Class 10th Science

Chapter - 1

Chemical Reaction and Equations

Textual Questions and Answers :

Page No - 6

Q.1. Why should a magnesium ribbon be cleaned before burning in air?

Ans :- Because of unwanted impurities are removed.

Q.2. Write the balanced equation for the following chemical reactions.

(i) Hydrogen + chloride → Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride

(iii) Sodium + water → Sodium hydroxide + Hydrogen.

Ans :- (i) $H_2 + Cl_2 \rightarrow 2HCl$

(ii) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 3BaSO_4 + 2AlCl_3$

(iii) $2Na + 2H_2O \rightarrow 2NaOH + H_2$

Q.3. Write a balanced chemical equation with state symbols for the following reactions.

(i) Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.

(ii) Sodium hydrochloric acid solution (in water) to produce sodium chloride solution an water.

Ans :- (i) $Bacl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4\ (s) + 2Nacl(aq)$

(ii) $NaOH\ (aq) + Hcl(aq) \rightarrow Nacl(aq) + H_2O$

Page No - 10

Q.1. A solution of 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) x' is quick lime; CaO

(ii) $CaO + H_2O \rightarrow Ca(OH)_2$

Q.2. Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Ans :- In activity 1.7 water is electrolysed to give H_2 gas at one electrode and O_2 gas at the other electrode according to the given chemical reaction.

$$2H_2O \rightarrow 2H_2 + O_2$$

Thus, two molecules of water on electrolysis give two molecules of hydrogen gas and one molecule of oxygen gas or the amount of hydrogen gas collected would be double than that of oxygen gas.

Page No -13

Q.1. Why does the colour of copper sulphate solution change when an iron nail is dipped in it ?

Ans :- The following chemical reaction takes place when an iron nail dipped in copper sulphate solution:

$$Fe(S) + CaSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$$

(coper sulphate) (Iron sulphate)

In this reaction iron has displaced or removed copper from copper sulphate solution.

Thus amount of copper sulphate decreases and its colour fades.

Q.2. Give an example of a double displacement reaction other than the one given in Activity 1.10.

Ans :- When a solution of hydrochloric acid is added to a solution of lead nitrate, a white precipitate of lead chloride is formed.

$Pb(NO_3)_2(aq) + 2Hcl(aq) \rightarrow Pbcl_2(s) + 2HnO_3(aq)$

Q.3. Identify the substances that are oxidised and the substances that are reduced in the following reactions :

(i) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$

(ii) $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$

Ans :- (i) Oxidised :- $Na(s)$, $H_2(g)$

(ii) Reduced :- $O_2(g)$, $CuO(s)$

Exercises :

Q.1. Which of the statements about the reaction below are incorrect?

$2PbO(s)+C(s) \rightarrow 2Pb(s) + (Co_2(g)$

(a) Lead is getting reduced.

(b) Carbon dioxide is getting oxidised.

(c) Carbon is getting oxidized.

(d) Lead oxide is getting reduced.

(i) (a) and (b)

(ii) (a) and (c)

(iii) (a), (b) and (c)

(iv) all

Ans :- (i) (a) and (b)

Q.2. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$ The above reaction is an example of a

(a) combination reaction.

(b) double displacement reaction .

(c) decomposition reaction.

(d) displacement reaction.

Ans :- (d) déplacement réaction.

Q.3. What happens when dilute hydrochloric acid is added to iron filling? Tick the correct answer.

(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.

Ans :- (a) Hydrogen gas and iron chloride are produced.

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

Ans :- A chemical equations is balanced so that the numbers of atoms of each type involved in a chemical reaction are the same on the reactant and product sides of the equation.

The chemical equations must be balanced because the number of atoms of each element remains the same, before and after a chemical reaction.

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

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

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

(c) Barium 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.

