CHAPTER 1

Chemical Reactions and Equations

ONE MARK QUESTIONS

1. In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode.

Ans : [CBSE S.R 2018, CBSE 2009, 2012, 2013]

Water contains hydrogen and oxygen in the ratio of 2 : 1, that is why volume of H_2 is double than that of oxygen.

2. What can be seen when a strip of copper metal is placed in a solution of silver nitrate?

Ans : [CBSE 2015]

The solution will become blue, shiny silver metal will get deposited.

$Cu(s) + 2AgNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

3. State one industrial application of reduction process.

Ans : [CBSE 2015]

It is used in the extraction of metals e.g.,

$ZnO(s) + C(s) \xrightarrow{Heat} Zn(s) + CO_2(g)$

4. Which one of the following is a chemical change? Give reason also.

(a) Burning of wax (b) Melting of wax

Ans : [CBSE 2014]

Burning of gas is a chemical change because new products with new properties will be formed on burning.

5. Which one is a chemical change:
Rusting of iron or melting of iron?

Ans : [CBSE 2014]

Rusting of iron is a chemical change.

6. State one basic difference between a physical change and a chemical change.

Ans : [CBSE 2014, 2011]

In a physical change, no new substance is formed. In a chemical change, new substance(s) with new properties is/are formed.

7. Name the oxidising and reducing agent in the following reaction:

$CuO + H_2 \longrightarrow Cu + H_2O$

Ans : [CBSE 2013]

CuO is oxidising agent H_2 is reducing agent.

8. Write a complete balanced chemical equation for the following reaction:

Sodium hydroxide + Sulphuric acid $\longrightarrow$

Ans : [CBSE 2013]

$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$

9. Name and state the law which is kept in mind when we balance chemical equations.

Ans : [CBSE 2012]

Law of conservation of mass. It states **Matter can neither be created nor be destroyed.** The total mass of reactants must be equal to total mass of products.

10. What is meant by a chemical reaction?

Ans : [CBSE 2011]

Chemical reaction, a process in which one or more substances, the reactants, are converted to one or more different substances, the products. Substances are either chemical elements or compounds. A chemical reaction rearranges the constituent atoms of the reactants to create different substances as products

11. $AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl \downarrow + NaNO_3(aq)$
$FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S \uparrow$
Consider the above mentioned two chemical equations with two different kinds of arrows (↑ and ↓) along with the product. What do these two different arrows indicate?

Ans : [CBSE 2011]

↑ shows evolution of gas, ↓ represents a precipitate.

12. Hydrogen being a highly inflammable gas and oxygen being a supporter of combustion, yet water, a compound made up of hydrogen and oxygen is used to extinguish fire. Why?

Ans : [CBSE 2011]

H_2O is a compound constituted of hydrogen of oxygen elements and being a compound it has different properties as compared to its constituting elements.

13. $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$, name the type of reaction.

Ans : [CBSE 2011]

Combination reaction.

14. If copper metal is heated over a flame it develops a coating. What is the colour and composition of coating?

Ans : [CBSE 2011]

Black coloured coating is formed. It is a due to formation of copper oxide.

15. Write a balanced chemical equation to represent the following reaction: carbon monoxide reacts with hydrogen gas at 340 atm to form methyl alcohol.

Ans : [CBSE 2011]

$CO(g) + 2H_2(g) \xrightarrow{340\ atm} CH_3OH(l)$

16. Which one is a chemical change: fermentation of fruit juice or diluting fruit juice?

Ans : [CBSE 2011]

Fermentation of fruit juice is a chemical change.

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

Ans : [CBSE 2011]

Burning of a candle wax is a chemical change.

18. Write a balanced equation for the chemical reaction that can be characterised as precipitation reaction.

Ans : [CBSE 2011]

$AgNO_3(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3(aq)$
It is a precipitation reaction.

19. State the main difference between endothermic reaction and an exothermic reaction.

Ans : [CBSE 2011]

In endothermic reaction, heat is absorbed. In exothermic reaction, heat is evolved.

20. What happens chemically when quick lime is added to water filled in a bucket?

Ans : [CBSE 2010, 2008]

Calcium hydroxide (Slaked lime) is formed with evolution of heat and hissing sound.
$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

21. Define oxidation and reduction.

Ans : [CBSE 2011, 2010]

Oxidation is a process in which oxygen is added or loss of electrons take place. Reduction is a process in which hydrogen is added or gain of electrons takes place.

22. Give an example of double displacement reaction (only with complete balanced equation).

Ans : [CBSE 2011, 2010]

$BaCl_2(aq) + H_2SO_4(dil.) \longrightarrow BaSO_4(s) + 2HCl(aq)$
It is a double displacement reaction.

23. On what basis is a chemical reaction balanced?

Ans : [CBSE 2010, 2008]

Chemical equation is balanced on the basis of law of conservation of mass.

24. What change in colour is observed when white silver chloride is left exposed to sun¬light? State the type of chemical reaction in this change.

Ans : [CBSE 2010, 2009]

Grey coloured silver metal is formed and pungent smelling chlorine gas is evolved.
$2AgCl(s) \xrightarrow{sunlight} 2Ag(s) + Cl_2(g)$
It is photochemical decomposition reaction.

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

Ans : [CBSE 2010]

$\underset{(Silver\ Nitrate)}{AgNO_3(aq)} + \underset{(Sodium\ Chloride)}{NaCl(aq)} \xrightarrow{Heat} \underset{(Silver\ Chloride)}{AgCl(s)} + \underset{(Sodium\ NItrate)}{NaNO_3(aq)}$

26. Complete and balance the following equation:
$Fe_2O_3 + Al \longrightarrow$

Ans : [CBSE 2010]

$Fe_2O_3 + 2Al \longrightarrow 2Fe + Al_2O_3$

27. Balance the following chemical equation:
$Pb(NO_3)_2 \longrightarrow PbO + NO_2 + O_2$

Ans : [CBSE 2009]

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

28. Identity the type of reaction in the following example:
$Na_2SO_4(aq) + BaCl_2(aq) \longrightarrow BaSO_4(s) + 2NaCl(ag)$

Ans : [CBSE 2008(C)]

Double displacement reaction.

