Chemical Reactions and Equations

SYNOPSIS

In nature, we come across temporary, permanent, natural and manmade changes. A permanent change in which new substance or substances formed with completely unlike those of the original substances is called a chemical change. Chemical changes are represented by formulae or equation is known as chemical equations. All the chemical equations must balance, because atoms are neither created nor destroyed in chemical reactions.

Chemical reactions are generally of four types; they are

1. Chemical Decomposition 2.Chemical Combination

3. Displacement Reactions 4.Double Displacement Reactions.

Oxidation is a reaction that involves the addition of oxygen or removal of hydrogen. Reduction is a reaction that involves the addition of hydrogen or removal of oxygen. If oxidation and reduction occur in the same reaction, such reactions are called oxidation - reduction reactions or redox reactions.

When some metals are exposed to moisture, acids etc, they tarnish due to the formation of respective metal oxides on their surface. This process is called corrosion damage to car bodies, bridges, iron railings, ships etc., and to all other objects that are made of metals. Especially corrosion of iron is a serious problem.

Corrosion can be prevented by shielding the metal surface from oxygen and moisture. It can be prevented by painting, oiling, greasing, galvanizing chrome plating or making alloys.

When food materials that were left for a long period, the fat/oil containing in food materials oxidized and become rancid. The spoilage of food can be prevented by adding preservatives like vitamin C and vitamin E.

Keeping food in air tight containers helps to slow down oxidation process. Manufactures of potato chips flush bags of chips with nitrogen gas to prevent the chips from getting oxidized.

Problems

1) Calculate the amount of aluminum required to get 1120Kg of iron by the reaction.

$$Al_{(s)} + Fe_2O_{3(S)} \longrightarrow Al_2O_{3(S)} + Fe_{(S)}$$

Atomic masses of Al = 27 U, Fe = 56 U and O= 16U

Sol: Given Equation is

$$Al_{(s)} + Fe_2O_{3(S)} \longrightarrow Al_2O_{3(S)} + Fe_{(S)}$$

Balancing the equations

$$2Al_{(s)} + Fe_2O_{3(S)} \longrightarrow Al_2O_{3(S)} + F_{(\ )}$$

$$2\,mol\ Al + 1mol\ Fe_2O_3 \longrightarrow 1mol\ Al_2O_3 + 2mol\ Fe$$

(2×27) U + (56×2+16×3)U → (27×2+16×3)U+2×56U

54U + 160U → 102U+112U

54 g + 160g → 102g+112g

As per the balancing equation 54g

For 112g of iron we required 54g Aluminum for 1120 kg of iron required aluminum is-

$$\frac{1120 \times 1000}{112} \times 54$$

= 540,000g

Or 540kg

To get 1120kg or iron the required aluminum is 540 kg.

2.) Calculate the volume, liberate when 230g of sodium reacts with excess water at STP-

Sol: Skeleton equation is -

$Na_{(s)} + H_2O \rightarrow 2NaOH + H_2$

$(2\times23)U + 2(2\times1+1\times16)\ U \rightarrow 2(23+16+1)\ U + (2\times1)$

$46U + 36U+ \rightarrow 80U+2U$

$46G+36g \rightarrow 80g+2g$

Mass

As per the balanced equation

46g. of sodium gives 2g of hydrogen

230g of sodium gives _____g of hydrogen

$$\frac{230}{46}\times 2$$
$$= 10g$$

230g of sodium gives 10g of hydrogen

Volume:

At STP

2g of hydrogen occupies 24.4 lt

10g of hydrogen occupies____ lt

$$\frac{10}{2} \times 24.4 = 112\text{lt}$$

$\therefore$ 10g of hydrogen occupies 112 lt volumes

Number of molecules

2g o hydrogen i.e. 1 mole of H_2 contains 6.02×10^{23} molecules

10g of hydrogen i.e. 5mole of H_2 contains.

$5\times6.02\times10^{23}$ molecules

$=30.10\times10^{23}$

$= 3.01\times10^{24}$ molecules

$\therefore$ 10g of hydrogen contains 3.01×10^{24} molecules

4 Mark Questions

1. What is a balanced chemical equation? Why should chemical equations be balanced?

Sol: Balanced chemical equation: A chemical equation in which the numbers of atoms of different elements on the reactants side (left side) are same as those on product side (right side) is called a balanced reaction.

A chemical equation should be balanced because-

1) According to the law of conservation of mass, the total mass of the products formed in chemical reaction must be equal to the mass of reactants consumed.

2) The number of atoms of each element before and after reaction must be the same.

3) Atoms are neither created nor destroyed in chemical reactions.

2. **Write an equation for decomposition reaction where energy is supplied in the form of heat/light/electricity?**

Sol: Heat: on heating calcium carbonate ($Caco_3$) decomposes to calcium oxide

(Cao) and carbon dioxide (Co_2)

$Ca\ Co_{3(s)} \rightarrow Cao_{(s)} + Co_{2\,(g)}$

Lime stone quick lime

Light (photo chemical reaction): silver bromide decomposes to silver and bromine in sun light. Such reactions are called photo chemical reactions.

$2Ag\ Br_{(s)} \xrightarrow{\text{sun light}} 2Ag_{(s)} + Br_{2\,(g)}$

The light yellow colored silver bromide turns to gray due to sunlight.

