

1 Chemical Reactions and Equations

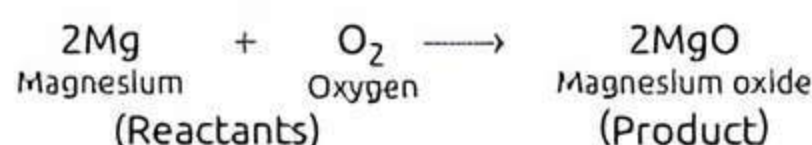
Fastrack« Revision

► **Chemical Change:** It is a process of change in which new substances with new properties are formed. Some common chemical changes seen in our daily lives are ripening of fruit, fermentation of fruit juice, cooking of food, digestion of food, burning of fuel, respiration, etc.

► **Chemical Reaction:** It is a chemical change in which one or more substances react to form one or more products of entirely different properties by undergoing a change in state, colour, temperature or due to evolution of gas. Rearrangement of atoms also takes place in a chemical reaction.

► **Chemical Equation:** It is a representation of a chemical reaction in terms of standard symbols and formulae used for the reactants and the products. It comprises of reactants, products and an arrow ($\rightarrow$) sign.

For example, magnesium ribbon burns with oxygen present in the air to form a white powder of magnesium oxide, which can be represented as:

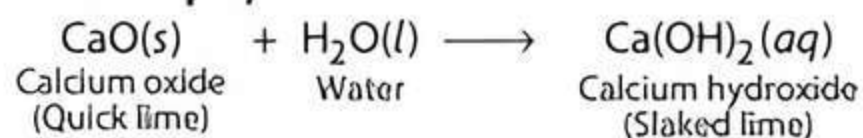


► **Balanced and Unbalanced Chemical Equations:** Equation having an equal number of atoms or masses of various elements in the reactants as well as products is balanced chemical equation but that having an unequal number of both is an unbalanced chemical equation.

► **Types of Chemical Reactions:** Chemical reactions are of the following types:

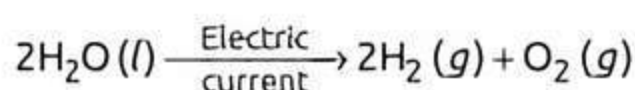
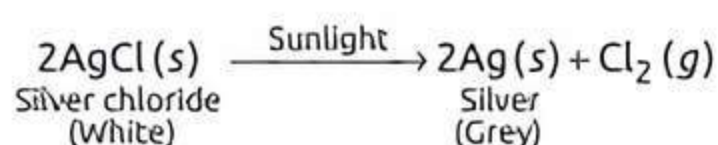
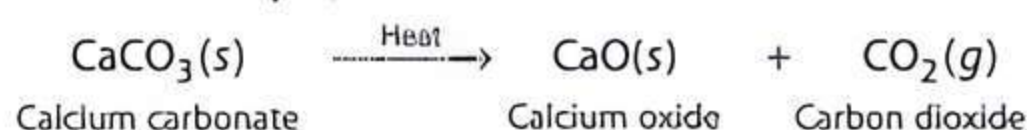
► **Combination Reaction:** It is the reaction in which two or more reactants combine to form a single compound.

For example,



► **Decomposition Reaction:** It is the reaction in which a single reactant breaks up to give two or more simpler products. These reactions are carried out by applying heat (thermal decomposition), light (photochemical decomposition) or electricity (electrolysis or electrolytic decomposition).

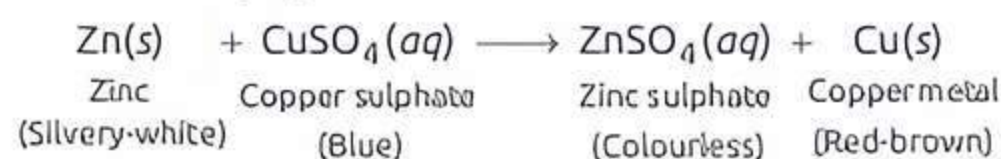
For example,



This reaction is known as electrolysis of water.

► **Displacement Reaction:** It is the reaction in which one element takes the place of another element in a compound. A more reactive element displaces a less reactive element from its compound.

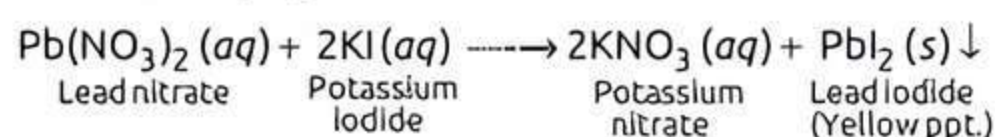
For example,



These reactions are also called single displacement reactions.

► **Double Displacement Reaction:** It is the reaction in which anions and cations of two different reactant molecules interchange their positions to form two extremely different compounds.

For example,



These reactions are also called precipitation reactions.

► **Oxidation and Reduction Reactions or Redox Reaction:**

- **Oxidation:** In it, a substance gains oxygen or loses hydrogen during a reaction.
- **Reduction:** In it, a substance loses oxygen or gains hydrogen during a reaction.

MNEMONICS

Concept: Definition of oxidation and reduction

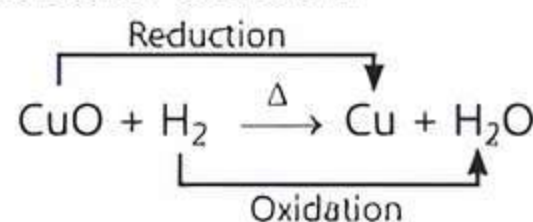
Mnemonics: OIL RIG

Interpretation:

OIL = Oxidation Is Loss (of hydrogen)

RIG = Reduction Is Gain (of hydrogen)

- **Redox Reaction:** In it, oxidation and reduction occur simultaneously. Redox is the short form of Reduction-oxidation.



► **Exothermic Reactions:** These are the reactions in which heat is released along with the formation of products. **For example,** respiration.

► **Endothermic Reactions:** These are the reactions in which heat is absorbed along with the formation of products. **For example,** melting of ice to form water.

► **Corrosion:** It is the process of slow conversion of metals into their undesirable compounds by the action of moisture, water, acids and air. It causes damage to car bodies, bridges, iron railings, ships and other metal objects of daily use.

The formation of rust (reddish brown coating of hydrated iron (III) oxide, $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$) on iron, green coating on copper and black coating on silver are all examples of corrosion.

Corrosion can be prevented by applying a layer of oil and grease, or coating the iron article with a thick layer of zinc (Galvanisation).