29. Identify the type of reaction in the following example:
$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Ans : [CBSE 2008(C)]

Displacement reaction.

30. Identify the type of reaction in the following example:
$2H_2(g) + O_2(g) \longrightarrow 2H_2O(l)$

Ans : [CBSE 2008(C)]

Combination reaction.

31. Balance the given chemical equation:
$Al(s) + CuCl_2(aq) \longrightarrow AlCl_3(aq) + Cu(s)$

Ans : [CBSE 2008(C)]

$2Al(s) + 3CuCl_2(aq) \longrightarrow 2AlCl_3(aq) + 3Cu(s)$

32. Balance the given chemical equation:
$FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

Ans : [CBSE 2008]

$2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

33. Balance the following chemical equation:
$Fe(s) + H_2O(g) \longrightarrow Fe_3O_4(s) + H_2(g)$

Ans :

$3Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2(g)$

34. On adding dilute hydrochloric acid to copper oxide powder, the solution formed is blue green. Predict the new compound formed which imparts a blue green colour to the solution.

Ans : [CBSE 2008]

$CuO + 2HCl \longrightarrow CuCl_2 + 2H_2O$
Copper chloride solution imparts blue green colour to the solution.

35. Why is respiration considered as exothermic process?

Ans : [CBSE 2008]

Respiration is an exothermic process because energy is given out in respiration.

TWO MARKS QUESTIONS

36. Write the essential condition for the following reaction to take place:
$2AgBr \longrightarrow 2Ag + Br_2$
Write application of this reaction.

Ans : [CBSE 2016]

The reaction will take place in presence of sunlight. This reaction is used in black and white photography.

37. (a) Complete the following equation for the chemical reaction:
$FeSO_4(s) \xrightarrow{Heat} Fe_2O_3 + ___ + ___$
(b) What happens when water is added to quicklime (CaO)? Write the chemical equation.

Ans : [CBSE 2016]

(a) $2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$
(b) Slaked lime $Ca(OH)_2$ is formed. Hissing sound and lot of heat is also produced:
$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$

38. Write balanced chemical equation for the following reactions:
a. Hydrogen sulphide burns in air to give water and sulphur dioxide.
b. Barium chloride reacts in aqueous solution with zinc sulphate to give zinc chloride and barium sulphate.

Ans : [CBSE 2016]

a. $2H_2S(g) + 3O_2(g) \longrightarrow 2H_2O(l) + 2SO_2(g)$
b. $BaCl(aq) + ZnSO(aq) \longrightarrow BaSO_4(s) + ZnCl_2(aq)$

39. List two observations that are noticed when an iron nail is put inside copper sulphate solution. Write the chemical equation for the reaction that occurs.

Ans : [CBSE 2016]

The blue coloured solution will become pale green. Reddish brown metal will get deposited.
$Fe(s) + \underset{(Blue)}{CuSO_4(aq)} \longrightarrow \underset{(Pale\ Green)}{FeSO_4(aq)} + \underset{(Reddish\ brown)}{Cu(s)}$

40. Name the reducing agent in the following reaction:
$3MnO_2 + 4A1 \longrightarrow 3Mn + Al_2O_3$
State which is more reactive, Mn or Al and Why?

Ans : [CBSE 2016, 2015]

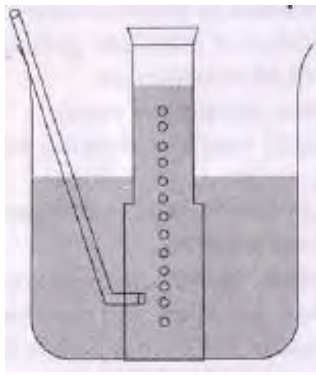
Al is the reducing agent. Al is more reactive than Mn. Reason: It is because Al is displacing Mn from MnO_2.

41. "We need to balance a skeleton chemical equation". Give reason to justify the statement.

Ans : [CBSE 2015]

We must balance a skeletal equation so as to ensure that the reaction follows 'Law of conservation of mass'. The total mass of reactants must be equal to the total mass of products, that is why all reactions should he balanced.

42. A metal is treated with dilute H_2SO_4. The gas evolved is collected by the method as shown in figure.



Answer the following questions:
a. Name the gas liberated.
b. Name the method used for collection of gas.
c. Is the gas soluble or insoluble in water?
d. Is the gas lighter or heavier than air?

Ans : [CBSE 2015, CBSE 2010]

a. The gas liberated is H_2.
b. It is collected by downward displacement of water.
c. The gas is insoluble in water.
d. Hydrogen gas is lighter than air.

43. Giving an example list two important information which makes a chemical equation more useful (informative).

Ans : [CBSE 2015]

a. It should include physical states of reactants and products.
b. It should specify conditions under which reaction takes place e.g.,
$\underset{(Cold)}{2Na(s) + 2H_2O(l)} \longrightarrow 2NaOH(aq) + H_2(g)$
$H_2(g) + Cl_2(g) \xrightarrow{sunlight} 2HCl(g)$

44. Consider the following chemical equation:
$X + Barium\ chloride \longrightarrow \underset{(White\ ppt)}{Y} + Sodium\ chloride$
Identify (a) X and Y (b) The type of reaction.

Ans : [CBSE 2015]

(a) X is silver nitrate, Y is silver chloride.
$2AgNO_3(aq) + BaCl_2(aq) \longrightarrow \underset{(White\ ppt)}{2AgCl\downarrow} + Ba(3NO_3)_2(aq)$
(b) The reaction is an example of double displacement (precipitation) reaction.