Electricity (electrolysis):- On passing the electricity water dissociates to hydrogen and oxygen.

$2H_2O_{(l)} \xrightarrow{\text{electrolysis}} 2H_{2(g)} = O_{2(g)}$

3. How chemical displacement reactions defer from chemical decomposition reactions? Explain with an example for each? (As_1)

Displacement Reaction	Decomposition Reaction
1.In Displacement reaction one element displaces another element from its compound. Ex: $Fe_{(s)}+Cuso_{4(aq)} \rightarrow Feso_{4(aq)}+cu_{(s)}$ 2. Energy is not required in any form for this reaction. 3.Reactants are more than one.	1. A chemical reaction in which a substance decomposes to form two or more simpler substances. Ex: $CaCo_{3(s)} \rightarrow Cao_{(s)} + Co_{2(g)}$ 2. Energy is required in the form of heat or light or electricity for this reaction. 3. Reactant is only one substance.

4. Balance the following chemical equations?

a) $Na\ OH + H_2\ So_4 \rightarrow Na_2so_4 + H_2o.$

b) $Hg\ (No_3) + KI \rightarrow HgI_2 + KNo_3$

C) $H_2 + O_2 \rightarrow H_2O$

d) $Kclo_3 \rightarrow Kcl + O_2$

e) $C_3\ H_8 + O_2 \rightarrow Co_2 + H_2o$

4) a) $Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + H_2o.$

Step1: Unbalanced equation.

$$Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + H_2o$$

Step2: Compare number of atoms of each element on both sides.

Elements	No. of Atoms in Reactants	No of Atoms in Products
Na	1 (in Na OH)	2 (in $Na_2\ So_4$)
S	1 (in $H_2\ So_4$)	1 (in $Na_2\ So_4$)
H	3 (in Na OH, $H_2\ So_4$)	2 (in H_2o)
O	5 (in Na OH, $H_2\ So_4$)	5 (in Na OH, $H_2\ So_4$)

No. of Na atoms equating both sides

$$2Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + H_2o$$

No. of H atoms equating both sides

$$2Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + 2H_2o$$

No. of O atoms equating both sides

$$2Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + 2H_2o$$

Step3: The above equation is balanced and coefficients are also smallest whole number

$$2Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + 2H_2o$$

Step4: Verify the above equation for the balancing of atoms on both sides of the equation. Hence the equation is a balanced one.

$$2Na\ OH + H_2\ So_4 \rightarrow Na_2\ so_4 + 2H_2o$$

b) $Hg(No_3)_2 + KI \rightarrow Hg I_2 + kNo_3$

Sol: Step1: Unbalanced chemical equation

$Hg(No_3)_2 + KI \rightarrow Hg I_2 + kNo_3$

Step2: compare no. of atoms of each element on both sides

Elements	No of atoms in reactants	No of atoms in products
Hg	1	1
N	2	1
O	6	3
K	1	1
I	1	2

No. of Hg atoms balancing

$Hg(No_3)_2 + KI \rightarrow Hg I_2 + kNo_3$

No. of N atoms balancing

$Hg(No_3)_2 + KI \rightarrow Hg I_2 + 2kNo_3$

No. of O atoms balancing

$Hg(No_3)_2 + KI \rightarrow Hg I_2 + 2kNo_3$

No. of K atoms balancing

$Hg(No_3)_2 + 2KI \rightarrow Hg I_2 + 2kNo_3$

No. of I atoms balancing

$Hg(No_3)_2 + 2KI \rightarrow 1Hg I_2 + 2kNo_3$

Step3: the above equation is balanced. Write coefficients and also smallest ratio.

$Hg(No_3)_2 + 2KI \rightarrow 1Hg I_2 + 2kNo_3$

Step4: Verified the above equation for the balancing of atom on both sides of the equation. Hence the equation is balanced.

$Hg(No_3)_2 + 2KI \rightarrow Hg I_2 + 2kNo_3$

C) $H_2+O_2 \rightarrow H_2O$

Sol: Step1: Unbalanced equation

$H_2+O_2 \rightarrow H_2O$

Step2: compare no. of atoms of each element on both sides.

Atom	No. of atoms in LHS	No. of atoms in RHS
H	2	2
O	2	1

No. of 'O' atoms balancing

$H_2+O_2 \rightarrow 2 H_2O$

No. of 'H' atoms balancing

$2H_2+O_2 \rightarrow 2H_2O$

Step3: The above equation is balanced is and write and write the coefficient in smallest ratio.

$2H_2+O_2 \rightarrow 2H_2O$

Step4: Verified above equation for balancing of atoms each element on both sides. Hence the equation is balanced.

$2H_2+O_2 \rightarrow 2H_2O$

d) $Kclo_3 \rightarrow kcl + O_2$

Sol: Step1: Unbalanced equation

$Kclo_3 \rightarrow kcl + O_2$

Step2: Compare no. of atoms of each element on both sides.

Atom	No. of atoms in LHS	No. of atoms in RHS
K	1	1
CL	1	1
O	1	2

Balancing 'O' atoms on both sides

$2Kclo_3 \rightarrow kcl + 3O_2$

Balancing 'K' atoms on both sides

$2Kclo_3 \rightarrow 2kcl + 3O_2$

Step3: The above equation is balanced write the coefficient of smallest ratio.