Ans :- (a) $3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$

(b) $2H_2s(g) + 3O_2 \rightarrow 2SO_2(g) + 2H_2O(e)$

(c) $3BaCl_2(aq) + Al_2(SO_4)_3(aq) \rightarrow 2AlCl_3(aq) + 3BaSO_4(s)$

(d) $2K(s) + 2H_2O(l) - 2KOH(aq) + H_2(g)$

Q.6. Balance the following chemical equations -

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c) $Nacl + AgNO_3 \rightarrow Agcl + NaNO_3$

(d) $Bacl_2 + H_2SO_4 \rightarrow BaSo_4 + HCl$

Ans :- (a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

(c) $Nacl + AgNO_3 \rightarrow Agcl + NaNO_3$

(d) $Bacl_2 + H_2SO_4 \rightarrow BaSO_4 + 2Hcl$

Q.7. Write the balanced chemical equations for the following reactions :

(a) Calcium hydroxide + Carbon dioxide → Calcium Carbonate + water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium Chloride + copper

(d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride.

Ans :- (a) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

(b) $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

(c) $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$

(d) $BaCl_2 + K_2SO_4 \rightarrow BaSo_4 + 2Kcl$

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

(a) Potassium bromide (aq) + Barium iodide (ag) → Potassium iodide (aq) + Barium bromide(s)

(b) Zinc carbonate (s) → Zinc oxide(s) + carbon di-oxide(g)

(c) Hydrogen(g) + chloringe(g) → Hydrogen chloride(g)

(d) Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen (g)

Ans :- (a) $2KBr\ (aq) + BaI_2\ (aq) - \rightarrow KI(aq) + BaBr_2\ (s)$

Type :- Double displacement reaction.

(b) $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$

Type :- Decomposition reaction.

(c) $H_2(g) + Cl_2\ (g) – 2HcI(g)$

Type :- Combination reaction.

(d) $Mg(s) + 2Hcl(aq) \rightarrow Mgcl_2\ (aq) + H_2(g)$

Type :- Displacement reaction.

Q.9. What does one mean by exothermic and endothermic reactions? Give examples.

Ans :- Exothermic reactions :- reactions in which heat is given out along with the products are called exothermic reactions.

Examples :- (i) $C(s) + O_2(g) \rightarrow Co_2(g) + 393.7\ kJ$ (ΔH=-393.7 KJ)

(ii) $N_2(g) + 3H_2(g) \rightarrow 2NH_3\ (g) + 92KJ$ (ΔH=- 92KJ)

Endothermic reactions :- Reactions in which energy is absorbed are known as endothermic reactions.

Examples :- (i) $C(s) + 2S(s) \rightarrow CS_2(b) - 92\ KJ$ (ΔH=-92KJ)

(ii) $N_2(g) + O_2(g) \rightarrow 2NO(g) - 180.5KJ$ (ΔH=-180.5 KJ)

Q.10. Why is respiration considered an exothermic reactions? Explain.

Ans :- During digestion, food is broken down into simpler substances. For example- rice, potatoes and bread contain carbohydrates. These carbohydrates are broken down to form glucose. This glucose combines with oxygen in the cells of our body and provides energy. This reaction is known as respiration. The chemical equation is-

$C_6H_{12}O_6\ (aq) + 6O_2\ (aq) \rightarrow 6CO_2\ (aq) + 6H_2O(e)$ +energy Thus respiration is an exothermic reaction.

Q.11. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

Ans :- Decomposition reactions are opposite of combination reactions. In a decomposition reaction, a single substance decomposes to give two or more substances. For example -

$$\underset{\text{(limestone)}}{CaCo_3(s)} \xrightarrow{\text{Heat}} \underset{\text{(quicklime)}}{CaO(s) + CO_2(g)}$$

In a combination reaction two or more substances combine to form a new single substance.