- **Rancidity:** It is the phenomenon in which food items containing oils and fats when exposed to air give an

unpleasant smell and taste. This is due to oils and fats present in the food items getting oxidised by air, heat and light.

The methods to prevent rancidity are:

- Keeping food in air-tight containers.
- By adding antioxidants to food.
- By packaging fat and oil containing food with nitrogen.



Practice Exercise



Multiple Choice Questions

Q 1. In which of the following process a chemical reaction has taken place?

- a. Ice melts into water
- b. A wet shirt got dried in sunlight
- c. A brown layer is formed over iron rod kept in air
- d. Sugar getting dissolved in water

Q 2. In which of the following, the identity of initial substance remains unchanged? (CBSE 2020)

- a. Curdling of milk
- b. Formation of crystals by process of crystallisation
- c. Fermentation of grapes
- d. Digestion of food

Q 3. Which of the following condition help us to determine that a chemical reaction has taken place?

- a. Evolution of gas
- b. Formation of precipitate
- c. Change in colour
- d. All of the above

Q 4. Which of the following feature(s) is involved in a properly written chemical equation?

- a. Temperature is required
- b. It should be balanced
- c. It should have information regarding physical states
- d. All of the above

Q 5. Why is it important to balance a skeletal chemical equation? (CBSE SQP 2021 Term-1)

- a. To verify the law of conservation of energy.
- b. To verify the law of constant proportion.
- c. To verify the law of conservation of mass.
- d. To verify the law of conservation of momentum.

Q 6. It is important to balance the chemical equations to satisfy the law of conservation of mass. Which of the following statements of the law is incorrect? (CBSE 2021 Term-1)

- a. The total mass of the elements present in the reactants is equal to the total mass of the elements presents in the products.
- b. The number of atoms of each elements remains the same, before and after a chemical reaction.
- c. The chemical composition of the reactants is the same before and after the reaction.
- d. Mass can neither be created nor can it be destroyed in a chemical reaction.

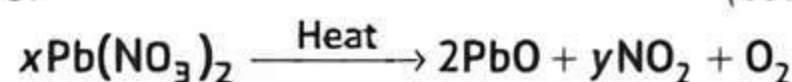
Q 7. Which of the following correctly represents a balanced chemical equation? (CBSE SQP 2021 Term-1)

- a. $\text{Fe(s)} + 4\text{H}_2\text{O(g)} \longrightarrow \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$
- b. $3\text{Fe(s)} + 4\text{H}_2\text{O(g)} \longrightarrow \text{Fe}_3\text{O}_4\text{(s)} + 4\text{H}_2\text{(g)}$
- c. $3\text{Fe(s)} + \text{H}_2\text{O(g)} \longrightarrow \text{Fe}_3\text{O}_4\text{(s)} + \text{H}_2\text{(g)}$
- d. $3\text{Fe(s)} + 4\text{H}_2\text{O(g)} \longrightarrow \text{Fe}_3\text{O}_4\text{(s)} + \text{H}_2\text{(g)}$

Q 8. When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is: (CBSE 2023)

- a. $\text{KI} + \text{PbNO}_3 \longrightarrow \text{PbI} + \text{KNO}_3$
- b. $2\text{KI} + \text{Pb(NO}_3)_2 \longrightarrow \text{PbI}_2 + 2\text{KNO}_3$
- c. $\text{KI} + \text{Pb(NO}_3)_2 \longrightarrow \text{PbI} + \text{KNO}_3$
- d. $\text{KI} + \text{PbNO}_3 \longrightarrow \text{PbI}_2 + \text{KNO}_3$

Q 9. In order to balance the following chemical equation, the values of the coefficients x and y respectively are: (CBSE 2023)



- a. 2, 4
- b. 2, 2
- c. 2, 3
- d. 4, 2

Q 10. The chemical reaction between copper and oxygen can be categorised as: (CBSE 2021 Term-1)

- a. displacement reaction
- b. decomposition reaction
- c. combination reaction
- d. double displacement reaction

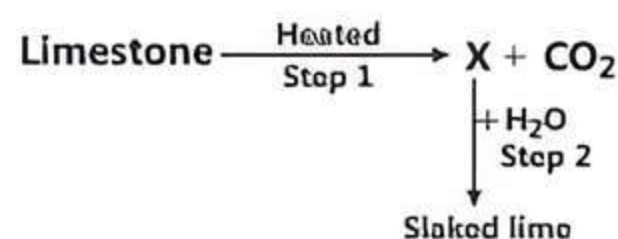
Q 11. During electrolysis of water, if the volumes of oxygen and hydrogen evolved at the electrodes are V_O and V_H respectively, then V_O/V_H is: (CBSE 2023)

- a. 4
- b. 2
- c. $\frac{1}{2}$
- d. $\frac{1}{4}$

Q 12. Which one of the following reactions is categorised as thermal decomposition reaction? (CBSE 2021 Term-1)

- a. $2\text{H}_2\text{O(l)} \longrightarrow 2\text{H}_2\text{(g)} + \text{O}_2\text{(g)}$
- b. $2\text{AgBr(s)} \longrightarrow 2\text{Ag(s)} + \text{Br}_2\text{(g)}$
- c. $2\text{AgCl(s)} \longrightarrow 2\text{Ag(s)} + \text{Cl}_2\text{(g)}$
- d. $\text{CaCO}_3\text{(s)} \longrightarrow \text{CaO(s)} + \text{CO}_2\text{(g)}$

Q 13.



Identify the correct option from the given table which represents the type of reactions occurring in step 1 and step 2.

