SCIENCE CLASS X
CHAPTER-1 CHEMICAL REACTIONS AND EQUATIONS

Q.1. In the reaction

$$Be_2C + XH_2O \rightarrow YBe(OH)_2 + CH_4$$

Write the values of X and Y.

Ans. On balancing the given equation

$$Be_2C + 4H_2O \rightarrow 2Be(OH)_2 + CH_4$$

Beryllium carbide, Water, Beryllium hydroxide, Methane

Hence, X = 4 and Y = 2

Q.2. The carbonate of metal X is a white solid. It decomposes when heated to form carbon dioxide and a yellow solid oxide. What is metal X.

Ans. Metal X is lead carbonate ($PbCO_3$).

$$PbCO_3\ (s) \rightarrow PbO\ (s) + CO_2\ (g)$$

Lead Carbonate, lead oxide, Carbon dioxide

Q.3. Which type of glasses can be used for storage of fresh sample of an oil for a long time?

Ans. Helium (He) and nitrogen (N_2) can be used because both are unreactive gases hence prevent oxidation of oil and also its rancidity.

Q.4. Is burning of a candle wax a physical change or a chemical change?

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Ans. Burning of a candle wax is a chemical change because candle wax is a hydrocarbon which burns to produce carbon dioxide.

Q.5. Write difference between a physical change and a chemical change ?

Ans. The differences between a physical change and a chemical change are

S.No.	Physical change	Chemical change
(i)	No new chemical substance is formed.	A new chemical substance is formed.
(ii)	The change is reversible.	The change is normally difficult to reverse.
(iii)	Its examples are melting, freezing, evaporation, condensation, boiling, sublimation, dissolving and expansion.	Its examples are combustion, oxidation, chemical decomposition and chemical combination.

Q.6. Which one is a chemical change-melting of iron or rusting of iron?

Ans. Rusting of iron is a chemical change because this reaction cannot be reversed.

Q.7. What is incorrect in the following equation ?

$$\mathbf{C + 2O \xrightarrow{Heat} CO_2}$$

Ans. It is incorrect to write oxygen as 2O. It should be written as O_2

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$$\underset{\text{Carbon}}{C} + \underset{\text{Oxygen}}{O_2} \xrightarrow{Heat} \underset{\text{Carbon dioxide}}{CO_2}$$

Q.8. Give one use of quick lime.

Ans. Quick lime (CaO) is used in the manufacture of cement.

Q.9. Write a balanced chemical equation for the following reaction

Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4.

Ans. $\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Ethanoic acid}}{CH_3COOH} \xrightarrow[\text{Esterification}]{Conc.H_2SO_4} \underset{\text{Ester}}{CH_3COOC_2H_5} + \underset{\text{Water}}{H_2O}$

The reaction is double displacement type.

Q.10. Give an example of exothermic reaction.

Ans. Examples of exothermic reaction is burning of natural gas.

The reaction involved is

$$\underset{\text{Methane}}{CH_4}\ (g) + \underset{\text{Oxygen}}{2O_2}\ (g) \longrightarrow \underset{\text{Carbon dioxide}}{CO_2}\ (g) + \underset{\text{Oxygen}}{2H_2O}\ (g) + \text{Heat}$$

Q.11. Give an example of double displacement reaction. (Write a balanced equation only).

Ans. $\underset{\text{Hydrochloric Acid}}{HCl(aq)} + \underset{\text{Sodium hydroxide}}{NaOH(aq)} \longrightarrow \underset{\text{Sodium Chloride}}{NaCl(aq)} + \underset{\text{Water}}{H_2O(l)}$

Q.12. Balance the given chemical equation.

$Al(s) + CuCl_2(aq) \longrightarrow 2AlCl_3(aq) + Cu(s)$

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Ans. $2Al(s) + 3CuCl_2(aq) \longrightarrow 2AlCl_3(aq) + 3Cu(s)$
Aluminium; Copper Chloride; Aluminium chloride; Copper

Q.13. Write a balanced chemical equation for the reaction between sodium chloride and silver nitrate indicating the physical state of the reactant and the products.

