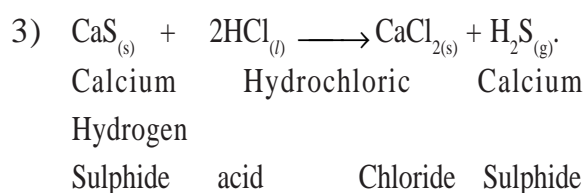
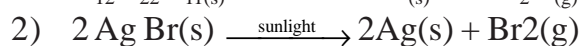
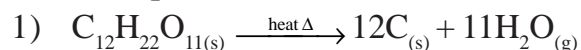


20) Decomposition Reaction.

Ans: i) A reaction in which a single reactant is broken down is called decomposition reaction.

ii) Decomposition reactions require heat and light, energy or are brought about by acids.

iii) Examples :



Q.8 Answer the following.

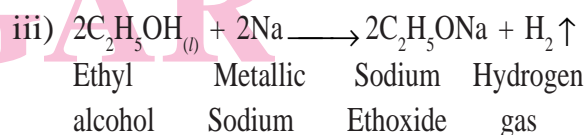
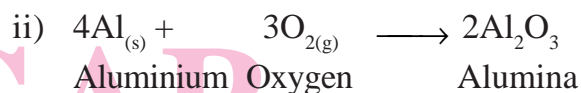
1) Add a small quantity of dil.  $\text{H}_2\text{SO}_4$  to FeS very carefully, (under the supervision of your teacher). Touch the test tube. Also experience the odour. What do you observe?

Ans: i) When a small quantity of dil.  $\text{H}_2\text{SO}_4$  is added to FeS, hydrogen sulphide ( $\text{H}_2\text{S}$ ) gas is liberated.

ii) It has the smell of rotten eggs.

2) What is an oxidation reaction? Explain with example.

Ans: i) The chemical reaction in which reactants gain oxygen to form a corresponding oxide or the chemical reaction in which reactants lose hydrogen to form a product is called oxidation reaction.



\*3) We feel fresh while on a morning walk in natural surroundings. Why don't we feel the same after 10 a.m. and during rush hours? Write a chemical equation to support your answer.

Ans: i) Early in the morning the air is fresh, has less pollutants due to low vehicular traffic.

ii) Breathing pure (unpolluted or less polluted) air gives us the feeling of freshness.

iii) After 10 a.m. vehicular traffic increases.

iv) Fast moving vehicles raise dust in the air, and the partially burnt fuels set free carbon particles and carbon monoxide.



- v) The air also gets polluted with oxides of nitrogen and sulphur dioxide (diesel, petrol contains certain amount of S) pollute the air.
- vi) Inhaling polluted air makes us feel tired (besides causing illness).
- vii) Sulphur burns in the air to produce sulphur dioxide :  $S + O_2 \rightarrow SO_2$  .
- viii) Partial burning of carbon (petrol, diesel, being hydrocarbon contain carbon) which produces carbon monoxide:  $2C + O_2 \xrightarrow{\text{Partial burning}} 2CO \uparrow$

**4) Take a tablespoon full of copper powder in a china dish. heat it strongly. What changes do you observe?**

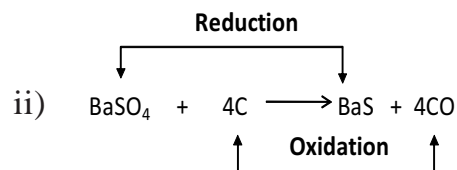
**Ans :** When copper powder is strongly heated in a china dish, black copper oxide is formed.

**\*5) Take finely-powdered zinc and allow it to react with copper sulphate solution. Then take zinc granules and carry out the same reaction. Which reaction takes place faster? Why?**

- Ans :** i) The reaction between powdered zinc and copper sulphate solution is faster than that between zinc granules and copper sulphate solution.
- ii) This is because one of the factors that controls the rate of reaction is the size of the particles.
- iii) The smaller the particles, the faster is the reaction.
- iv) Zinc granules are larger than powdered zinc.
- v) Hence, the rate of reaction is faster when powdered zinc is used.

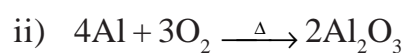
**\*6) What is a Redox reaction? Explain with example.**

**Ans :** i) When oxidation and reduction take place simultaneously in a given chemical reaction it is known as a Redox reaction.



**7) Take a small piece of aluminum wire and burn it. Record your observations. Remove a tungsten wire from a fused bulb. Try to ignite it. What do you observe?**

**Ans :** i) When a small piece of aluminium wire is burnt, it forms aluminium oxide.



iii) It is not possible to ignite tungsten wire.

iv) The melting point of the tungsten wire is much higher than the temperature of the flame.