45. (a) Write a balanced chemical equation for the process of photosynthesis.
(b) When do desert plant take up carbon dioxide and perform photosynthesis.

Ans : [CBSE 2015]

a. $6CO_2(g) + 6H_2O(l) \xrightarrow[chlorophyll]{sunlight} C_6H_{12}O_6(aq) + 6O_2(g)$
b. Desert plant take up carbon dioxide and perform photosynthesis at night.

46. Two reactions are given below:
a. $2KI + Cl_2 \longrightarrow 2KCl + I_2$
b. $2K + Cl_2 \longrightarrow 2KCl$
Identify the type of reaction, giving justification in each case.

Ans : [CBSE 2015]

a. Displacement reaction because Cl_2 is displacing I2 from KI solution.
b. Combination reaction because K reacts with Cl_2 to form potassium chloride.

47. On heating copper powder in air, the surface of copper powder becomes coated with black CuO. How can this black coating be converted into brown copper? Write chemical equation for the reaction that occurs during the colour change.

Ans : [CBSE 2015]

$$2Cu + O_2 \xrightarrow{\text{Heat}} \underset{\text{(Black)}}{2CuO}$$

Copper oxide on heating with H_2 will change back to reddish brown copper metal.

$$CuO(s) + H_2(g) \xrightarrow{\text{Heat}} Cu(s) + H_2O(g)$$

48. What is observed when a solution of potassium iodide is added to a solution of lead nitrate? Name the type of reaction. Write a balanced chemical equation to represent the above chemical reaction.

Ans : [CBSE 2014, 2013]

Yellow precipitate is formed due to formation of lead iodide.

It is a precipitation as well as double displacement reaction.

$$Pb(NO_3)(aq) + 2KI(ag) \longrightarrow \underset{\text{Yellow ppt}}{PbI_2(s)} + 2KNO_3(aq)$$

49. Write a balanced chemical equation for the process of photosynthesis and the conditions of reaction giving physical state of all substances.

Ans : [CBSE 2014)

$$6CO_2(g) + 6H_2O(l) \xrightarrow[\text{chlorophy II}]{\text{sunlight}} C_6H_{12}O_6(aq) + 6O_2(g)$$

50. Give one example of each:
a. Chemical reaction showing evolution of a gas.
b. Change in colour of a substance during chemical reaction.

Ans : [CBSE 2013]

a. $2K(s) + 2H_2O(l) \longrightarrow 2KOH(aq) + H_2(g)$
b. $\underset{\text{(Pale green)}}{FeSO_4.7H_2O(aq)} \xrightarrow{\text{Heat}} \underset{\text{(Dirty white)}}{FeSO_4(s)} + 7H_2O(l)$

51. Translate the following statement into chemical equation and then balance it. "A metal in the form of ribbon burns with a dazzling white flame and changes into white powder."

Ans : [CBSE 2013]

$$2Mg(s) + O_2(g) \xrightarrow{\text{Burning}} 2MgO(s) + \text{Light} + \text{Heat}$$

52. It has been found that marble of Taj is getting corroded due to development of industrial areas around it. Explain this fact giving a chemical equation.

Ans : [CBSE 2013]

Taj is made up of $CaCO_3$ which reacts with acid formed by pollution of $SO_2(g)$ and NO_2 from Mathura refinery and other industries.

$$CaCO_3 + 2H_2SO_4 \longrightarrow CaSO_4 + CO_2 + 2H_2O$$
$$CaCO_3 + 2HNO_3 \longrightarrow Ca(NO3)_2 + H_2O + CO_2$$

53. Consider the chemical equations given below and answer the questions which follow:

(i) $CuO + H_2 \xrightarrow{\text{Heat}} Cu + H_2O$
(ii) $ZnO + C \xrightarrow{\text{Heat}} Zn + CO$

a. Name the substances that are oxidised and reduced respectively in each case,
b. Identify the reducing agent in each case.

Ans : [CBSE 2013]

a. H_2 is getting oxidised to H_2O, CuO getting reduced to Cu.
b. H_2 is reducing agent in (i) reaction whereas C is reducing agent in second reaction.

54. What is a redox reaction? Identify the substances oxidised and the substance reduced in the following reactions:

a. $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + H_2O$
b. $CuO + H_2 \longrightarrow Cu + H_2O$

Ans : [CBSE 2012]

Redox reaction is a reaction in which oxidation and reduction takes place simultaneously.

c. HCl is the substance oxidised, MnO_2 is the substance getting reduced.
d. H_2 is getting oxidised, CuO is getting reduced.

55. Write balanced chemical equations for the following reactions:

a. Silver bromide on exposure to sunlight decomposes into silver and bromine.
b. Sodium metal reacts with water to form sodium hydroxide and hydrogen gas.

Ans : [CBSE 2012]

a. $2AgBr(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Br_2(g)$
b. $2Na(s) + 2H_2O(l) \longrightarrow 2NaOH(l) + H2(g)$

56. Identify the type of reaction from the following equations:

a. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$
b. $Pb(NO_3)_2 + 2KI \longrightarrow PbI_2 + 2KNO_3$
c. $CaO + H_2O \longrightarrow Ca(OH)_2$
d. $CuSO_4 + Zn \longrightarrow ZnSO_4 + Cu$

Ans : [CBSE 2012]

a. Oxidation reaction
b. Double displacement reaction
c. Combination reaction
d. Displacement reaction

57. Write balanced equation for the reaction between Mg and hydrochloric acid. Name the product obtained, identify the type of reaction.

Ans : [CBSE 20i2]

$$Mg(s) + 2HCl(dil) \longrightarrow MgCl_2(aq) + H_2(g)$$

Magnesium chloride and hydrogen gas are formed in this reaction. It is a displacement reaction.