Option	Endothermic	Exothermic
a.	X	✓
b.	✓	X
c.	✓	✓
d.	X	X

Q 14. Which among the following is/are double displacement reaction(s)? (NCERT EXEMPLAR)

- (i) $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$
 (ii) $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
 (iii) $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
 (iv) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

- a. (i) and (iv) b. Only (ii)
 c. (i) and (ii) d. (iii) and (iv)

Q 15. Barium chloride on reacting with ammonium sulphate forms barium sulphate and ammonium chloride. Which of the following correctly represents the type of the reaction involved? (NCERT EXEMPLAR)

- (i) Displacement reaction
 (ii) Precipitation reaction
 (iii) Combination reaction
 (iv) Double displacement reaction

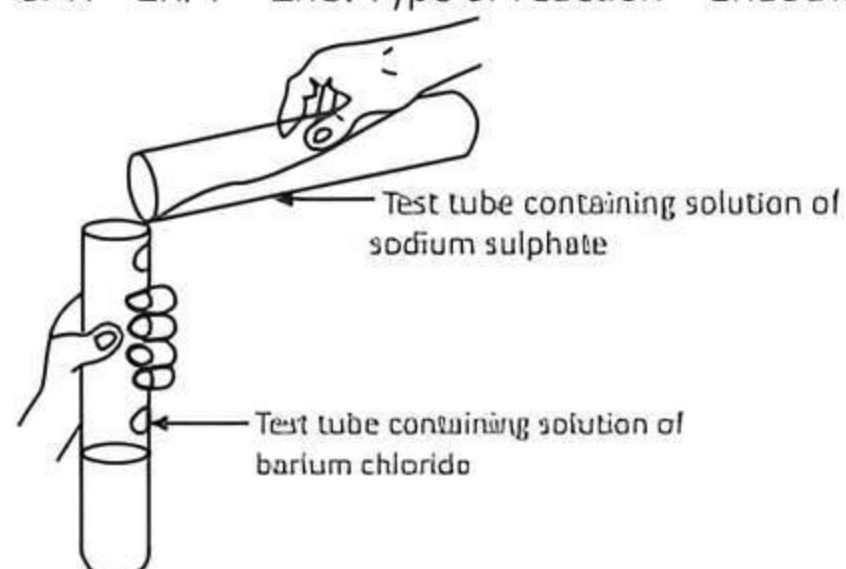
- a. Only (i) b. Only (ii)
 c. Only (iv) d. (ii) and (iv)

Q 16. A metal ribbon X burns in oxygen with a dazzling white flame forming a white ash Y. The correct description of X, Y and the type of reaction is:

(CBSE 2023)

- a. X = Ca; Y = CaO; Type of reaction = Decomposition
 b. X = Mg; Y = MgO; Type of reaction = Combination
 c. X = Al; Y = Al_2O_3 ; Type of reaction = Thermal decomposition
 d. X = Zn; Y = ZnO; Type of reaction = Endothermic

Q 17.



Identify the product which represents the solid state in the above reaction. (CBSE SQP 2023-24)

- a. Barium chloride b. Barium sulphate
 c. Sodium chloride d. Sodium sulphate

Q 18. In the reaction of iron with copper sulphate solution:

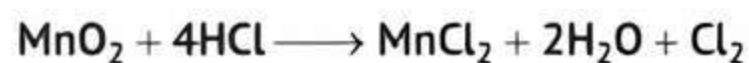


Which option in the given table correctly represents the substance oxidised and the reducing agent?

(CBSE SQP 2021 Term-1)

Option	Substance oxidised	Reducing agent
a.	Fe	Fe
b.	Fe	FeSO_4
c.	Cu	Fe
d.	CuSO_4	Fe

Q 19. In the redox reaction: (CBSE SQP 2022-23)



- a. MnO_2 is reduced to MnCl_2 and HCl is oxidised to H_2O
 b. MnO_2 is reduced to MnCl_2 and HCl is oxidised to Cl_2
 c. MnO_2 is oxidised to MnCl_2 and HCl is reduced to Cl_2
 d. MnO_2 is oxidised to MnCl_2 and HCl is reduced to H_2O

Q 20. Which of the following gases can be used for storage of fresh sample of an oil for a long time? (NCERT EXEMPLAR)

- a. Carbon dioxide or Oxygen
 b. Nitrogen or Oxygen
 c. Carbon dioxide or Helium
 d. Helium or Nitrogen



Assertion & Reason Type Questions

Directions (Q. Nos. 21-28): Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
 b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
 c. Assertion (A) is true but Reason (R) is false.
 d. Assertion (A) is false but Reason (R) is true.

Q 21. **Assertion (A):** Rusting of iron is endothermic in nature.

Reason (R): As the reaction is slow, the release of heat is barely evident. (CBSE SQP 2023-24)

Q 22. **Assertion (A):** Burning of natural gas is an endothermic process.

Reason (R): Methane gas combines with oxygen to produce carbon dioxide and water.

(CBSE 2021 Term-1)

Q 23. **Assertion (A):** Reaction of quicklime with water is an exothermic reaction.

Reason (R): Quicklime reacts vigorously with water releasing a large amount of heat. (CBSE 2023)

Q 24. **Assertion (A):** When an iron rod is dipped into a solution of copper sulphate, copper is displaced.

Reason (R): Iron is more reactive than copper.

Q 25. **Assertion (A):** Silver bromide decomposition is used in black and white photography.

Reason (R): Light provides energy for this exothermic reaction. (CBSE SQP 2022-23)

Q 26. Assertion (A): $2\text{H}_2\text{S}(g) + \text{O}_2(g) \longrightarrow 2\text{S}(s) + 2\text{H}_2\text{O}(l)$ is a redox reaction.

Reason (R): In this reaction, oxidation of H_2S to S and reduction of O_2 to H_2O takes place.

Q 27. Assertion (A): Rusting can be prevented by applying a layer of oil and grease.

Reason (R): The whole of iron deteriorates due to rust.

Q 28. Assertion (A): Chips manufacturers usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidised.

Reason (R): This increases the taste of the chips and helps in their digestion.