Ans. $NaCl(aq) + AgNO_3(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$
Sodium Chloride; Silver nitrate; Silver chloride (white ppt.); Sodium nitrate

Q.14. Complete the missing component/variable given as X and Y in the following reaction $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(X) + H_2(Y)$

Ans. $Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g)$
Zinc; Sulphuric acid; Zinc sulphate; Hydrogen

therefore X = (aq) and Y = (g)

Q.15. Identify the following agent in the given following reaction

$Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$

Ans. CO i.e., carbon monoxide is the reducing agent in the given reaction as it removes oxygen from Fe_2O_3 and causes its reduction.

Q.16. Identify the type of reaction in the following example

$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Ans. The above reaction is displacement reaction.

Q.17. (i) $AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s)\downarrow + NaNO_3(aq)$

(ii) $FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S\uparrow$

Consider the above mentioned two chemical equations with two

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Chemical equations with two different kinds of arrows (↑ and ↓) alongwith product. What do these two different arrows indicate?

Ans. (↑) indicates the gaseous state.

(↓) indicates the solid state or precipitate.

Q.18. A brown substance X on heating in air forms a substance Y. When hydrogen gas is passed over heated Y it again changes back into X.

Ans. The substance X is copper and Y is copper (II) oxide or CuO.

Q.19. What change in colour is observed when white silver chloride is left exposed in sunlight? State the type of chemical reaction in this change.

Ans. The colour of silver chloride changes from white to grey. The reaction is an example of photochemical decomposition.

$$\underset{\substack{\text{Silver Chloride}\\\text{(white)}}}{2AgCl(s)} \xrightarrow{Sunlight} \underset{\substack{\text{Silver}\\\text{(grey)}}}{2Ag(s)} + \underset{\text{Chlorine}}{Cl_2(g)}$$

Q.20. State the chemical change that takes place when lime stone is heated.

Ans. Calcium carbonate (limestone) decomposes on heating to give calcium oxide and carbon dioxide.

$$\underset{\substack{\text{Calcium}\\\text{Carbonate}}}{CaCO_3(s)} \xrightarrow{Heat} \underset{\substack{\text{Calcium}\\\text{oxide}}}{CaO(s)} + \underset{\substack{\text{Carbon}\\\text{dioxide}}}{CO_2(g)}$$

Q.21. Write balanced chemical equation for the following

Phosphorus burns in oxygen to give phosphorus pentaoxide

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Ans. P_4 (Phosphorus) + $5O_2$ (Oxygen) $\longrightarrow$ $2P_2O_5$ (Phosphorus Pentaoxide)

Q.21. Why does the colour of heated copper powder become black when air is passed over it?

Ans. When copper powder is heated in air, then copper oxide is formed which is black in colour.

$$2Cu \text{ (Copper powder)} + O_2 \text{ (Oxygen)} \xrightarrow{Heat} 2CuO \text{ (Copper oxide (black))}$$

Q.22. A student took few crystals of sugar in a dry test tube and heated the test tube over flame. The colour of the solution turned black, why?

Ans. Sugar is a complex compound which on heating undergoes decomposition and water gets evaporated thereby leaving behind black carbon in the test tube.

Q.23. What precaution should be taken while heating magnesium ribbon over burner?

Ans. The dazzling light is produced on burning magnesium ribbon which can be harmful to the eyes. Hence, while performing this experiment, keep your eyes as far as possible from the burning magnesium ribbon.

Q.24. Using a suitable chemical equation, justify that some chemical reactions are determined by

(a) change in colour.

(b) change in temperature.

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Ans. The two reactions given below justify that chemical reactions are also determined by change in colour and change in temperature.

(a) Heating of copper sulphate crystals

$$\underset{\text{Blue}}{CuSO_4 \cdot 5H_2O} \xrightarrow{Heat} \underset{\text{(White)}}{CuSO_4} + 5H_2O$$

i.e., colour changes

(b) $$\underset{\text{Quick lime}}{CaO} + H_2O \xrightarrow[Combination]{Dissolution} \underset{\text{Slaked lime}}{Ca(OH)_2} + \text{Heat}$$

i.e., temperature increases.

Q.25. Aluminium is a reactive metal but is still used for packing food articles. Why?

Ans. Aluminium is quite reactive when it is kept in air or oxygen for sometime, it is converted into its oxide called aluminium oxide (Al_2O_3). This gets deposited as the surface of the metal as a thin coating .

This aluminium oxide is passive which means that it is not reactive. Therefore, this metal is used for packing food articles which do not get spoiled in the foil.

Q.26. A white salt on heating decomposes to give brown fumes and residue is left behind,

(a) Name the salt.

(b) Write the equation for the decomposition reaction.