58. a. What is colour of ferrous sulphate crystals? How does this colour change after heating?
b. Name the products formed on strongly heating ferrous sulphate crystals. What type of chemical reaction occurs in this change?

Ans : [CBSE 2012.2009]

a. $FeSO_4 \cdot 7H_2O$ crystals are pale green in colour.

They become dirty white on heating.

b. Ferric oxide, sulphur dioxide and sulphur trioxide are formed:

$2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

It is a decomposition reaction.

59. Reaction of compound X with aluminium is used to join railway tracks or cracked machine parts.

a. Identify the compound.

b. Name the reaction.

c. Write a balanced chemical equation for the reaction.

Ans : [CBSE 2012]

a. The compound X is Fe_2O_3 (Ferric oxide) or Iron (III) oxide.

b. It is called Thermite Reaction.

c. $2Al(s) + Fe_2O_3(s) \xrightarrow{Heat} Al_2O_3(s) + 2Fe(l)$

60. Using balanced chemical equation explain the difference between a displacement reaction and a double displacement reaction.

Ans : [CBSE 2012, 2011]

Displacement reaction: A reaction in which a more reactive element displaces a less reactive element from its salt solution e.g.,

$2KBr(aq) + Cl_2(g) \longrightarrow 2KCl(aq) + Br_2(aq)$

Double displacement reaction: A reaction in which two compounds exchange their ions to form two new compounds e.g.,

$KOH + HNO_3 \longrightarrow KNO_3 + H_2O$

61. Give an example each for thermal decomposition and photochemical decomposition reactions. Write balanced chemical equation also.

Ans : [CBSE 2012]

Thermal decomposition:

$ZnCO_3(s) \xrightarrow{Heat} ZnO(s) + CO_2(g)$

Photochemical decomposition:

$2AgI(s) \xrightarrow{sunlight} 2Ag(s) + I_2(g)$

62. Why are decomposition reactions called the opposite of combination reactions? Give chemical equations for these reactions.

Ans : [CBSE 2012]

In decomposition reactions, a compound is broken down into one or more elements or compounds e.g.,

$CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$

In combination reactions, two or more elements or compounds combine to form a new compound. Therefore, decomposition reactions are opposite to combination reactions e.g.,

$3Mg(s) + N_2(g) \xrightarrow{Burns} Mg_3N_2(s)$

63. Why does the colour of copper sulphate solution changes when an iron pin is dipped in it?

Ans : [CBSE 2012]

Iron being more reactive displaces copper from copper sulphate (Blue) solution to form iron (II) sulphate (Pale green) solution and reddish brown copper metal gets deposited.

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

64. 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. State the two types in which this reaction can be classified.

d. Potassium reacts with water to give potassium hydroxide and hydrogen gas.

Ans : [CBSE 2012]

a. $3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$

b. $2H_2S(g) + 3O2(g) \longrightarrow 2H_2O(l) + 2SO_2(g)$

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

This reaction can be classified as a double displacement reaction as the two reacting species $(BaSO_4,\ Al_2SO_4)_3$ undergoes mutual exchange of ions. It can also be classified as precipitation reaction, since a white ppt. of $BaSO_4$ is obtained.

d. $2K(s) + 2H_2O(l) \longrightarrow 2KOH(aq) + H_2(g)$

65. When a metal X is added to salt solution of metal Y, the following chemical reaction takes place:

Metal X + Salt solution of Y $\longrightarrow$

Salt solution of X + Metal Y

Mention the inference you draw regarding the reactivity of metal X and Y and also the type of reaction. State the reason of your conclusions.

Ans : [CBSE 2012]

X is more reactive than Y because , X displaces Y from its salt solution. Hence, this reaction is an example of displacement reaction.

66. Identify the type of each of the following reactions:

a. A reaction in which a single product is formed from two or more reactants.

b. The reaction mixture becomes warm.

c. An insoluble substance is formed.

d. External surface of the container in which reaction takes place becomes cold.

Ans : [CBSE 2012]

a. Combination reaction

b. Exothermic reaction

c. Precipitation reaction (Double displacement reaction)

d. Endothermic reaction

67. A solution of potassium chloride when mixed with silver nitrate solution, an insoluble white substance is formed. Write the chemical reaction involved and also mention the type of reaction.

Ans : [CBSE 2012, 2011, 2010]

$AgNO_3(aq) + KCl(aq) \longrightarrow \underset{\text{(White ppt.)}}{AgCl(s)} + KNO_3(aq)$

It is a double displacement reaction.

68. Using a suitable chemical equation justify that some chemical reactions are determined by

a. Change in colour.

b. Change in temperature.

Ans : [CBSE 2011]

a. **Change in colour:** Blue coloured crystalline copper sulphate crystals changes to white CuSO4 (anhydrous) on heating.

$$\underset{\text{(Blue)}}{CuSO_4.5H_2O} \xrightarrow{\text{Heat}} \underset{\text{(Dirty white)}}{CuSO_4} + 5H_2O$$

b. **Change in temperature:**

$$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + \text{Heat}$$

69. (a) A solution of substance X is used for white washing. What is substance X? Write the chemical reaction of X with water.

(b) Why does the colour of copper sulphate solution changes when iron nail is dipped in it?

Ans : [CBSE 2011]

a. X is CaO, calcium oxide

$$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$$

b. It is because Fe displaces Cu from $CuSO_4$ (blue) solution to form $FeSO_4$ (pale green) and reddish brown Cu metal gets deposited.