$2Kclo_3 \rightarrow 2kcl + 3O_2$

Step4: Verified above equation for balancing of atoms of each element on both sides.

$2Kclo_3 \rightarrow 2kcl + 3O_2$

e) $C_3H_8 + O_2 \rightarrow Co_2 + H_2o$

Step1: Unbalanced equation

$C_3H_8 + O_2 \rightarrow Co_2 + H_2o$

Step2: Compare no. of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
C	3	1
H	8	2
O	2	3

No. of C atoms balancing

$C_3H_8+O_2 \rightarrow 3Co_2+H_2o$

No. of H atoms balancing

$C_3H_8+O_2 \rightarrow 3Co_2+4H_2o$

No. of O atoms balancing

$C_3H_8+5O_2 \rightarrow 3Co_2+4H_2o$

Step3: The above equation is balanced and writes the coefficient in smallest ratio.

$C_3H_8+5O_2 \rightarrow 3Co_2+4H_2o$

Step4: Verified above equation for balancing of atoms each element on both sides. Hence the equation is balanced.

$C_3H_8+5O_2 \rightarrow 3Co_2+4H_2o$

5. Write the balanced chemical equations for the following reaction. (As_1)

a) Zinc + silver nitrate → Zinc nitrate + silver

b) Aluminum + Copper chloride → Aluminum chloride + copper

c) Hydrogen + chlorine → Hydrogen chloride

d) Ammonium nitrate → Nitrogen + carbon dioxide +water.

Sol: a) Zinc + silver nitrate → Zinc nitrate + silver

Step1: Write the unbalanced equation using correct chemical formulae for all substances.

$$Zn + Ag\ No_3 \rightarrow Zn\ (No_3)_2 + Ag$$

Step2: Compare number of atom of each element on both sides.

Element	No. of atoms in LHS	No. of atoms in RHS
Zn	1	1
Ag	1	1
N	1	2
O	3	6

Balancing 'N' atoms on both sides

$$Zn + 2Ag\ No_3 \rightarrow Zn\ (No_3)_2 + Ag$$

Balancing 'Ag' atoms on both sides

$$Zn + 2Ag\ No_3 \rightarrow Zn\ (No_3)_2 + 2Ag$$

The above equation is balanced.

Step-3: Write the coefficient of smallest ratio

$$1Zn + 2Ag\ No_3 \rightarrow 1Zn\ (No_3)_2 + 2Ag$$

Step-4: Verified above equation for balancing of atoms of each element on both sides.

$$Zn + 2Ag\ No_3 \rightarrow Zn\ (No_3)_2 + 2Ag$$

b) Aluminum + Copper chloride → Aluminum chloride + copper

Sol: Step1: Write the equation using the correct chemical symbols and formulae for all the reactants and products.

$Al + Cu\,Cl_2 \rightarrow Al\,Cl_3 + Cu$

Step-2: Compare no of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
Al	1	1
Cu	1	1
CL	2	3

Balancing "CL" atoms on both sides

$Al + 3Cu\,Cl_2 \rightarrow 2Al\,Cl_3 + Cu$

Balancing "Al", "Cl" atoms on both sides

$2Al + 3Cu\,Cl_2 \rightarrow 2Al\,Cl_3 + 3Cu$

The above equation is balanced.

Step-3: Write the coefficient of smallest ratio.

$2Al + 3Cu\,Cl_2 \rightarrow 2Al\,Cl_3 + 3Cu$

Step-4: Verified above equation for balancing of atoms of each element on both sides.

$$2Al + 3Cu\,Cl_2 \rightarrow 2Al\,Cl_3 + 3Cu$$

c) Hydrogen + chlorine → Hydrogen chloride

Sol: Step-1: Write the unbalanced equation using correct chemical formulae for the reactants and products.

$H_{2+}\,Cl_2 \rightarrow Hcl$

Step-2: Compare no. of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
H	2	1
CL	2	1

Balancing "H" and "CL" atoms in both sides

$1H_2 + 1Cl_2 \rightarrow 2Hcl$

The above equation is balanced

Step-3: Write the coefficient of smallest ratio

$1H_2 + 1Cl_2 \rightarrow 2Hcl$

Step-4: Verified above equation for balancing of atoms of each element on both sides.

$H_2 + Cl_2 \rightarrow 2Hcl$

d) Ammonium nitrate → Nitrogen + carbon dioxide +water.

Sol: **Step-1:** Write the unbalanced equation using correct chemical formulae for all substances.