Ans. (a) Lead nitrate

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(b) $2Pb(NO_3)_2\ (s) \xrightarrow{Heat} 2PbO(s) + 4NO_2(g) + O_2\ (g)$

Lead nitrate (white salt) | Lead oxide (residue) | Nitrogen oxide $\left(\begin{matrix}brown\\fumes\end{matrix}\right)$ | Oxygen

Q.27. Write any two observations in an activity which may suggest that a chemical reaction has taken place. Give an example in support of your answer.

Ans. Two observation are

(i) Change in colour of the reaction mixture

$Zn(s) + CuSO_4(aq) \longrightarrow ZnSO_4\ (aq) + Cu(s)$

Zinc (grey) | Copper sulphate | Zinc sulphate | Copper (brown)

(ii) Evolution of a gas

$Na_2CO_3(s) + 2CH_3COOH(aq) \longrightarrow 2CH_3COONa\ (aq) + H_2O(l) + CO_2(g)$

Sodium carbonate | Acetic acid | Sodium acetate | Water | Carbon dioxide

CO_2 is produced and it is observed in the form of effervescence in the reaction mixture.

Q.28. When the powder of a common metal is heated in an open China dish, its color turns black. However, when hydrogen is passed over the hot black substance so formed, it regains its original colour.

Based on the given information, answer the following questions

(a) What type of chemical reaction takes place in each of the two given steps?

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Write balanced chemical equations for both reactions .

(b) Name the metal initially taken in the powder form.

Ans. (a) Step I combination reaction/oxidation reaction

$$\underset{\text{Copper (brown)}}{2Cu(s)} + \underset{\text{Oxygen}}{O_2(g)} \xrightarrow[\text{Oxidation}]{Heat} \underset{\text{Copper oxide (black)}}{2CuO(s)}$$

Step II Reduction reaction

$$\underset{\text{Copper oxide}}{CuO(s)} + \underset{\text{Hydrogen}}{H_2(g)} \xrightarrow{Reduction} \underset{\text{Copper (brown)}}{Cu(s)} + \underset{\text{Water}}{H_2O(g)}$$

(b) Copper metal is taken initially in the power form.

Q.29. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(a) Thermite reaction, iron (III) oxide reacts with aluminium oxide and gives molten iron and aluminium oxide.

(b) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride.

Ans. (a) $\underset{\text{Iron (III) oxide}}{Fe_2O_3(s)} + \underset{\text{Aluminium}}{2Al(s)} \xrightarrow[\textit{Displacement}]{\Delta} \underset{\text{Molten iron}}{2Fe(l)} + \underset{\text{Aluminium oxide}}{Al_2O_3(s)}$

(b) $\underset{\text{Magnesium}}{3Mg(s)} + \underset{\text{Nitrogen}}{N_2(g)} \xrightarrow[\textit{Combination}]{\Delta} \underset{\text{Magnesium Nitride}}{Mg_3N_2(s)}$

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Q.30. Which among the following changes are exothermic or endothermic in nature?

(a) Decomposition of ferrous sulphate.

(b) Dilution of sulphuric acid.

(c) Dissolution of sodium hydroxide in water.

(d) Dissolution of ammonium chloride in water.

Ans. (a) Endothermic (b) Exothermic

(c) Exothermic (d) Endothermic

Q.30. Identify the oxidising agents (oxidants) in the following reactions

Ans.(a) $Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$

(b $CuSO_4 + Zn \longrightarrow Cu + ZnSO_4$

Ans. (a) Pb_3O_4 (b) $CuSO_4$

Q.31. Why do fire flies glow at night?

Ans. Fire flies have a special kind of substance i.e., luciferin that undergoes oxidation (in the presence of air) in the presence of an enzyme. This reaction is accompanied by emission of light. Therefore, fire flies glow at night.

Q.32. Why do we store silver chloride in dark coloured bottles?

Ans. Dark coloured bottles interrupt the path of light such that light cannot reach silver chloride in the bottles and its decomposition is prevented. It is known that silver chloride decomposes to silver and chloride in the presence of light.

This is shown in the reaction given below

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$$2AgCl(s) \longrightarrow 2Ag(s) + Cl_2(g)$$

Silver chloride (white) → Silver (grey) + Chloride

Q.33. Bhawna took a pale green substance A in a test tube and heated it over the flame of a burner. A brown coloured residue B was formed alongwith the evolution of two gases with burning smell of sulphur. Identify A and B. Write the chemical reaction involved.