For example :- $C(s) + O_2(g) \rightarrow CO_2(g)$

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

Ans :-

$$2MgO(s) \xrightarrow{\text{heat}} 2Mg(s) + O_2(g)$$

$$AgBr(s) \xrightarrow{\text{light}} Ag(s) + Br_2(g)$$

$$2H_2O(l) \xrightarrow[\text{(acid)}]{\text{electricity}} 2H_2(g) + O_2(g)$$

Q.13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans :- When an element displaces another element from its compound, a displacement reaction occurs. In other hard two different atoms an groups of atoms are exchanged in double displacement reactions.

Equation of displacement reaction :-

$$Fe(s) + CuSo_4\ (aq) \rightarrow Cu(s) + FeSO_4\ (aq)$$

In this reaction iron displaces copper from its solution.

Equation of double displacement reaction :-

$$AgNO_3\ (aq) + Nacl\ (aq) \rightarrow Agcl(s) + NaNO_3$$

In this reaction silver nitrate and sodium chloride exchanged cl^- and NO_3^- ions between them.

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

Ans :- $AgNO,_3\ (aq) + Cu(s) \rightarrow CuNO_3\ (aq) + Ag\ (s)$

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

Ans :- Any reaction that produces a precipitate can be called a precipitation reaction.

For example :-

$$Na_2SO_4\ (aq) + Bacl_2\ (aq) \rightarrow BaSO_4\ (s) + 2Nacl(aq)$$

(Sodium sulphate) (Barium chloride) (Barium sulphate) (Sodium chloride)

The white precipitate of $BaSO_4$ is formed by the reaction of SO_4^{2-} and Ba^{2+}

Q.16. Explain the following in terms of gain or logs of oxygen with two example reach –

(a) Oxidation.

(b) Reduction.

Ans :- Oxidation :- The chemical reactions in which a substance gains oxygen is called oxidation.

Example :-

$$2Cu + O_2 \xrightarrow{heat} 2CuO$$

$$2Mg + O_2 \xrightarrow{burn} 2MgO$$

(b) Reduction :- The chemical reactions in which a substance losses oxygen is called reduction.

Example :- $ZnO + C \rightarrow Zn + CO$

$Cuo + H_2 \rightarrow Cu + H_2O$

Q.17. A shiny brown colured element 'x' on heating in air becomes black in colour. Name the element 'x' and black coloured compound formed.

Ans :- Element 'x' is copper (Cu)

Black colour compound is copper oxide (CuO)

$$2Cu\ (s) + O_2 \rightarrow 2CuO$$
Brown fromair Black

Q.18. Why do we apply paint on iron articles?

Ans :- Paint saves iron articles from damage on iron articles.

Q.19. Oil and fat containing food items are flushed with nitrogen. Why?

Ans :- To keep food items fresh and save these from oxidising effect of oxygen, food items are flushed with nitrogen,

Q.20 . Explain the following terms with an example each:

(a) corrosion.

(b) Rancidity.

Ans :- (a) Corrosion :- When a metal is attacked by substances around it such as moisture, acids etc., it is said to corrode and this process is called corrosion.

The black coating on silver and the green coating on copper are examples of corrosion.

(b) Rancidity :- When fats and oils ar oxidised, they become rancid and their smell and taste changes and causes infection on eating. This is called Rancidity.

Chips manufactures usually flush ags of chips with gas such as nitrogen to prevent the chips from getting oxidised.

Additional Questions and Answers :

Q.1. What is a chemical equation?

Ans :- A chemical equation is an expression for gives chemical change in terms of symbols or formula of the reactants and products.

Q.2. How do we came to know that a chemical reaction has taken place?

Ans :- Any of the following observations helps us to determine whether a chemical reaction has taken place.

(a) Change in stale.

(b) Change in colour.

(c) Evolution of gas.

(d) Change in tempe rature.

Q.3. How magnesium oxide is formed ?

Ans :- Magnesium oxide is formed due to the reaction between magnesium and oxygen present in the air.

Q.4. When an unbalanced equation formed ?

Ans :- If the number of atoms of each element are not same on the both sides then an unbalanced equation formed.

Q.5. What is combination reactions? Give one example?