$NH_4No_3 \rightarrow N_2 + Co_2 + H_2O$

Step-2: Compare number of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
N	2	2
H	4	2
O	3	3

Balancing “H” atoms in both sides

$$NH_4No_3 \rightarrow N_2 + Co_2 + 2H_2O$$

Balancing “N” and “O” atoms in both sides

$$NH_4No_3 \rightarrow N_2 + Co_2 + 2H_2O$$

Step-3: Write the coefficient of smallest ratio.

$$NH_4No_3 \rightarrow N_2 + Co_2 + 2H_2O$$

Step-4: Verified above equation for balancing of atoms of each element on both sides.

$$NH_4No_3 \rightarrow N_2 + Co_2 + 2H_2O$$

6. Write the balanced chemical equation for the following and identify the type of reaction in each case (As_1)

a) Calcium hydroxide $_{(aq)}$ + Nitric acid $_{(aq)}$ → Water $_{(l)}$ + calcium nitrate $_{(aq)}$

b) Magnesium$_{(s)}$ + Iodine $_{(g)}$ → Magnesium iodide$_{(s)}$

c) Magnesium$_{(s)}$ + hydrochloric acid $_{(aq)}$ → Magnesium chloride $_{(aq)}$ + Hydrogen $_{(g)}$

d) Zinc$_{(s)}$ + calcium chloride $_{(aq)}$ + → Zinc chloride $_{(aq)}$ + Ca$_{(s)}$

Sol: a) Calcium hydroxide $_{(aq)}$ + Nitric acid $_{(aq)}$ → Water $_{(l)}$ + calcium nitrate $_{(aq)}$

$$Ca\,(OH)_{2(aq)} + HNo_{3\,(aq)} \rightarrow H_2O + Ca\,(No_3)_2$$

It is a skeleton equation.

Balancing the atoms of each element on both sides-

$$OH)_{2\,(aq)} + 2HNo_{3\,(aq)} \rightarrow 2H_2O_{\,(l)} + Ca\,(No_3)_{2(aq)}$$

The reaction is double displacement reaction.

b) Magnesium$_{(s)}$ + Iodine $_{(g)}$ → Magnesium iodide$_{(s)}$

Sol: The skeleton equation for the above reaction.

$$Mg_{(s)} + I_{2\,(g)} \rightarrow Mg\ I_{(S)}$$

Balancing the atoms of each element on both sides-

$$2Mg_{(s)} + I_{2\,(g)} \xrightarrow{-19-} 2Mg\ I_{(S)}$$

This reaction is chemical combination.

c) Magnesium$_{(s)}$ + hydrochloric acid$_{(aq)}$ →Magnesium chloride $_{(aq)}$+Hydrogen $_{(g)}$

Sol: The skeleton equation is-

$$Mg_{(s)} + Hcl_{\,(aq)} \rightarrow Mgcl_2 + H_2$$

Balancing the atoms of each element on both sides

$$1Mg_{(s)} + 2Hcl \rightarrow 1Mgcl_2 + 1H_2$$

(Or) $Mg + 2Hcl \rightarrow Mgcl_2 + H_2$

This reaction is displacement reaction.

d) Zinc$_{(s)}$ + calcium chloride $_{(aq)}$ + → Zinc chloride $_{(aq)}$ + Ca$_{(s)}$

Sol: The skeleton equation is-

$$Zn_{(S)} + Cacl_{2\,(aq)} \rightarrow Zncl_2 + Ca_3$$

Balancing the atoms of each element on both sides-

$$1ZN_{(S)} + 1\ Cacl_{2\,(aq)} \rightarrow 1Zncl_{2(aq)} + 1Ca_3$$

This reaction is displacement reaction.

7. Balance the chemical equation by including the physical states of the substances for the following reactions. (As_1)

a) Barium chloride and sodium sulphate aqueous solutions react to give insoluble barium sulphate and aqueous solution of sodium chloride

Step-1: Skeleton equation is

$$Bacl_{2\,(aq)} + Na_2\,So_{4\,(aq)} \rightarrow BaSo_{4\,(s)} \downarrow + Nacl_{\,(aq)}$$

Step-2: compare no. of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
Ba	1	1
CL	2	
Na	2	1
S	1	1
O	4	4

Balancing atoms on both sides

$$1Bacl_{2\,(aq)} + 1Na_2\,So_{4\,(aq)} \rightarrow 1BaSo_{4\,(s)} \downarrow + 2\,Nacl_{\,(aq)}$$

Step-3: write the coefficient of smallest ratio

$$1Bacl_{2\,(aq)} + 1Na_2\,So_{4\,(aq)} \rightarrow 1BaSo_{4\,(s)} \downarrow + 2\,Nacl_{\,(aq)}$$

Step-4: Verified above equation for balancing of atoms of each element on both sides.

$$Bacl_{2\,(aq)} + Na_2\,So_{4\,(aq)} \rightarrow BaSo_4 \downarrow + 2\,Nacl_{\,(aq)}$$

b) Sodium hydroxide reacts with hydro chloric acid to produce sodium chloride and water.

Sol: Step-1: skeleton equation is

$$NaOH_{(aq)} + Hcl_{(aq)} \rightarrow Nacl_{(aq)} + H_2O_{(l)}$$

Step-2: Compare no. of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
Na	1	1
O	1	1
H	1	1
CL	1	1

Balancing the atoms of each element on both sides

$$1NaOH_{(aq)} + 1Hcl_{(aq)} \rightarrow Nacl_{(aq)} + H_2O_{(l)}$$

Step-3: write the coefficient of smallest ratio

$$1NaOH_{(aq)} + 1Hcl_{(aq)} \rightarrow 1Nacl_{(aq)} + 1H_2O_{(l)}$$

Step-4: Verified above equation for balancing of atoms of each element on both sides

$$1Na\ OH_{(aq)} + 1Hcl_{(aq)} \rightarrow 1Nacl_{(aq)} + 1H_2O_{(l)}$$

C) Zinc pieces react with dilute Hydrochloric acid to liberate hydrogen gas and forms zinc chloride

Sol: Step-1: Skeleton equation is-

$$Zn_{(s)} + Hcl_{(aq)} \rightarrow Zncl_{2(aq)} + H_2 \uparrow$$

Step-2: compare no. of atoms of each element on both sides.