70. Balance the following reactions:

a. $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + HCl$

b. $Ca(OH)_2 + HNO_3 \longrightarrow Ca(NO_3)_2 + H_2O$

c. $Pb(NO_3)_2 \longrightarrow PbO + NO_2 + O_2$

d. $MnO_2 + HCl \longrightarrow MnCl_2 + Cl_2 + H_2O$

Ans : [CBSE 2011, 2009, 2008, 2008C]

a. $BaCl_2(aq) + H_2SO_4(dil) \longrightarrow BaSO_4(s) + 2HCl(aq)$

b. $Ca(OH)_2(aq) + 2HNO_3 \longrightarrow Ca(NO_3)_2(aq) + 2H_2O(l)$

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

d. $MnO_2 + 4HCl \longrightarrow MnCl_2 + Cl_2 + 2H_2O$

71. Write the balanced equation for the following reactions and identify the type of reaction in each case:

a. Potassium bromide + Barium iodide $\longrightarrow$ Barium bromide + Potassium Iodide

b. Hydrogen(g) + Chlorine(g) $\longrightarrow$ Hydrogen chloride(g)

Ans : [CBSE 2011]

a. $2KBr(aq) + BaI_2 \longrightarrow BaBr_2(aq) + 2KI(aq)$
It is double displacement reaction.

b. $H_2(g) + Cl_2(g) \xrightarrow{\text{sunlight}} 2HCl(g)$
It is combination reaction.

72. A zinc plate was put into solution of copper sulphate kept in a glass container. It was found that blue colour of the solution gets fader and fader with passage of time. After few days when zinc plate was taken out of the solution, a number of holes were observed on it.

a. State the reason for the changes observed on zinc plate.

b. Write the chemical equation for the reaction involved.

Ans : [CBSE 2011]

a. Zinc displaces copper from copper sulphate solution to form colourless ZnSO4 and copper metal is deposited. Zinc gets consumed due to which holes are formed.

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

73. A white salt on heating decomposes to give brown fumes and a white residue is left behind.

a. Name the salt.

b. Write the equation for the decomposition reaction.

Ans : [CBSE 2011]

a. Lead nitrate

b. $\underset{\text{(White)}}{2Pb(NO_3)_3(s)} \xrightarrow{\text{Heat}} \underset{\text{(Residue)}}{2PbO(s)} + \underset{\text{(Brown)}}{4NO_2(g)} + O_2(g)$

74. When a solution of potassium iodide is added to a solution of lead nitrate in a test tube, a reaction takes place.

a. What type of reaction is this?

b. Write the balanced chemical equation to represent the above reaction.

Ans : [CBSE 2011, 2010, 2008]

a. It is precipitation as well as double displacement reaction.

b. $Pb(NO_3)(aq) + 2KI(aq) \longrightarrow PbI_2(s) + 2KNO_3(aq)$

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

Ans : [CBSE 2011]

Combination reaction: The reaction in which two or more elements or compounds combine to form compound(s) e.g.,

$$C(s) + O_2(g) \longrightarrow CO_2(g) + \text{Heat}$$

It is an exothermic, combination reaction.

76. What happens when an aqueous solution of sodium sulphate reacts with an aqueous solution of barium chloride? State the physical conditions of reactants in which the reaction between them will not take place. Write the balanced chemical equation for the reaction and name the type of reaction.

Ans : [CBSE 2016, 2010]

White precipitate of $BaSO_4$ is formed.

$$BaCl_2(aq) + Na_2SO_4(aq) \longrightarrow BaSO_4(s) + 2NaCl(aq)$$

It is a double displacement reaction. If reactants are taken in solid state, products will not be formed.

77. What is redox reaction? When a magnesium ribbon burns in air with a dazzling flame and forms a white ash, is magnesium oxidised or reduced. Why?

Ans : [CBSE 2010, 2009]

Redox reaction is a reaction in which oxidation and reduction takes place simultaneously.

Mg is getting oxidised because it is gaining oxygen to form magnesium oxide.

78. 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 : [CBSE 2010]

a. **Change in colour:**

$$AgNO_3(aq) + KI(aq) \longrightarrow \underset{\text{(Yellow ppt)}}{AgI(s)} + KNO_3(aq)$$

b. **Evolution of gas:**

$$Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(g)$$

79. When the powder of common metal is heated in open china dish its colour turns black. However, when hydrogen is passed over the hot black substance so formed, it regains its original colour. Based on the

above information answer the following questions:

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

b. Name the metal initially taken in powdered form. Write balanced equations for both the reactions.

Ans : [CBSE 2010]

a. Oxidation reaction, Redox reaction

b. Copper metal was present initially

$$2Cu(s) + O_2(g) \xrightarrow{\text{Heat}} \underset{\text{(Black)}}{CuO(s)}$$

$$CuO(s) + H_2(g) \xrightarrow{\text{Heat}} \underset{\text{(Reddish brown)}}{Cu(s)} + H_2O(l)$$

80. Why do we store silver chloride in dark coloured bottle? Explain in brief.

Ans : [CBSE 2010]

It is done so as to cut off the exposure to sunlight. AgCl is photosensitive, it will decompose to Ag and Cl_2 in the presence of sunlight.

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

81. "Oxidation and reduction processes occur simultaneously". Justify this statement with the help of example.

Ans : [CBSE 2010]

Oxidation involves loss of electrons or addition of oxygen. Whereas reduction involves gam of electrons or addition of hydrogen e.g.,

$$\underset{\text{Reduction}}{CuO(s)} + \overset{\text{Oxidation}}{H_2(g)} \longrightarrow Cu(s) + H_2O(l)$$

H_2 is getting oxidised to H_2O, CuO is getting reduced to Cu.

It shows oxidation and reduction occur simultaneously.

82. When magnesium ribbon bums in air or oxygen, a product is formed. State the type of chemical reaction and name the product formed in the reaction. Write balanced chemical equation for the reaction.