Answers

- (c) A brown layer is formed over iron rod kept in air
- (b) Formation of crystals by process of crystallisation
- (d) All of the above
- (d) All of the above
- (c) To verify the law of conservation of mass.
- (c) The chemical composition of the reactants is the same before and after the reaction.
- (b) $3\text{Fe}(s) + 4\text{H}_2\text{O}(g) \longrightarrow \text{Fe}_3\text{O}_4(s) + 4\text{H}_2(g)$
- (b) $2\text{KI} + \text{Pb}(\text{NO}_3)_2 \longrightarrow \text{PbI}_2 + 2\text{KNO}_3$
- (a) 2, 4
 $2\text{Pb}(\text{NO}_3)_2 \longrightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$
Hence, $x = 2$ and $y = 4$.
- (c) Combination reaction
 $2\text{Cu} + \text{O}_2 \longrightarrow 2\text{CuO}$
Here, two substances combine to form a single substance, thus, it is a combination reaction.
- (c) $1/2$
- (d) $\text{CaCO}_3(s) \longrightarrow \text{CaO}(s) + \text{CO}_2(g)$
Reaction (a) takes place in the presence of electricity. (b) and (c) are carried out by the action of light energy. Decomposition of calcium carbonate, i.e., (d) is carried out by heating, thus, it is a thermal decomposition reaction.
- (c) Endothermic Exothermic
✓ ✓
- (b) Only (ii)
- (d) (ii) and (iv)
- (b) $X = \text{Mg}$; $Y = \text{MgO}$; Type of reaction = Combination
 $2\text{Mg} + \text{O}_2 \longrightarrow 2\text{MgO}$
(x) (y)
As two or more substances combine to form a new single substance, therefore, it is a combination reaction.
- (b) Barium sulphate
 $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \longrightarrow \text{BaSO}_4 + 2\text{NaCl}$
(Sodium sulphate) (Barium chloride) (Barium sulphate)
- (a) Substance oxidised—Fe. Reducing agent—Fe
In this reaction, substance oxidised = Fe, substance reduced = CuSO_4 , oxidising agent = CuSO_4 , Reducing agent = Fe
- (b) MnO_2 is reduced to MnCl_2 and HCl is oxidised to Cl_2 .
- (d) Helium or Nitrogen
- (d) Assertion (A) is false but Reason (R) is true.
Assertion (A) is false because rusting of iron is an exothermic reaction.
- (d) Assertion (A) is false but Reason (R) is true.
Assertion is false because burning of natural gas is an exothermic reaction.

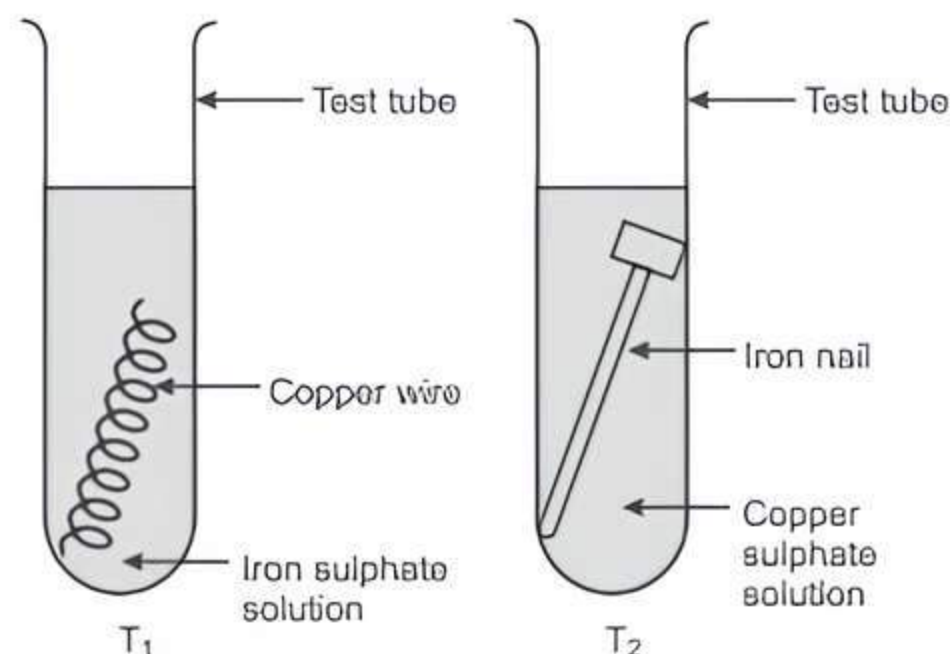
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false.
Reason (R) is false because light provides energy for photochemical decomposition reaction.
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false.
Reason (R) is false because this process prevents the chips from getting rancid.



Case Study Based Questions

Case Study 1

Rishabh wanted to study displacement reactions. He knows that he needs a metal and a salt solution of a different metal. So, he takes two tubes T_1 and T_2 , out of which in T_1 , he placed a copper wire in iron sulphate solution and in T_2 , he placed an iron nail in copper sulphate solution as shown below:



Read the above passage carefully and give the answer of the following questions:

- Q 1. Based on the above passage which test tube will undergo displacement reaction?**
- T_1
 - T_2
 - Both T_1 and T_2
 - Neither T_1 nor T_2

Q 2. Identify the balanced chemical equation for reaction taking place in T_2 .

- $\text{Fe(s)} + \text{CuCl}_2(\text{aq}) \longrightarrow \text{FeCl}_2(\text{aq}) + \text{Cu(s)}$
- $\text{Cu(s)} + \text{FeSO}_4(\text{aq}) \longrightarrow \text{No reaction}$
- $\text{Fe(s)} + \text{CuSO}_4(\text{aq}) \longrightarrow \text{FeSO}_4(\text{aq}) + \text{Cu(s)}$
- $\text{Pb(s)} + \text{CuSO}_4(\text{aq}) \longrightarrow \text{PbSO}_4(\text{aq}) + \text{Cu(s)}$

Q 3. State the change(s) that is/are observed in T_2 .

- White precipitate of FeSO_4 is formed
- The blue colour of CuSO_4 changes to light green colour of FeSO_4
- Brown coating of copper is obtained on iron nail
- Both b. and c.

Q 4. What will happen if zinc wire is used in place of copper wire in T_1 ?

- It will produce zinc sulphate solution and copper metal
- It will produce zinc sulphate solution and iron metal
- It will produce iron sulphate solution and zinc metal
- No reaction will take place

Q 5. What will happen if silver nitrate is used in place of iron sulphate in T_1 ?

- No reaction will take place
- It will produce copper nitrate and iron metal
- It will produce copper nitrate and silver metal
- It will produce iron nitrate and silver metal

Answers

- (b) T_2
- (c) $\text{Fe(s)} + \text{CuSO}_4(\text{aq}) \longrightarrow \text{FeSO}_4(\text{aq}) + \text{Cu(s)}$
- (d) Both b. and c.
- (b) It will produce zinc sulphate solution and iron metal
- (c) It will produce copper nitrate and silver metal
 $\text{Cu} + 2\text{AgNO}_3 \longrightarrow \text{Cu(NO}_3)_2 + 2\text{Ag}$