Elements	No of atoms in reactants	No of atoms in products
Zn	1	1
H	1	2
CL	1	2

Balancing atoms of each element on both sides-

$$Zn_{(s)} + 2Hcl_{(aq)} \rightarrow Zncl_{2\,(aq)} + H_2 \uparrow$$

Step-3: write the coefficient of smallest ratio

$$Zn_{(s)} + 2Hcl_{(aq)} \rightarrow Zncl_{2(aq)} + H_2 \uparrow$$

Step-4: Verified above equation for balancing of atoms of each element on both sides.

$$Zn_{(s)} + 2Hcl_{(aq)} \rightarrow Zncl_{2\,(aq)} + H_2 \uparrow$$

2Marks Questions

1. Why does respiration considered as an exothermic reaction? Explain (As_1)

A) The term respiration refers to the whole chain of process for the inhalation of air to the use of oxygen in the cells. It is the process of breakdown of complex food molecules or a catabolic process to produce chemical energy.

$$(C\ H_2O)_n + O_2 \rightarrow Co_2 + H_2O + \text{energy}$$

As energy is released in this reaction, it is considered as an exothermic reaction.

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

A)

Displacement Reaction	Double Displacement Reaction
1. In displacement reaction, one element displaces another element from its compound $Zn + 2Hcl \rightarrow Zncl_2 + H_2$ 2. An element will displace another element. $Ca + 2Hcl \rightarrow Cacl_2 + H_2$	1. In double decomposition reaction, two reactants exchange their constituents chemically and form two products $Na_2\ So_4 + Bacl_2 \rightarrow Baso_4 + 2Nacl$ 2. Ions will exchange from two ionic compounds. $NaOH + Hcl \rightarrow Nacl + H_2O$

3. Give two examples of oxidation – Reduction reaction?

A) 1. $2Fe_2O_{3\,(s)} + 3c_{\,(s)} \rightarrow 4Fe_{(s)} + 3Co_{2\,(g)}$

Carbon combines with oxygen to form carbon dioxide. Hence carbon is oxidized. Iron loses oxygen to form iron, hence iron is reduced.

2. $2pbo_{\,(s)} + c_{\,(s)} \rightarrow 2pb_{\,(s)} + Co_{2\,(g)}$

Carbon combines with oxygen to form carbon dioxide. Hence carbon is oxidized.

Lead loses oxygen to form lead, hence lead is reduced.

4. What do mean by corrosion? How can you prevent it?

A) Corrosion: - When some metals are exposed to moisture, acids etc. they tarnish due to the formation of respective metal oxide on their surface. This process is called corrosion.

Corrosion is the oxidative deterioration of a metal.

Prevention: - Corrosion can be prevented by or at least minimized by shielding the metal surface from oxygen and moisture.

It can be prevented by painting, oiling, greasing, galvanizing, chrome plating or making alloys.

A) When the fat/oil containing food maternal left for a long time, they are oxidized and become rancid.

Rancidity is an oxidation reaction. The spoilage of food can be prevented by adding preservatives like vitamin C and vitamin E.

6. Balance the following chemical equations including the physical state (As_1)

a) $C_6H_{12}O_6 \rightarrow C_2H_5OH + Co_2$

A) $C_6H_{12}O_{6\,(S)} \rightarrow 2\,C_2H_5OH + 2\,Co_2$

b) $Fe + O_2 \rightarrow Fe_2O_3$

A) $4\,Fe_{(s)}\ 3O_{2\,(g)} \rightarrow 2Fe_2O_{3\,(S)}$

c) $NH_3 + Cl_2 \rightarrow N_2H_4 + NH_4Cl$

A) $\mathbf{4}NH_{3\,(g)} + Cl_{2\,(g)} \rightarrow N_2H_{4\,(g)} + 2NH_4Cl_{\,(aq)}$

D) $Na + H_2o \rightarrow Na\,OH + H_2$

A) $\mathbf{2}Na_{\,(S)} + H_2o_{\,(l)} \rightarrow 2\,Na\,OH_{\,(aq)} + H_{2\,(g)}$

7. Why do we apply paint on iron articles?

A) Iron articles when exposed to air, reacts with oxygen and moisture in air. As a result rusting takes place in the metal deteriorates.

To prevent this rusting and deterioration of iron, we have to apply paint to iron article.

8 What is the use of keeping food in air tight containers?

A) When food materials containing fat/oil left for a long time, their taste and odour changes due to rancidity.

Rancidity is an oxidation process. To prevent rancidity and to slow down the oxidation process food will be stored in air tight containers.

Manufacturers of potato chips flush bags of chips with nitrogen gas to prevent the chips from getting oxidized.