Ans : [CBSE 2009(C)]

It is a combination reaction. The product formed is magnesium oxide:

$$2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$$

83. Distinguish between a displacement reaction and a double displacement reaction. Identify the displacement and the double displacement reaction from the following reactions:

a. $HCl(aq) + NaOH(aq) \longrightarrow NaCl(aq) + H_2O(l)$

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

Ans : [CBSE 2009]

Displacement Reaction: When a more reactive metal displaces a less reactive metal from its salt solution.

Double displacement reaction: When two compounds exchange their ions to form two new compounds.

a. Double displacement reaction.

b. Displacement reaction.

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

Ans : [CBSE 2009]

Oxidation reaction: The reaction in which O_2 is added or H_2 is removed or loss of electrons takes place is called oxidation reaction. E.g.,

$$2Cu(s) + O_2(g) \longrightarrow 2CuO(s)$$

It is an exothermic reaction.

THREE MARKS QUESTIONS

85. Decomposition reactions require energy either in the form of heat, light or electricity for breaking down the reactants. Write an equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.

Ans : [CBSE 2018, 2014]

a. $CaCO_3(s) \xrightarrow{\text{Heat}} CaO(s) + CO_2(g)$

b. $2AgBr(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Br_2(g)$

c. $2H_2O(l) \xrightarrow{\text{Electricity}} 2H_2(g) + O_2(g)$

86. In the electrolysis of water:

a. Name the gas collected at the cathode and anode respectively.

b. Why is volume of gas collected at one electrode double than that at the other? Name this gas.

c. How will you test this gas?

Ans : [CBSE 2012, CBSE Sample Paper 2018]

a. Hydrogen is collected at the cathode, oxygen is collected at the anode.

b. It is because H_2O contains hydrogen and oxygen in the ratio 2 : 1.

c. Bring a burning matchstick near the gas, if the gas burns with 'pop' sound, the gas is H_2.

87. Define the term decomposition reaction. Give one example each of thermal decomposition and electrolytic decomposition reactions.

Ans : [CBSE 2016]

Decomposition reaction: The reaction in which a compound is broken down into simpler elements or compounds:

a. $CaCO_3(s) \xrightarrow{\text{Heat}} CaO(s) + CO_2(g)$

b. $2H_2O(l) \xrightarrow{\text{Electricity}} 2H_2(g) + O_2(g)$

88. Name two salts that are used in black and white photography. Give equations for the reactions when these are exposed to sunlight.

Ans : [CBSE 2016]

AgBr (Silver bromide) and AgI (Silver iodide) are used in black and white photography.

$$2AgBr(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Br_2(g)$$

$$2AgI(s) \xrightarrow{\text{sunlight}} 2Ag(s) + I_2(g)$$

89. State one example each characterised by following along with suitable chemical equation.

a. Change in state,

b. Evolution of gas,

c. Change in temperature.

Ans : [CBSE 2016]

a. **Change in state:**

$$AgNO_3(aq) + HCl(aq) \longrightarrow AgCl(s) + HNO_3(aq)$$

b. **Evolution of gas:**

$CaCO3(s) + 2HCl(dil) \longrightarrow CaCl_2(aq) + H_2O(1) + CO2(g)$

c. **Change in temperature:**

d. $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(l) + Heat$

90. Name the type of reactions represented by the following equations:

a. $CaO + H_2O \longrightarrow Ca(OH)_2$

b. $3BaCl_2 + Al_2(SO_4) \longrightarrow 3BaSO_4 + 2AlCl_3$

c. $2FeSO_4 \xrightarrow{Heat} Fe_2O_3 + SO_2 + SO_3$

Ans : [CBSE 2015]

a. Combination reaction,

b. Double displacement reaction,

c. Decomposition reaction.

91. Write the chemical equation of the reaction in which the following changes take place with an example of each.

a. Change in colour,

b. Change in tem-perature,

c. Formation of precipitate.

Ans : [CBSE 2015]

a. **Change in colour:**

$Zn(s) + \underset{\text{Pale green}}{FeSO_4(aq)} \longrightarrow \underset{\text{(Colourless)}}{ZnSO_4(aq)} + Fe(s)$

b. **Change in Temperature:**

$2Mg + O_2(g) \longrightarrow 2MgO(s) + Heat$

c. **Formation of precipitate**:

$Pb(NO_3)_2(aq) + 2HCl(dil) \longrightarrow \underset{\text{White ppt}}{Pbcl_2(s)} + 2HNO_3(aq)$

92. State the type of chemical reactions and chemical equations that take place in the following:

a. Magnesium wire is burnt in air.

b. Electric current is passed through water.

c. Ammonia and hydrogen chloride gases are mixed.

Ans : [CBSE 2015]

a. $2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$;

b. Oxidation reaction

c. $2H_2O(l) \longrightarrow 2H_2(g) + O_2(g)$;

Decomposition reaction

d. $NH_3(g) + HCl(g) \longrightarrow NH_4Cl(s)$;

Combination reaction

93. Write the balanced chemical equations for the following chemical reactions:

a. Hydrogen + Chlorine $\longrightarrow$ Hydrogen Chloride

b. Lead + Copper Chloride $\longrightarrow$ Lead chloride + Copper

c. Zinc oxide + Carbon $\longrightarrow$ Zinc + Carbon Monoxide

Ans : [CBSE 2013]

a. $H_2(g) + Cl_2(g) \longrightarrow 2HCl(g)$

b. $Pb(s) + CuCl_2(aq) \longrightarrow PbCl_2(s) + Cu(s)$

c. $ZnO(s) + C(s) \longrightarrow Zn(s) + CO(g)$

94. Write chemical equations for the reactions taking place when

a. Iron reacts with steam

b. Magnesium reacts with dil. HCl

c. Copper is heated in air

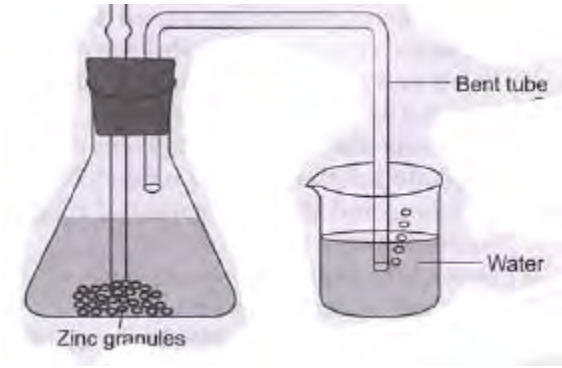
Ans : [CBSE 2014]