Case Study 2

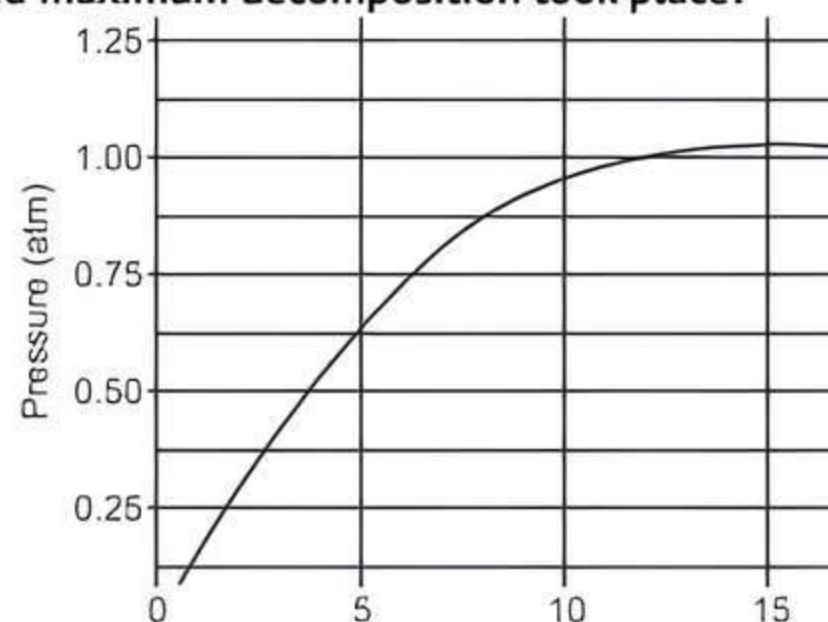
Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.



Read the above passage carefully and give the answer of the following questions:

- Q 1. The substance not likely to contain CaCO_3 is:
- dolomite
 - a marble statue
 - calcined gypsum
 - sea shells

Q 2. A student added 10 g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?



- 15-20 min
- 10-15 min
- 5-10 min
- 0-5 min

Q 3. Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process:

- respiration
- photosynthesis
- transpiration
- photolysis

Q 4. Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.



- Decomposition of calcium carbonate to calcium oxide
- Polluted water is basic in nature hence it reacts with calcium carbonate
- Polluted water is acidic in nature hence it reacts with calcium carbonate
- Calcium carbonate dissolves in water to give calcium hydroxide.

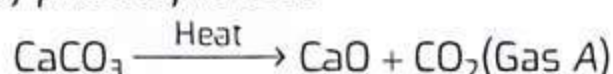
Q 5. Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidising agent in the above process?

- Sodium
- Sodium oxide
- Calcium
- Calcium oxide

Answers

- (c) calcined gypsum
- (d) 0-5 min

3. (b) photosynthesis

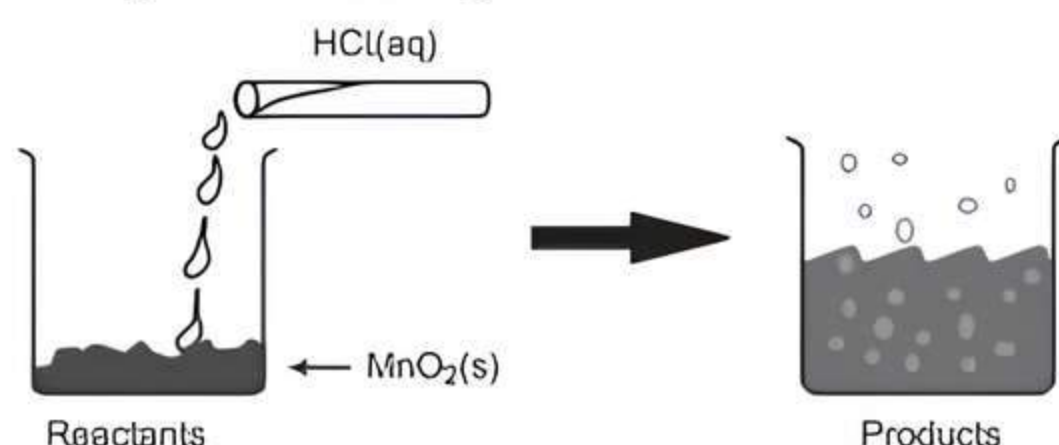


We know that CO_2 is a reactant of photosynthesis, which occurs in the presence of sunlight.

4. (c) Polluted water is acidic in nature hence it reacts with calcium carbonate
5. (d) Calcium oxide
In this reaction, calcium oxide is being reduced to calcium. Therefore, calcium oxide is the oxidising agent.

Case Study 3

The reaction between MnO_2 with HCl is depicted in the following diagram. It was observed that a gas with bleaching abilities was released.



Read the above passage carefully and give the answer of the following questions:

- Q 1. The chemical reaction between MnO_2 and HCl is an example of:
- displacement reaction
 - combination reaction
 - redox reaction
 - decomposition reaction
- Q 2. In which of the following chemical equations, the abbreviations represent the correct states of reactants and products?
- $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \longrightarrow \text{MnCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l}) + \text{Cl}_2(\text{g})$
 - $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \longrightarrow \text{MnCl}_2(\text{s}) + 2\text{H}_2\text{O}(\text{aq}) + \text{Cl}_2(\text{g})$
 - $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{l}) \longrightarrow \text{MnCl}_2(\text{s}) + 2\text{H}_2\text{O}(\text{l}) + \text{Cl}_2(\text{g})$
 - $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \longrightarrow \text{MnCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{aq}) + \text{Cl}_2(\text{g})$
- Q 3. Identify the correct statement from the following:
- MnO_2 is getting reduced whereas HCl is getting oxidised
 - MnO_2 is getting oxidised whereas HCl is getting reduced
 - MnO_2 and HCl both are getting reduced
 - MnO_2 and HCl both are getting oxidised
- Q 4. In the above discussed reaction, name the reducing agent.
- MnCl_2
 - HCl
 - MnO_2
 - H_2O
- Q 5. What will happen if we take dry HCl gas instead of aqueous solution of HCl ?
- Reaction will occur faster
 - Reaction will not occur
 - Reaction rate will be slow
 - Reaction rate will remain the same

Answers

- (c) redox reaction
- (a) $\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \longrightarrow \text{MnCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l}) + \text{Cl}_2(\text{g})$
- (a) MnO_2 is getting reduced whereas HCl is getting oxidised
- (b) HCl
- (b) Reaction will not occur

Case Study 4

Rahul is a skilled painter. He mixed a white coloured powder, compound X with water. The compound X reacted vigorously with water to produce a compound Y and a large amount of heat. Then, Rahul used the compound Y for white washing the walls. Customer was not satisfied with the work of Rahul as walls were not shining. But Rahul guaranteed him that the walls would shine after 2-3 days and after 3 days of whitewash, the walls became shiny.