Ans :- A reactions in which a single product is formed fro two or more reactants is known as a combination reaction.

For example :- $CaO + H_2O \rightarrow Ca(OH)_2$

Q.6. Give two examples of exothermic reactions?

Ans :- (i) Burning of natural gas CH_4 (g) + $2O_2$(g) → CO_2 + $2H_2O$ (g)

(ii) The decomposition of vegetable matter into compost is an example of an exothermic reaction.

Q.7. What is thermal decomposition? Give two examples.

Ans :- When a decomposition reaction is carried out by heating it is called thermal decomposition.

Example :-

$$CaCO_3 \xrightarrow{heat} CaO + CO_2$$

$$2Pb(No_3)_2 \xrightarrow{heat} 2PbO + 4No_2 + O_2$$

Q.8. Why silver chloride turns grey in sunlight ?

Ans :- This is due to the decomposition of silver chloride into silver and chlorine by light.

$$2Agcl\ (s) \xrightarrow{sunlight} 2Ag(s) + Cl_2(g)$$

Q.9. Balance the following skeletal equations-

(i) $KClO_3 \rightarrow KCl + O_2$

(ii) $CH_4 + O_2 \rightarrow CO_2 + H_2O$

(iii) $Nacl + H_2SO_4 \rightarrow Na_2So_4 + HCl$

(iv) $H_2S + O_2 \rightarrow H_2O + S$

(v) $H_2 + N_2 \rightarrow NH_3$

Ans. (i) $2KClO_3 \rightarrow 2KCl + 3O_2$

(ii) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

(iii) $2Nacl + H_2SO_4 \rightarrow Na_2So_4 + 2HCl$

(iv) $2H_2S + O_2 \rightarrow 2H_2O + 2S$

(v) $3H_2 + N_2 \rightarrow 2NH_3$

Q.10. What is the need to balance a chemical equation with respect to mass and change?

Ans :- The chemical equation must be balanced with respect to mass because matter can neither be created nor destroyed. The equation must be balanced with respect to charge because the electrons lost by atoms to form cations are equal to the electrons gained by other atoms to form anions. Thus, as the reaction mixture does not contain any free electrons, the total positive change should be equal to the total negative charge.

Q.11. Identify the substance oxidized and reduced in the chemical reaction.

$$MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$$

Ans :- oxidised :- HCl

Reduced :- MnO_2

Q.12. Milk becomes sour if kept for a long time, what is the type of reaction?

Ans :- Decomposition reaction.

Q.13. Give two necessary conditions for rusting?

Ans :- (i) Presence of air or oxygen.

(ii) Presence of moisture.

Q.14. How is rusting of iron prevented ?

Ans :- Prevention of rusting :

(i) The iron articles should be painted.

(ii) Iron can be coated with chromium.

(iii) The machine parts should be oiled and greased.

(iv) Galvanised iron pipes are used for water supply.

Q.15. Name the type of reactions :

(i) $Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$

(ii) $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$

(iii) $HN_4Cl\ (s) \rightarrow NH_3\ (g)\ Hcl\ (g)$

(iv) $2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (g)$

(v) $Mg(s) + H_2SO_4\ (aq) – MgSO_4\ (aq) + H_2\ (g)$

Ans :- (i) Displacement reaction.

(ii) Decomposition reaction.

(iii) Decomposition reaction.

(iv) Combination reaction.

(v) Displacement reaction.

Q.16. How are the following information indicated in a chemical equation ?

(i) Formation of a precipitate.

(ii) Evolution of a gas.

(iii) A solution made in water.

(iv) Evolution of heat.

(v) Absorption of heat.

Ans :- (i) ↓or (s)

(ii)↑or (g)

(iii) (aq)

(iv) + heat (Δ H = - ve)

(v) - heat (Δ H = + ve)

Q.17. What is a redox reaction?