**8) When you mix VIBGYOR colours, what colour do you get?**

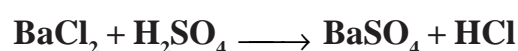
**Ans :** i) By mixing (combining) VIBGYOR colours in appropriate proportion it is possible to obtain white light.

ii) This experiment is due to Sir Isaac Newton.

**9) Write the balanced equation for the following reaction :**

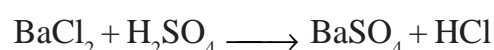
**Barium chloride + sulphuric acid**

**Barium sulphate + hydrogen chloride**



**Ans : Step 1 :**

Rewrite the given equation as it is



**Step 2 :**

Write the number of atoms of each element in the given unbalanced equation on both sides of the equation.

Element	Number of atom in reactants (LHS)	Number of atoms in products (RHS)
Ba	1	1
H	2	1
Cl	2	1
S	1	1
O	4	4

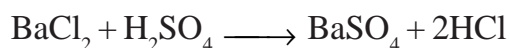
- i) As number of barium, sulphur and oxygen atoms involved in different compounds on both sides (reactants and products) are equal.
- ii) Therefore, balance the other elements such as hydrogen and chlorine.

**Step 3 :**

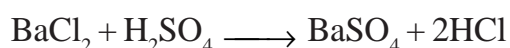
To balance hydrogen atoms.

Hydrogen atoms	In reactants	In products
To begin with	2 (in H <sub>2</sub> SO <sub>4</sub> )	1 (in HCl)
To balance	2	1 x 2

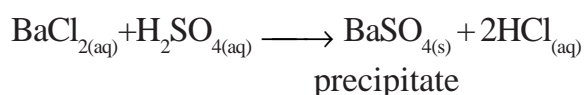
- i) To equalise the number of hydrogen atoms we use 2 as the coefficient of HCl in the products.
- ii) Now the partly balanced equation becomes

**Step 4 :**

Now, count atoms of each element on both sides of the equation. The number of atoms on both sides are equal. Hence, the balanced equation is



Now, indicate the physical states of the reactant and the product



**\*10) What is a chemical equation? What is its importance?**

- Ans :** i) A representation of chemical reaction with the help of chemical formula and other symbols, is called a chemical equation.
- ii) Its importance lies in the fact that it can concisely and precisely convey:
- The name of each reactant.
  - The name of each product.
  - Their exact quantities.
  - Their physical states, and
  - The conditions under which the reaction takes place.

**11) Take 5 ml of copper chloride solution in a test tube, add 5 ml of potassium iodide to it. Note your observation.**

- Ans :** i) When you add potassium iodide solution to copper chloride solution, a brown precipitate of cupric iodide is formed.
- ii)  $2\text{CuCl}_2 + 2\text{KI} \longrightarrow \text{CuI}_2 \downarrow + 2\text{KCl}$
- Copper chloride      Potassium iodide      Cupric iodide

**12) When copper articles are exposed to light and moisture. Do they undergo corrosion?**

- Ans :** i) Copper oxidises to form black copper oxide.
- ii) Further copper oxide slowly reacts with CO<sub>2</sub> in air to form copper carbonate which is green in colour.
- iii) Thus, copper articles are exposed to light and moisture, they undergo corrosion to form the green coating on its surface.

13) When you add potassium chromate ( $K_2CrO_4$ ) to barium sulphate ( $BaSO_4$ ) solution.

- What was the colour of precipitate formed?
- Name the precipitate.
- Write the balanced equation for the reaction.

**Ans:** i) The colour of precipitate was yellow.  
 ii) The name of the precipitate is barium chromate.  
 iii) The balanced equation is  

$$K_2Cr_2O_4 + BaSO_4 \longrightarrow BaCrO_4 \downarrow + K_2SO_4$$
  
 iv) It is a double displacement reaction.

14) Have you ever peeped into the store room of your home? If you have, you must have seen some old and out of use articles made of iron. They are usually covered with a reddish layer. Do you know what the red layer is called?