Read the above passage carefully and give the answer of the following questions:

- Q 1. Name the compound X, that Rahul mixed with water.
- Q 2. Name the compound Y, that Rahul got after mixing X with water.
- Q 3. What type of reaction has occurred here?
- Q 4. Write the chemical reaction responsible for shiny finish of the walls.
- Q 5. Write the common name of X and Y.

Answers

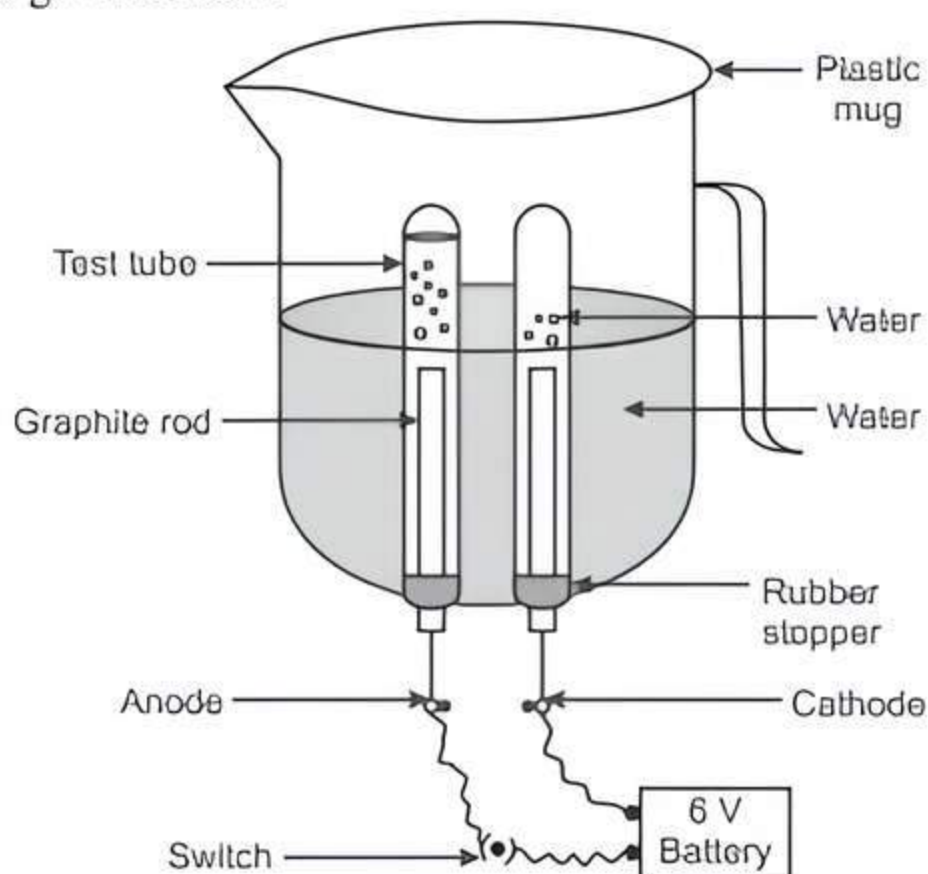
- The compound X is calcium oxide (CaO).
- $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2 + \text{Heat}$
(X) (Y)
Thus, compound Y is calcium hydroxide.
- Here, CaO combine with water to form a single product, $\text{Ca}(\text{OH})_2$, thus it is a combination reaction.
- $\text{Ca}(\text{OH})_2(\text{aq}) + \text{CO}_2(\text{g}) \longrightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$
(Calcium Hydroxide) (Calcium carbonate)
- Common name of CaO (X) is quick lime and that of $\text{Ca}(\text{OH})_2$ (Y) is slaked lime.

Case Study 5

Electrolysis of water is a popular method used for different applications in various industries. The electrolysis of water is mainly carried out to yield pure hydrogen and oxygen gases. It involves passing an electric current through the water which results in decomposition of water into hydrogen and oxygen.

Pure water is a poor conductor of electricity. Sulphuric acid is added to the water so that the conductance of water increases which makes the

reaction faster. The setup for electrolysis of water is given below:



The number of hydrogen molecules produced in electrolysis is twice the number of oxygen molecules. Also, hydrogen is double in volume than oxygen.

Read the above passage carefully and give the answer of the following questions:

- Q 1. Name the gases evolved at cathode and anode respectively.
- Q 2. Why is volume of one gas collected at one electrode is double of anode?
- Q 3. Why are few drops of H_2SO_4 added to pure water?
- Q 4. How will you test the gas evolved at anode?
- Q 5. How will you test the gas evolved at cathode?

Answers

1. At cathode, hydrogen gas (H_2) is evolved and at anode, oxygen gas (O_2) is evolved.
2. During electrolysis, water splits into 2 molecules of hydrogen and 1 molecule of oxygen. Since, number of molecules of hydrogen released is double the number of molecules of oxygen released. Thus, volume occupied by hydrogen gas is double the volume occupied by oxygen gas.
3. Few drops of H_2SO_4 are added to make the water conduct electricity as distilled water is a poor conductor of electricity.
4. If we bring a glowing splinter close to the mouth of anode, it relights because oxygen supports combustion.
5. If we bring a burning splinter close to the mouth of cathode, it makes a popping sound in the presence of hydrogen gas.

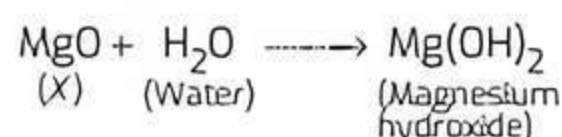
COMMON ERROR

Usually students get confused in the tests performed to detect different gases.