Ans. Substance A is ferrous sulphate $FeSO_4$

Substance B is ferric oxide Fe_2O_3

The reaction involved is

$$2Fe_2SO_4 \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$$

Ferrous sulphate (pale green) → Ferric oxide (brown) + Sulphur dioxide + Sulphur trioxide

Q.34. A silver article generally turn black when kept in the open for a few days. The article when rubbed with toothpaste again starts shinning.

(a) Why do they turn black? Name the phenomenon involved.

(b) Name the black substance formed and write its formula.

Ans. (a) Silver article reacts with sulphur compounds such as H_2S present in air. The phenomenon is called corrosion. For silver particularly, it is called tarnishing of silver.

(b The black substance is silver sulphide (Ag_2S).

Q.35. 'Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate'.

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(a) Translate the above statement into a chemical equation.

(b) State two types in which this reaction can be classified.

Ans. (a) $3BaCl_2(aq) + Al_2(SO_4)_3(aq) \longrightarrow 3BaSO_4 \downarrow + 2AlCl_3(aq)$

Barium chloride | Aluminium sulphate | Barium sulphate (white ppt.) | Aluminium chloride

(b) Double displacement and precipitation

Q.36. Combustion of some fuels cause environmental pollution as well as acid rain. This effect is due to the presence of some elements. Name these elements.

Ans. These elements are nitrogen and sulphur (N and S). Fuels containing elements like sulphur and nitrogen when burnt in air, cause pollution and acid rain both, because oxides of sulphur and nitrogen are acidic in nature and dissolve in water to produce strong acids H_2SO_4, HNO_3, etc.

Q.37. $\mathbf{X + YSO_4 \longrightarrow XSO_4 + Y}$

$\mathbf{Y + XSO_4 \longrightarrow}$ **No reaction**

In the above two reactions elements X or Y. Which is more reactive and Why?

Ans. X is more reactive than Y since it has displaced Y is the displacement reaction.

Q.38. In the reaction

$$2KClO_3 \xrightarrow[MnO_2]{\Delta} 2KCl + 3O_2$$

What do the symbol Δ and MnO_2 signify?

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Ans. The symbol Δ signifies that the reaction takes place on heating whereas MnO_2 represents the catalyst present to speed up the reaction.

Q.39. What is the colour of ferrous sulphate crystals? How does this colour change after heating?

Ans. The colour of ferrous sulphate srystals is green. On heating ferrous sulphate ($FeSO_4 \cdot 7H_2O$) first decomposes to form anhydrous ferrous sulphate ($FeSO_4$) which is white in colour.

Q.40. What type of chemical reactions are represented by the following equations?

(a) A + B → C **(b) A + BC → AC + B**

(C) A → B + C **(d) AB + CD → AD + BC**

Ans. (a) Combination reaction

(b) Displacement reaction

(c) Decomposition reaction

(d) Double displacement reaction

Q.41. Why is photosynthesis considered an endothermic reaction?

Ans. photosynthesis is considered an endothermic reaction because energy in the form of sunlight is absorbed by the green plants.

Q.42. What is an oxidation reaction? Identify in the following reaction

(a) the substance oxidized.

(b) the substance reduced.

ZnO + C → Zn + CO

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Ans. Oxidation involves the addition of oxygen or the removal hydrogen in a chemical reaction. In the given reaction, carbon is oxidized to carbon monoxide while zinc oxide is reduced to zinc.

Oxidation (gain of oxygen)

$$ZnO + C \longrightarrow Zn + CO$$

Reduction (removal of oxygen)

Q.43. Zinc liberates hydrogen gas when reacted with dilute hydrochloric acid, whereas copper does not. Explain, why?

Ans. The position of zinc in the reactivity series is above hydrogen whereas that of copper is below hydrogen. It means that zinc oxidises (loses electron) more easily that hydrogen whereas copper does not do so. So, copper does not displace H_2 from dilute acids.

Q.44. Why should a magnesium ribbon be cleaned before burning in air?

Ans. Magnesium being a reactive metal, reacts with atmospheric oxygen and moisture to form a layer of magnesium oxide and hydroxide. It prevents the magnesium metal to burn quickly in air. Therefore before burning, the metal is rubbed with a sand paper, which removes the deposited compounds layer and make combustion reaction of magnesium faster.

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