**Ans:** The red layer covered over the surface of iron is called rust, formed due to corrosion.

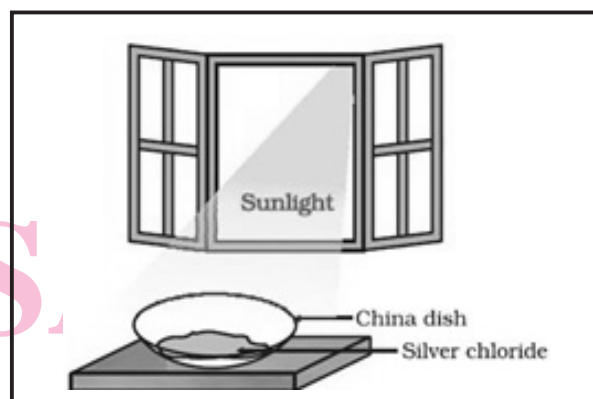
15) Take 100 ml of distilled water in two polythene bottles. (This prevents heat loss). Note the temperature of water in both bottles. Add about 5 gm of potassium nitrate ( $KNO_3$ ) to one bottle. Stir well. Note the temperature of the solution. Add 5 gm of NaOH to the other bottle. Note the temperature of the solution. What do you observe in both the cases? What inference can you draw?

**Ans:** i) When you add water to a polythene bottle containing  $KNO_3$ , the temperature of the solution falls.  
 ii) During the reaction, heat is absorbed.  
 iii) The reaction accompanied by absorption of heat is called an endothermic reaction.

- When you add water to a polythene bottle containing NaOH, the temperature of the solution increases.
- During the reaction heat is evolved.
- The reaction accompanied by evolution of heat is called an exothermic reaction.

16) What is meant by a decomposition reaction?

**Ans:**



The reaction in which a substance (a compound) is split up into two or more simple substances is called a decomposition reaction.

17) Take a small quantity of detergent powder or washing soda in your hand and add a little water to it. What do you feel? Is there any change in temperature when water is added to the detergent?

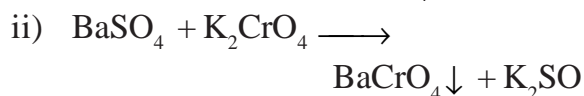
**Ans:** i) We feel warm. When water is added to the detergent, temperature increases.  
 ii) Hence, dissolution of a detergent is an exothermic reaction.

18) Take a small piece of used paper. Weigh it on an electronic balance which will be readily available in your nearby grocery. Burn the piece of paper and now weigh the ash. What do you observe about the initial and final weights? What can you infer?

**Ans:** The final weight (the weight of the ash) is less than the initial weight (the weight of the paper).

**19) Add potassium chromate ( $K_2CrO_4$ ) solution to barium sulphate ( $BaSO_4$ ) solution. What do you observe?**

**Ans:** i) When potassium chromate ( $K_2CrO_4$ ) solution is added to barium sulphate ( $BaSO_4$ ) solution, yellow precipitate of barium chromate ( $BaCrO_4$ ) is formed.



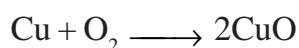
**20) As the number of copper (Cu) atoms involved in different compounds on both sides (reactants and products) are equal. Therefore, balance oxygen atoms.**

**Ans:** To balance oxygen atoms

Oxygen atoms	In reactants	In products
To begin with	2 (in $O_2$ )	1 (in $CuO$ )
To balance	2	1 x 2

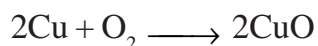
i) To equalise the number of oxygen atoms we use 2 as coefficient of  $CuO$  in the products.

ii) Now the partly balanced equation becomes

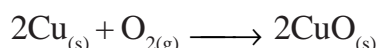


iii) Now, count atoms of each element of both sides of the equation.

iv) Balance the number of copper atoms. Hence the balanced equation is



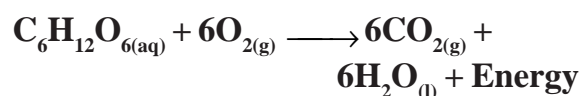
v) Now, indicate the physical states of the reactant and the product.



**21) Heat camphor in a porcelain dish. Keep a funnel plugged with cotton over the dish. What do you observe when camphor is heated? What happens when the apparatus is cooled?**

**Ans:** When camphor is heated, it sublimes and when the apparatus is cooled, camphor vapour condenses on the cooler part of the inverted funnel and the cotton plug.

**22) Carbohydrates such as rice, potato, sago, etc. are major sources of energy in our diet. During digestion, these carbohydrates are broken down into glucose. Glucose combines with oxygen in our body and provides energy.**



**Is the above reaction exothermic or endothermic?**

**Ans:** The above reaction is exothermic.

**23) Will it be possible for you to decompose water by heat or light energy? If you pass current from a 6 volt battery is decomposition of water possible?**

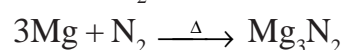
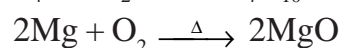
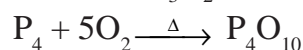
**Ans:** i) If you take pure water it is not possible to decompose water by heat or light energy or using a 6 volt battery.

ii) But if you add a few drops of acid to water then it is possible to decompose acidulated water by passing current from a 6 volt battery.