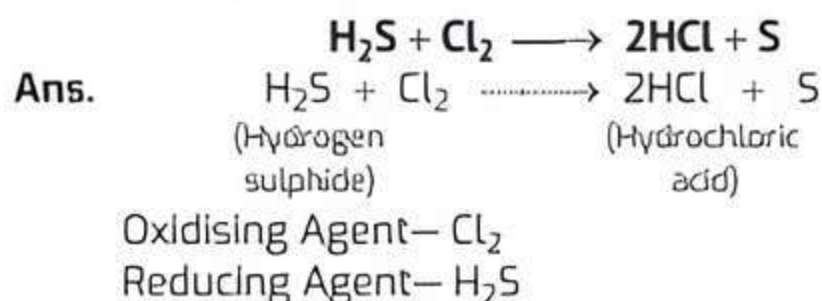


Very Short Answer Type Questions

- Q 1. Which one is a chemical change-Rusting of iron or melting of iron?
Ans. Rusting of iron is a chemical change.
- Q 2. Why is respiration considered as an exothermic reaction?
Ans. Respiration results in oxidation of glucose which produces heat energy. So, it is an exothermic reaction.
- Q 3. A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. Write a balanced chemical equation, when X is dissolved in water. (NCERT EXEMPLAR)
Ans. The balanced chemical equation is:



- Q 4. Ferrous sulphate decomposes with the evolution of a gas having a characteristic odour of burning sulphur. Write the chemical reaction involved and identify the type of reaction. (NCERT EXEMPLAR)
Ans. $2\text{FeSO}_4(s) \xrightarrow{\text{Heat}} \text{Fe}_2\text{O}_3(s) + \text{SO}_2(g) + \text{SO}_3(g)$
 It is a thermal decomposition reaction.
- Q 5. Why do we store silver chloride in dark-coloured bottles? (NCERT EXEMPLAR)
Ans. We store silver chloride in dark-coloured bottles to prevent its decomposition in the sunlight.
- Q 6. Identify the products formed when potassium iodide is added to lead nitrate solution. Also, name the compound precipitated.
Ans. Potassium nitrate (KNO_3) and lead iodide (PbI_2) are produced. The compound precipitated is lead iodide (yellow ppt.).
- Q 7. The surface of copper gets coated with black copper (II) oxide. Why?
Ans. The surface of copper turns black, when kept exposed to air, due to its reaction with oxygen making black copper (II) oxide.
- Q 8. Indicate the oxidising and reducing agent in the reaction.



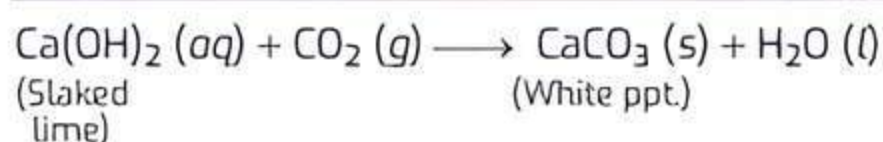
Short Answer Type-I Questions

- Q 1. "Dil. HCl is added to Zn granules." How will you prove that chemical change has taken place here? Support your response with two arguments. (CBSE SQP 2023-24)
Ans. A chemical change has taken place can be proved with the help of following two arguments:
 (i) **Evolution of a gas:** When dilute HCl is added to Zn granules in a test tube, a colourless and odourless gas is evolved with bubbles.
 (ii) **Change in temperature:** It is an exothermic reaction and temperature of the test tube increases.

Q 2. A clear solution of slaked lime is made by dissolving Ca(OH)_2 in an excess of water. This solution is left exposed to air. The solution slowly goes milky as a faint white precipitate forms. Explain why a faint white precipitate forms, support your response with the help of a chemical equation.

(CBSE SQP 2022-23)

Ans. Slaked lime (calcium hydroxide) reacts slowly with carbon dioxide present in the air to form calcium carbonate which results in milkiness or white ppt.



Q 3. Which among the following changes are exothermic or endothermic in nature? (NCERT EXEMPLAR)

- (i) Decomposition of ferrous sulphate
- (ii) Dilution of sulphuric acid
- (iii) Dissolution of sodium hydroxide in water
- (iv) Dissolution of ammonium chloride in water

Ans. (ii) and (iii) are exothermic as heat is released in these changes.

(i) and (iv) are endothermic as heat is absorbed in these changes.

Q 4. (i) Write two observations when lead nitrate is heated in a test tube.
(ii) Name the type of reaction.

Ans. (i) The compound turns yellow due to formation of lead oxide and reddish brown fumes evolve due to formation of nitrogen dioxide.

(ii) It is a thermal decomposition reaction.

Q 5. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans. In a displacement reaction, a more reactive element displaces a less reactive element from its compound. While, in a double displacement reaction, two atoms or a group of atoms interchange their positions to form new compounds.

For example:

Displacement reaction:



Double displacement reaction:



COMMON ERROR

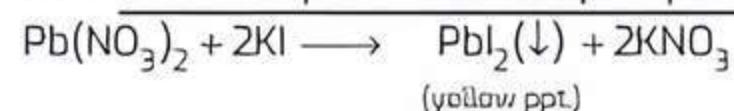
Students get confused between the displacement and double displacement reactions and interchange their definitions.

Q 6. What is observed when aqueous solutions of potassium iodide and lead nitrate are mixed together? Name the type of reaction and write the chemical equation for the reaction that occurs.

(CBSE 2023)

Ans. When aqueous solutions of potassium iodide and lead nitrate are mixed together a yellow precipitate of lead iodide is observed.

It is a double displacement and precipitation reaction.



Q 7. When copper powder is heated in a watch glass, a black substance is formed:

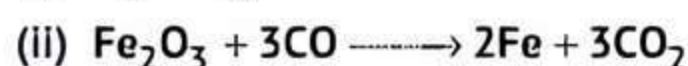
(i) Why is this black substance formed? Name it.

(ii) How can this black substance be reversed to its original form? (CBSE 2023)

Ans. (i) This black substance is formed because oxygen is added to copper powder and copper oxide (black substance) is formed.

(ii) If hydrogen gas is passed over this black substance (CuO), the black coating on the surface turns brown as the reverse reaction takes place and original form (copper) is obtained.

Q 8. Identify the reducing agent in the following reactions:



Ans.



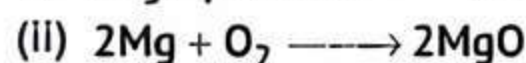
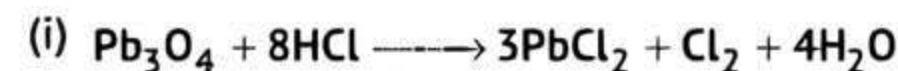
TIP

Learn the definition of reducing agents. Reducing agents are those substances which have the ability of adding hydrogen or removing oxygen from other substances.

(i) Water (H_2O) as F_2 is getting reduced to HF.

(ii) Carbon monoxide (CO).

Q 9. Identify the oxidising agent in the following reactions:



Ans. (i) Pb_3O_4 (ii) O_2

COMMON ERROR

Usually students get confused between the oxidising agent and reducing agent in a reaction.



Short Answer Type-II Questions

Q 1. What is meant by skeletal type chemical equation? What does it represent? Using the equation for electrolytic decomposition of water, differentiate between a skeletal chemical equation and a balanced chemical equation.