a. $3Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2(g)$

b. $Mg(s) + 2HCl(dil) \longrightarrow MgCl_2(aq)$

c. $2Cu(s) + O_2(g) \longrightarrow 2CuO(s)$

95. In a schematic diagram for the preparation of hydrogen gas as shown in the figure. What would happen if the following changes are made



a. In place of zinc granules, same amount of zinc dust is taken in the test tube?

b. Instead of dilute sulphuric, dilute hydrochloric acid is taken?

c. Sodium hydroxide is taken in place of dilute sulphuric acid and the flask is heated?

Ans : [CBSE 2014, 2010]

a. Zinc dust will react faster, $H_2(g)$ will be liberated at a faster rate.

b. Same volume of $H_2(g)$ will be formed.

c. On heating Zn with NaOH, hydrogen gas will be formed at a faster rate.

96. (a) Why is it necessary to balance a chemical equation?

(b) Write the balanced chemical equation for the following reactions:

(i) Natural gas burns in air to form carbon dioxide and water.

(ii) During respiration, glucose combines with oxygen and forms carbon dioxide and water along with the release of energy.

Ans : [CBSE 2013]

a. Chemical equation must be balanced so as to follow the law of conservation of mass.

b. (i) $CH_4(g) + 2O2(g) \longrightarrow CO_2(g) + 2H_2O(l)$

(ii) $C_6H_{12}O_6(s) + 6O_2(g) \longrightarrow 6CO_2(g) + 6H_2O(l) + Heat$

97. (i) Solid calcium oxide was taken in a container and water was added slowly to it.

(a) Write the observations.

(b) Write the chemical formula of the product formed.

(ii) What happens when carbon dioxide is bubbled through lime water (a) in small amount (b) in excess?

Ans : [CBSE 2013, 2012, 2010]

(i) (a) The container becomes hot and hissing sound is produced.

(b) $Ca(OH)_2$ is the formula of the product formed.

(ii) (a) Lime water turn milky when $CO_2(g)$ is passed through it:

$Ca(OH)_2(aq) + CO_2(g) \longrightarrow CaCO_3(s) + H_2O(l)$

(b) If excess of CO_2 is passed milkiness disappears:

$CaCO_3(s) + CO_2(g) + H_2O(s) \longrightarrow Ca(HCO_3)_2(aq)$

98. Write the balanced chemical equation for the following

reaction and identify the type of reaction.
Thermite reaction, iron (III) oxide reacts with aluminium and give molten iron and aluminium oxide.

Ans : [CBSE 2012]

$Fe_2O_3(s) + 2Al(s) \longrightarrow Al_2O_3(s) + 2Fe(l)$
It is displacement as well as redox reaction.

99. An aqueous solution of metal nitrate 'P' reacts with sodium bromide solution to form yellow precipitate 'Q' which is used in photography. 'Q' on exposure to sunlight undergoes decomposition to form metal present along with a reddish brown gas. Identify 'P' and 'Q' write the balanced chemical equation for the chemical reaction. List the two categories in which reaction can be placed.

Ans : [CBSE 2012]

'P' is silver nitrate ($AgNO_3$)
$\underset{(P)}{AgNO_3}(aq) + NaBr(ag) \longrightarrow \underset{(Yellow\ ppt)}{AgBr(s)} + NaNO_3(aq)$
This reaction is categorised as double displacement as well as precipitation reaction.
$2AgBr(s) \xrightarrow{sunlight} 2Ag(s) + Br_2(g)$
The above reaction is photochemical decomposition reaction.

100. A green coloured hydrated metallic salt on heating loses water of crystallisation molecules and gives a gas with suffocating smell. Identify the salt and write the chemical equation for the reaction.

Ans : [CBSE 2011]

The salt is $FeSO_4 \cdot 7H_2O$ (Hydrated ferrous sulphate)
$FeSO_4 \cdot 7H_2O \xrightarrow{Heat} FeSO_4(s) + 7H_2O(l)$
$2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

101. a. Can combination reaction be an oxidation reaction?
b. How will you test whether the gas evolved in a reaction is hydrogen?
c. Why does copper not evolve hydrogen on reacting with dilute sulphuric acid?

Ans : [CBSE 2011]

a. Yes, combination reaction can be called a oxidation reaction.
b. Bring a burning splinter near the gas, if it burns with pop sound, it is hydrogen gas.
c. It is because copper is less reactive than hydrogen.

102. Write balanced equations for the following reactions:
a. Aluminium + Bromine $\longrightarrow$ Aluminium bromide
b. Calcium carbonate $\xrightarrow{Heat}$ Calcium oxide + Carbon dioxide
c. Silver chloride $\xrightarrow{sunlight}$ Silver + Chlorine

Ans : [CBSE 2011]

a. $2Al(s) + 3Br_2(g) \longrightarrow 2AlBr_3(s)$
b. $CaCO_3(s) \xrightarrow{Heat} CaO(s) + CO_2(g)$
c. $2AgCl(s) \xrightarrow{sunlight} 2Ag(s) + Cl_2(g)$

103. a. Why is respiration considered an exothermic reaction?
b. Define the terms oxidation and reduction,
c. Identify the substance that is oxidised and reduced in the following reaction:
$CuO(s) + Zn(s) \xrightarrow{heat} Cu(s) + ZnO(s)$

Ans : [CBSE 2011]

a. In respiration, energy is released, therefore, it is considered an exothermic reaction.
b. Oxidation involves addition of O_2 or loss of electrons. Reduction involves addition of H_2 or gain of electrons.
c. Zn is getting oxidised, CuO is getting reduced.