**24) During festivals all of you have fun while bursting crackers. When crackers burn, you will find an ash residue after they are burnt. What reaction has taken place?**

**Ans:** i) The crackers are made up of phosphorus and magnesium powder which burns with bright flash light.

ii) On burning they form an ash consisting of oxides  $P_4O_{10}$ ,  $MgO$  and magnesium nitride ( $Mg_3N_2$ ).



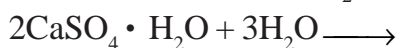
25) Paste of substance A is used to decorate the roof of your home.

- Name the substance A and write its formula.
- Write the reaction of substance A with  $H_2O$ . State the name of the product (B).
- Where and how is B useful?

Ans: i) The substance A is Plaster of Paris and its formula,



- The reaction of A with  $H_2O$  is



Plaster of Paris

- Gypsum is the raw material used in manufacturing cement.

26) When edible oil is converted to fats, what reaction is it? Explain this reaction in words.

Ans: When edible oil is converted to fats, i.e. it forms vanaspati ghee, the reaction is known as hydrogenation.

27) Take two completely used cells out of a wall clock, transistor, tape recorder, etc. Remove the material from inside. You will get a can that is made of zinc. Press and make it flat. Dip this zinc strip in copper sulphate solution (A). Let there be copper sulphate solution in another beaker B for comparison. Keep another plain zinc strip aside also for comparison.

Remove the zinc strip after about 5 minutes. Compare -

- Intensity of blue colour of  $CuSO_4$  in beaker A and beaker B.
- Compare the colour of the zinc strips.

Ans: i) Intensity of blue colour of  $CuSO_4$  in beaker B will be less than that in the case of solution of  $CuSO_4$  in beaker A.

- Pure zinc strip will appear bright grey relative to the zinc strip removed from cell.

28) Visit an oil merchant, request him to give you 100 ml of leftover edible oil from the tin. Heat it in a container. Note your observation.

Ans: When leftover edible oil is heated, it undergoes oxidation and starts frothing up and its smell turns foul.

29) Find out the names of some natural antioxidants. Nowadays many antioxidants are available in pharmacies. Can you list some brand names?

Ans: i) Antioxidants are the compounds which prevent the oxidation or deterioration of food.

- Naturally occurring many fruits contain antioxidants such as apple, strawberry, etc. dry fruits like walnut, almonds, etc., vegetables like capsicum, papaya, tomato, carrots, etc.

iii)  $\beta$ -carotene and lycopene are natural antioxidants.

iv) Many antioxidants are available in pharmacies which contain BHA (Butylated hydroxy anisole), BHT (Butylated hydroxy toluene).

30) What more steps are taken to prevent oxidation of edible articles?

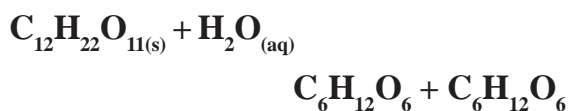
Ans: To prevent oxidation of the edible articles, the bags used to wrap the edible articles are flushed with an inert gas such as nitrogen.

31) What about silver ornaments?

Ans: i) Exposure to light has no action on silver ornaments.

- ii) But if the air is contaminated with  $\text{H}_2\text{S}$ , the silver is blackened due to the formation of a thin film of black silver sulphide ( $\text{Ag}_2\text{S}$ ) on the surface.
- iii) Thus, black coating is formed on silver ornaments.

32) Name the reactants and products in equation.



Ans: In the given reaction :

- i) Reactants :  $\text{C}_{12}\text{H}_{22}\text{O}_{11(s)}$  and  $\text{H}_2\text{O}_{(aq)}$   
                   Sugar                  Water
- ii) Products :  $\text{C}_6\text{H}_{12}\text{O}_{6(s)}$  and  $\text{C}_6\text{H}_{12}\text{O}_{6(s)}$   
                   Glucose              Fructose

33) What according to you is the reason for aluminium utensils regaining their original shine when green leafy vegetables are boiled in them?

- Ans: i) Aluminium utensils after a long use become dull due to oxidation of Al to  $\text{Al}_2\text{O}_3$ .
- ii) Leafy vegetables contain chlorophyll and chlorophyll has a capacity to produce reducing agent.
- iii) When leafy vegetables are boiled in dull aluminium utensils,  $\text{Al}_2\text{O}_3$  is reduced to Al and the aluminium utensils regain their original shine.