1 Mark Questions

1. What do you mean by precipitation relation? (As_1)

A) Precipitation reaction: A chemical reaction in which one or more of the products are obtained as a precipitate is called precipitation reaction.

$Ag\ No_{3\ (aq)} + Nacl_{\ (aq)} \rightarrow Ag\ Cl_{(s)} \downarrow + NaNO_{3\ (aq)}$

Silver Nitrate sodium chloride silver chloride

2. Name the reactions taking plane in the presence of sunlight?

A) Reactions occur in the presence of sunlight are called photo chemical reactions.

$$2Ag\ Br_{(s)} \xrightarrow{sunlight} 2Ag_{(s)} + Br_{2\ (g)}$$

$$6Co_{2\ (g)} + 6H_2o_{\ (aq)} \xrightarrow{sunlight} C_6H_{12}O_6 + Co_2 \uparrow$$

3. $Mno_2 + 4Hcl \rightarrow Mncl_2 + 2H_2o + Cl_2$ In the above equation, name the compound which is oxidized and which is reduced? (As_1)

A) In the above reaction Mno_2 is reduced and Hcl is oxidized.

4. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write the reaction involved?

A) Copper displaces silver from silver nitrate solution.

$$2Ag\ No_{3(l)} + Cu_{(s)} \rightarrow Cu\ (No_3)_2 + Ag$$

Copper is more reactive than silver. So, copper displaces silver.

5. A shiny brown colored element 'x' on heating in air becomes black in color. Can you predict the element 'x' and the black colored substance formed? How do you support your prediction? (As_2)

A) A Shiny brown colored element X may be Cu. Cu on heating in air become black colored copper oxide (Cuo)

$$\underset{\text{(Brown)}}{2Cu} + O_2 \rightarrow \underset{\text{(Black)}}{2Cuo}$$

Important Images

1. Formation of Hydrogen Gas

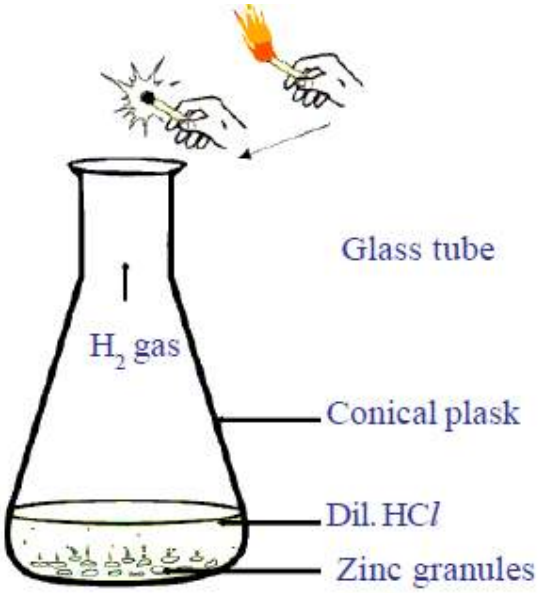

fig-2:Formation of hydrogen gas by action of dilute HCl on zinc and testing of H_2 gas

2. Heating of Carbonate

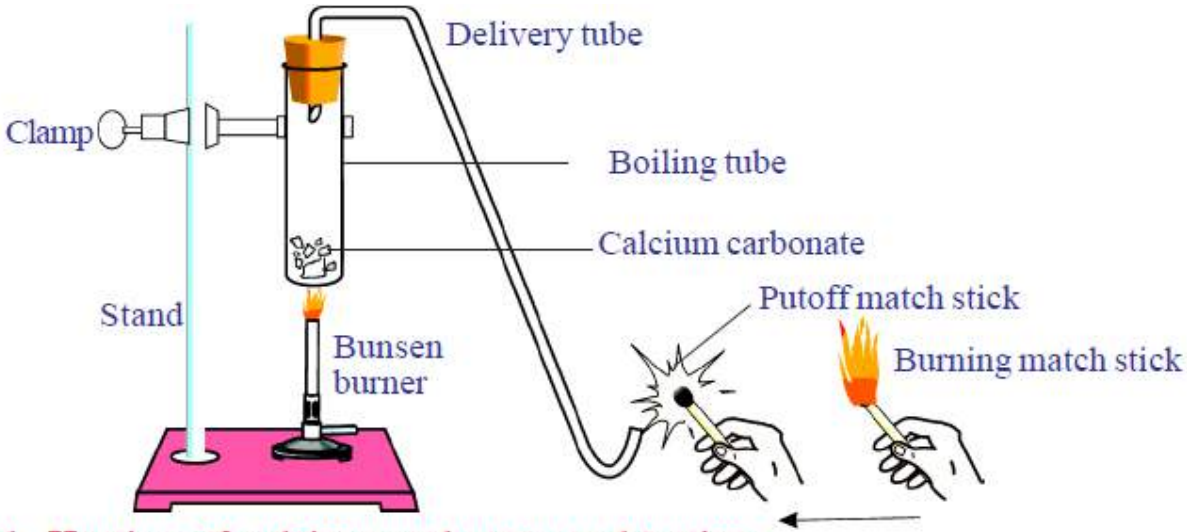

fig-6: Heating of calcium carbonate and testing the gas evolved with burning match stick