104. Write balanced chemical equations for the following reactions:
a. Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
b. Barium chloride reacts with zinc sulphate to give zinc chloride and barium sulphate.
c. Natural gas bums in air to form carbon dioxide and water.

Ans : [CBSE 2011]

a. $2H_2S(g) + 3O_2(g) \longrightarrow 2H_2O(l) + 2SO_2(g)$
b. $BaCl_2(aq) + ZnSO_4(aq) \longrightarrow BaSO_4(s) + ZnCl_2(aq)$
c. $CH_4(g) + 2O_2 \longrightarrow CO_2(g) + 2H_2O(l)$

FIVE MARKS QUESTIONS

105. Write balanced chemical equation for the following statements:
a. NaOH solution is heated with zinc granules.
b. Excess of carbon dioxide is passed through lime water.
c. Dilute sulphuric acid is added to sodium carbonate.
d. Egg shell is dropped in hydrochloric acid,
e. Copper (II) oxide reacts with dilute hydrochloric acid.

Ans : [CBSE 2016]

a. $Zn(s) + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$
b. $Ca(OH)_2 + 2CO_2 \longrightarrow Ca(HCO_3)_2$
c. $Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + CO_2$
d. $CaCO_3(s) + 2HCl(dil) \longrightarrow CaCl_2 + H_2O + CO_2$
e. $CuO(s) + 2HC1 \longrightarrow CuCl_2 + H_2O$

106. Identify the type of chemical reaction in the following statement and define each of them:
a. Digestion of food in our body.
b. Rusting of iron.
c. Heating of manganese dioxide with aluminium powder.
d. Blue colour of copper sulphate solution disappears when iron filings are added to it.
e. Dilute hydrochloric acid is added to sodium hydroxide solution to form sodium chloride and water.

Ans : [CBSE 2016]

a. **Decomposition reaction:** It is a process in which a compound is broken down into simple substances.
b. **Oxidation:** The process in which oxygen is added or electrons are lost.
c. **Displacement reaction:** The reaction in which a more reactive element can displace a less reactive element from its salt solution. Oxidation and Reduction are taking place simultaneously in rusting of iron.

d. **Displacement reaction:** The reaction in which a more reactive element can displace a less reactive element.

e. **Neutralisation reaction:** The reaction in which acid reacts with base to form salt and water.

107. Define chemical reaction. State four observations which helps to determine whether a chemical reaction has taken place or not. Write one example of each observation with a balanced chemical equation.

Ans : [CBSE 2015]

Chemical reaction is a reaction which represents a chemical change.

a. **Change in colour:**

$$\underset{\text{(Colourless)}}{Cu(s) + 2AgNO_3(aq)} \longrightarrow \underset{\text{(Blue)}}{Cu(NO_3)(aq)} + 2Ag(s)$$

b. **Evolution of gas:**

$$CaCO_3(s) \xrightarrow{\text{Heat}} CaO(s) + \underset{\text{(Carbon dioxide gas}}{CO\ (g)}$$

c. **Formation of precipitate:**

$$Pb(NO_3)_2(aq) + 2KI \longrightarrow \underset{\text{(Yellow ppt)}}{PbI_2(s)} \quad KNO_3(aq)$$

d. **Change in temperature:**

$$CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2 + \text{Heat}$$

108. a. Define a balanced chemical equation. Why should an equation be balanced?

b. Write a balanced chemical equation for the following reactions:

(i) Phosphorus burns in the presence of chlorine to form phosphorus pentachloride.

(ii) Burning of natural gas.

(iii) The process of respiration.

Ans : [CBSE 2015]

a. Balanced chemical equation is a equation in which number of atoms of various elements are equal on both sides of the equation.

The equation should be balanced due to law of conservation of mass.

b. (i) $2P(s) + 5Cl_2(g) \longrightarrow 2PCl_5(S)$

(ii) $CH_4(g) + O_2(g) \longrightarrow CO_2(g) + 2H_2O(l)$

(iii) $C_6H_{12}O_6(s) + 6O_2(g) \longrightarrow 6CO_2(g) + 6H_2O(l)$

109. (a) Write one example for each of decomposition reaction carried out with the help of (i) Electricity, (ii) Heat, (iii) Light.

(b) Which of the following statement is correct and why?

Copper can displace silver from silver nitrate solution and silver can displace copper from copper sulphate solution.

Ans : [CBSE 2014]

a. (i) $CaCO_3(s) \xrightarrow{\text{Heat}} CaO(s) + CO_2(g)$

(ii) $2AgBr(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Br_2(g)$

(iii) $2H_2O(l) \xrightarrow{\text{Electricity}} 2H_2(g) + O_2(g)$

b. Copper can displace Ag from $AgNO_3(aq)$ solution because Cu is more reactive than Ag.

$$Cu(s) + 2AgNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + 2Ag(s)$$

110. Identify the type of reactions taking place in each of the following:

a. Barium chloride solution is mixed with copper sulphate solution and white precipitate is formed.

b. On heating copper powder in china dish, the surface of copper powder turns black.

c. On heating green coloured ferrous sulphate crystals, raddish brown solid is left and smell of a gas having odour of burning sulphur is experienced.

d. Iron nails when left dipped in blue copper sulphate solution become reddish brown in colour and the blue colour of copper sulphate fades away.

e. Quick lime reacts vigorously with water releasing a large amount of heat.

Ans : [CBSE Sample Paper 2009]

a. Double displacement reaction,

b. Oxidation,

c. Decomposition reaction,

d. Displacement reaction,

e. Combination reaction.