34)  $2\text{Cu}_{(s)} + \text{O}_{2(g)} \longrightarrow 2\text{CuO}_{(s)}$   
**Copper Oxygen      Copper oxide**  
**It is an oxidation reaction. Why?**

- Ans: i) The chemical reaction in which reactants gain oxygen to form corresponding oxide is known as an oxidation.
- ii) In the above reaction, copper combines with oxygen to form copper oxide.
- iii) Therefore, it is an oxidation reaction.

\*35) What do you observe when hydrogen sulphide ( $\text{H}_2\text{S}$ ) gas is passed through a solution of cadmium chloride solution? Name the type of reaction.

- Ans: i) Hydrogen sulphide gas reacts with cadmium chloride to precipitate yellow -coloured cadmium sulphide.
- ii) Hydrochloric acid is also produced.
- iii)  $\text{CdCl}_{2(aq)} + \text{H}_2\text{S}_{(g)} \rightarrow 2\text{HCl}_{(aq)} + \text{CdS}_{(s)}$
- iv) The reaction is of double displacement precipitate type.

36) Mary was helping her mother to make brown sugar for pudding. After sometime she obtained a black mass instead of brown with burning smell. What do you think might have happened?

Ans: Sugar must have burnt and a black mass of carbon must have formed.

37) After you have your dinner tonight, wash your own plate with soap / detergent. What colour change is observed when soap / detergent is applied? Can you name the type of reaction?

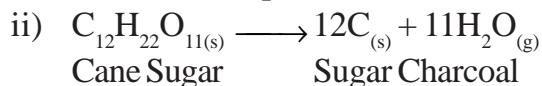
- Ans: i) When we wash our dinner plate with soap / detergent, the yellow oily leftover stains will turn red / orange due to soap / detergent.
- ii) It is a neutralization reaction.

38) Take a spatula full of silver bromide (your teacher will help to you get it) on a watch glass. Note its colour. Place the watch glass in sunlight. Observe the colour after some time.

Ans: The plate yellow silver bromide turns grey when exposed to sunlight.

**39) What happens if Cane sugar is heated.**

**Ans:** i) When cane sugar is heated it produces carbon in the form of black coloured sugar charcoal and water is set free in the form of vapours.



**Q.9 Distinguish between -**

**1) Decomposition Reaction and Combination Reaction.**

Decomposition Reaction	Combination Reaction
i) In decomposition reaction, a single compound decomposes into two or more simpler substances.	i) In combination reaction, two or more substances combine to form a single compound.
ii) It is a degradation reaction.	ii) It is a synthesis reaction.
iii) Complex substances are broken down into simpler compounds in decomposition reaction.	iii) New substances are synthesized in combination reaction.
iv) $2\text{H}_2\text{O} \xrightarrow[\text{Current}]{\text{electric}}$ Water $2\text{H}_2 + \text{O}_2$ Hydrogen Oxygen	iv) $\text{CaO} + \text{H}_2\text{O}$ Calcium oxide Water $\longrightarrow \text{Ca OH}_2$ Calcium hydroxide

**2) Oxidation Reactions and Reduction Reactions**

Oxidation Reaction	Reduction Reactions
i) In oxidation reactions, the reactants gain oxygen to form corresponding oxides.	i) In reduction reactions, the reactants lose oxygen.

ii) Chemical reactions in which reactants lose hydrogen to form products are also called oxidation reactions.	ii) Chemical reactions in which reactants gain hydrogen to form products are also called reduction reactions.
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**3) Displacement reaction and Double Displacement reaction**

Displacement reaction	Double Displacement reaction
i) These reactions take longer time for their completion and are usually slow.	i) These reactions take place instantaneously and are usually fast.
ii) In displacement reactions change of colour takes place.	ii) In double displacement reaction, precipitates are formed.
iii) In displacement reaction more active element displaces a less active element from its salt solution.	iii) In double displacement reaction, there is exchange of ions between two reactants to form new products.
iv) $\text{Fe} + \text{CuSO}_4 \longrightarrow$ Iron Copper Sulphate $\text{FeSO}_4 + \text{Cu}$ Ferrous Copper	iv) $\text{CdCl}_2 + \text{H}_2\text{S} \longrightarrow$ Cadmium Chloride $\text{CdS} \downarrow + 2\text{HCl}$ Cadmium Hydrochloric Sulphide acid

**4) Physical Changes and Chemical Changes**

Physical Changes	Chemical Changes
i) Physical changes can usually be reversed using physical methods, hence temporary changes.	i) Chemical changes cannot be reversed using physical methods, hence are permanent changes.