3. Electrolysis of water

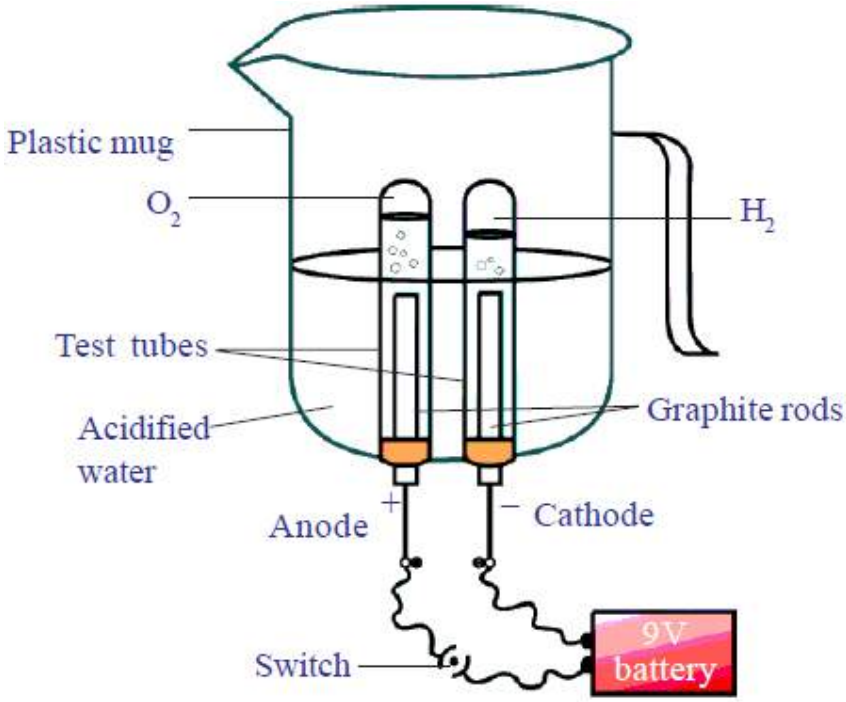

fig-8: Electrolysis of water

4. Reduction of copper oxide to copper

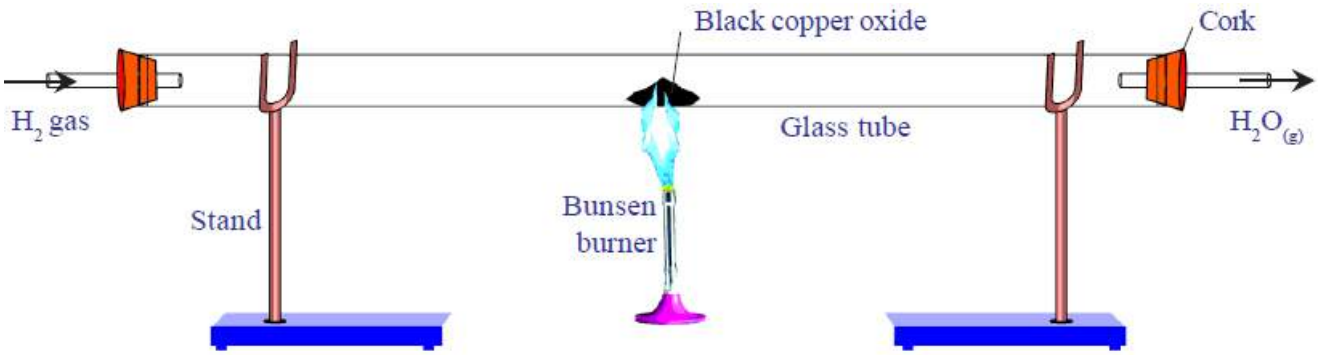

fig-14: Reduction of copper oxide to copper

Multiple Choice Questions

1. $Fe_2O_3 + 2AL \rightarrow Al_2O_3 + Fe$ **[c]**

a) Combination reaction b) Decomposition reaction

c) Displacement reaction d) Double decomposition reaction.

2. What happen when dil. Hydrochloric acid is added to iron filings? Choose the correct answer. **[a]**

a) Hydrogen gas and iron chloride are produced

b) Chlorine gas and iron hydroxide are produced

c) No reaction takes plane

d) Iron self and water are produced

3. $2pbo_{(s)} + c_{(s)} \rightarrow 2pb_{(s)} + co_{2\,(g)}$ **[b]**

Which of the following statements are correct for the above chemical reaction?