Ans :- a chemical reaction in which one substance oxidised and the other is reduced is called a redox reaction. All oxidation reduction reaction are redox

reaction. In a chemical reaction, a substance get oxidised only when another substance is present gets reduced.

Q.18. Give two differences between rusting and burning.

Ans :- (i) Rusting is a slow process while burning is a fast process.

(ii) Rusting takes place in the presence of oxygen and moisture while burning requires only oxygen.

Q.19. Fill in the blanks.

(i) New substances formed during a chemical change are ---------- .

Ans :- Product.

(ii) $Fe+CuSo_4 \rightarrow FeSO_4 + Cu$ is -------- reaction.

Ans :- Displacement.

(iii) The reaction which proceeds by evolution of heat is known as ---------- .

Ans :- Exothermic reaction.

(iv) Decomposition reactions are the opposite of---------- reactions.

Ans :- Combination.

(v) The gain of hydrogen by au atom or ion is known as---------- .

Ans :- Reduction.

(vi) The comparative reactivity of metal is shown by---------- reactions.

Ans :- Displacement.

(vii) More reactive metal displaces ---------- metal from its salt solution.

Ans :- Less Reactive.

(viii) The digestion of food in our body is indicative of---------- reaction.

Ans :- Décomposition.

(ix) Electrons are lost and gained during----------reactions.

Ans :- Redox.

Q.20. How can rancidity be prevented ?

Ans :- By adding antioxidants to food.

Multiple Choice Questions :

Q.1. In a chemical equation, what is avoided ?

(a) Symbols.

(b) Formula.

(c) Number of atoms. And

(d) Words.

Ans :- (d) Words.

Q.2. Choose the double displacement reaction

(a) X+ YZ → XY + Z

(b) X + Y → XY

(c) XYZ → YZX

(d) XY + AB → XA + YB

Ans :- (d) XY + AB → XA + YB

Q.3. Which is true for an oxidation reaction ?

(a) Addition of oxygen.

(b) Removal of oxygen.

(c) Removal of hydrogen.

(d) Addition of hydrogen.

(i) (a) and (c)

(ii) (a) and (d)

(iii) (a) and (b)

(iv) (b) and (d)

Ans :- (i) (a) and (c)

Q.4. Which one of the following can be a non-redox reaction ?

(a) Combination.

(b) Decomposition.

(c) displacement.

(d) Double displacement.

Ans :- (d) Double déplacement.

Q.5. Identify the double decomposition reactions.

(a) Hydrogen burns in air.

(b) Electrolysis of water.

(c) Digestion of food.

(d) Addition of dilute sulphuric acid to $BaCl_2$ solution.

Ans :- (d) Addition of dilute sulphuric acid to $BaCl_2$ solution.

Q.6. Choose the combination reaction.

(a) Electric current is passed through water.

(b) Hydrogen burns in oxygen.

(c) Hydrogen peroxide is exposed to sunlight.

(d) Digestion of food in our body.

Ans :- (b) Hydrogen burns in oxygen.

Q.7. Food items on exposures to atmosphere become rancid due to the process of.

(a) Oxygen.

(b) Reduction.

(c) Corrosion.

(d) Hydrogenation.

Ans :- (a) Oxidation.

Q.8. What is not true in a balanced chemical equation ?

(a) Number of atoms of different elements on both sides are equal.

(b) Mass of both sides are equal.

(c) Number of charged ions on both sides are equal.

(d) Total of charges on both sides are equal.

Ans :- (c) Number of charged ions on both sides are equal.

Q.9. Respiration is a chemical change because.

(a) Energy is evolved.

(b) There is decrease in temperature.

(c) There is increase in temperature.

(d) There is change in state.

Ans :- (a) Energy is evolved.

Q.10. In which of the following experiments, residue left behind is reddish brown ?

(a) Heating of coper powder in air.

(b) Heating of ferrous sulphate crystals.

(c) Heating of magnesium in air.

(d) Heating of solid calcium carbonate.

Ans :- (b) Heating of ferrous sulphate crystals.