1) Lead is reduced 2) carbon dioxide is oxidized

3) Carbon is oxidized 4) lead oxide is reduced

a) 1&2 b) 1&3 c) 1, 2, 3 d) All

4. The ch equation **[d]**

$Bacl_2 + Na_2So_4 \rightarrow BaSo_4 + 2Nacl$ represents following type of chemical reaction.

a) Displacement b) Combination

c) Decomposition d) Double displacement

5. The reaction of formation hydrogen chloride from hydrogen and chloride represents following- **[c]**

a) Decomposition b) Displacement

c) Combination d) Double displacement

6. Which of this is a chemical reaction? **[d]**

a) Coal is burnt b) Milk is converted into curd

c) Crackers are burnt d) All the above

7. When sodium sulphate (Na_2 So_4) solution mixed with barium chloride ($Bacl_2$) solution barium sulphate precipitate formed. What is the color of this precipitate? **[b]**

a) Yellow b) white c) Blue d) Black

8. Chemical changes may be - **[c]**

a) Exothermic b) Endothermic

c) Exothermic or endothermic d) None

9. **Zn + Hcl → ____ + H_2 ↑** **[b]**

a) Zn CL b) $Zncl_2$ c) ZnH d) Cl_2

10. For balancing the given chemical equation, the coefficient of oxygen (0_2) is C3 H_8 + O_2 → Co_2 + H_2O **[c]**

a) 3 b) 4 c) 5 d) 6

11. $C_{(s)}$ + $O_{2\,(g)}$ → $Co_{2\,(g)}$ is which type of reaction? **[a]**

a) Exothermic reaction b) endothermic reaction

c) Decompose reaction d) displacement reaction

12. The chemical formula of marble is- **[b]**

a) $ZnCo_3$ b) $CaCo_3$ c) KCL d) Nacl

13. When iron nail chipped in copper sulphate solution and left undisturbed for some time, the iron nail becomes brown due to formation of? **[a]**

a) $Feso_4$ b) Feo c) So_2 d) Fes

14. Corrosion can be prevented by? **[d]**

1) Painting 2) oiling

3) Greasing 4) galvanizing

a) 1 b) 1&2

c) 1, 2&3 d) 1, 2, 3&4

15. Which of the following is not a alloy? **[d]**

a) Brass b) Bronze

c) Steel d) Iron

16. Metal oxide is electric---- **[d]**

a) Conductor b) good conductor

c) Semi conductor d) insulator

17. Which is the good preservative of food? **[c]**

a) $Cuso_4$ b) Bacl

c) Vitamin C and vitamin E d) vitamin A

18. To prevent the potato chips from getting oxidization flush bags of chips are filled with? **[a]**

a) Nitrogen gas b) Oxygen

c) Hydrogen gas d) Fluorine

19. The color of copper oxide (Cuo) is? **[d]**

a) Blue b) Light red

c) Bluish green d) Black

20. Which enzyme is caused for the change the color on the cut surface of the fruits like apples, bananas? **[d]**

a) Inverts b) Zymase

c) Glycerol d) Tyrosimase

21. $2Fe_2O_3 + 3c \rightarrow 4Fe + 3Co_2$

The above chemical reaction is an example of? **[c]**

a) Oxidation reaction b) reduction reaction

c) Redox reaction d) None

22. When light yellow colored silver bromide exposed to sunlight, which colour does it change into? **[c]**

a) White b) Black c) Gray d) Red

23. Metals + Acid → _____ **[b]**

a) Hydrochloride b) Hydrogen c) Oxygen d) Ammonia

Fill in the Blanks

1. Quick lime's another name is _____. **(Calcium oxide)**

2. Zn + Hcl → $ZncL_2$ _____. **(H_2)**

3. Propane used as _____ fuel. **(Cooking)**

4. Unbalanced chemical equation containing molecular formulae of the substance is known as _____. **(Skeleton equation)**

5. Heat is _____in exothermic reaction. **(Liberated)**

6. If a precipitate is formed in the reaction it is denoted by _____.( ) **(Downward arrow)**

7. If chemical reaction atoms are neither ____ nor _____. **(created, destroyed)**

8. Chemical reactions occur with the formulation a breaking of ___. **(Chemical bonds)**

9. The chemical formula of marble is _____. **($CaCo_3$)**

10. _____is the color of silver bromide **(Light yellow color)**

11. Oxidation is a reaction that involves the addition of___ or removed of _____.

(Oxygen, Hydrogen)

12. Color of copper oxide _____. **(Black)**

13. Burring of crackers is also ____ process of variety of chemicals. **(Oxidation)**

14. Galvanizing is a method o protecting iron form _____. **(Rusting)**

15._____ Steel does not rust. **(Stainless)**

16. Rancidity is a _____ reaction. **(Oxidation)**

17._____ Gas is used to prevent the chips from getting oxidized. **(Nitrogen)**

18. ____ is the smallest particle of an element that takes part in chemical reaction. **(Atom)**

Matching

1.

Group-A		Group-B
1. Vitamin E	**[b]**	a) Heat energy release
2. Greasing	**[d]**	b) Preservative
3. Tyrosine's	**[c]**	c) Enzyme
4. Dazzling white flame	**[e]**	d) corrosion
5. Exothermic	**[a]**	e) Magnesium
		f) Heat absorption.

1.

Group-A		Group-B
1. $2Mg + O_2 \rightarrow 2Mgo$	**[e]**	a) Redox reaction
2. $2CaCo_3 \rightarrow Cao + Co_2$	**[d]**	b) Double displacement
3. $Zn + 2Hcl \rightarrow Zncl_2 + H_2$	**[c]**	c) Displacement
4. $Na_2So_4 + Bacl_2 \rightarrow Baso_4 + 2Nacl$	**[b]**	d) Decomposition
5. $2Fe_2O_3 + 3c \rightarrow 4Fe + 3Co_2$	**[a]**	e) Combination
		f) Rancidity.