Ans.

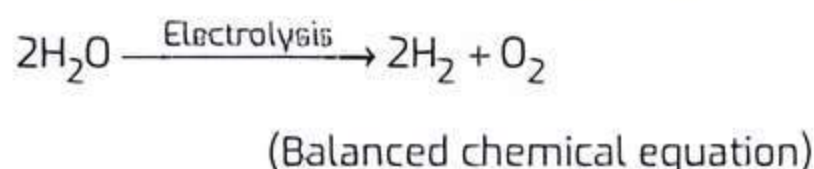
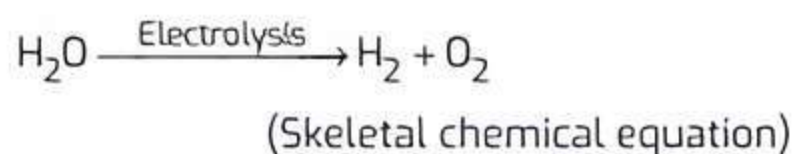


TIP

Learn the concept of skeletal chemical equation and also, the difference between skeletal and balanced chemical equations.

A chemical equation in which the number of atoms of reactants is not equal to the number of atoms of products is called a skeletal chemical equation.

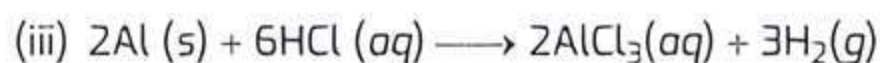
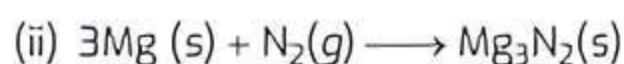
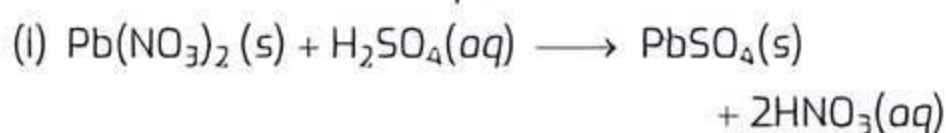
Such an equation only represents the chemical formula of reactants and products of a chemical reaction and does not follow the law of conservation of mass.



Q 2. Translate the following statements into chemical equations and balance them:

- Lead nitrate reacts with sulphuric acid to form a precipitate of lead sulphate and nitric acid.
- Magnesium burns in the presence of nitrogen to form magnesium nitride.
- Aluminium metal strip is added in hydrochloric acid to produce aluminium chloride and hydrogen gas.

Ans. The balanced chemical equations are as follows:



Q 3. Write the balanced chemical equations for the following reactions:

- Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogen carbonate.
- Sodium hydrogen carbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.
- Copper sulphate on treatment with potassium iodide precipitates cuprous iodide (Cu_2I_2), liberates iodine gas and also forms potassium sulphate. (NCERT EXEMPLAR)

Ans.



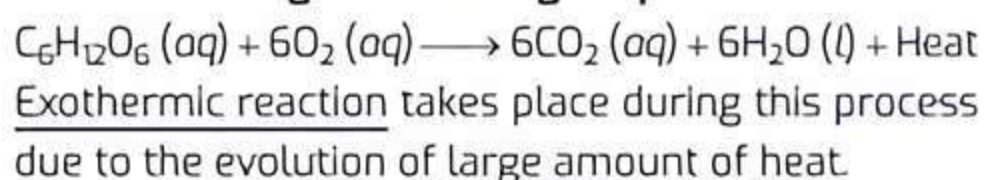
TIP

Practice writing balanced chemical equations with correct chemical formula of reactants and products.



Q 4. Write balanced chemical equation for the reactions that take place during respiration. Identify the type of combination reaction that takes place during this process and justify the name. Give one more example of this type of reaction.

Ans. Reaction Taking Place During Respiration:



Burning of natural gas is another example of such a reaction.



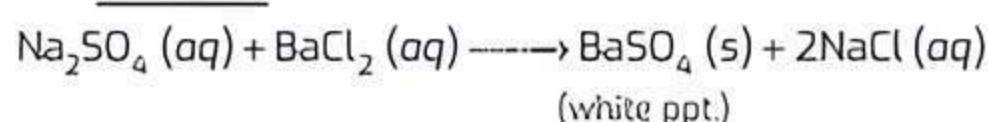
Q 5. Identify the type of each of the following reactions. Also write balanced chemical equation for each reaction.

- A reaction in which the reaction mixture becomes warm.
- A reaction in which an insoluble substance is formed. (CBSE 2020)

Ans. (i) Reaction mixture becomes warm in exothermic reactions.

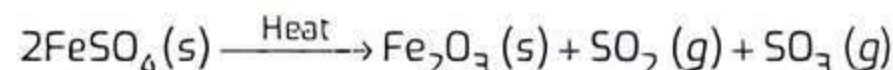


(ii) Insoluble substance is formed in precipitation reactions.

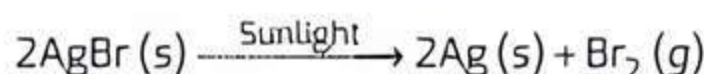


Q 6. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity. (CBSE 2018)

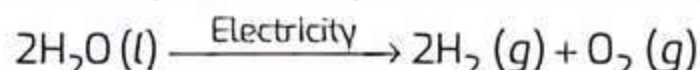
Ans. Thermal Decomposition (Heat):



Photochemical Decomposition (Light):



Electrolytic Decomposition (Electricity):



Q 7. (i) While electrolysis of water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.

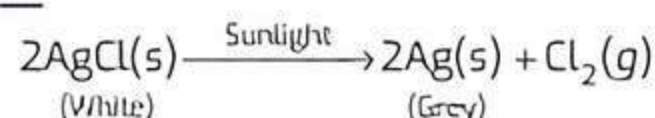
(ii) What is observed when silver chloride is exposed to sunlight? Give the type of reaction involved. (CBSE 2023)

Ans. (i) Some drops of an acid are added before electrolysis of water to make it a good conductor of electricity as distilled water is a poor conductor of electricity.

At cathode, hydrogen gas (H_2) is evolved and at anode, oxygen gas (O_2) is evolved.

The ratio of the volume of gas collected at anode (oxygen) to the volume of gas collected at cathode (hydrogen) is 1 : 2.

(ii) White silver chloride turns grey in sunlight. This is an example of photochemical decomposition reaction.



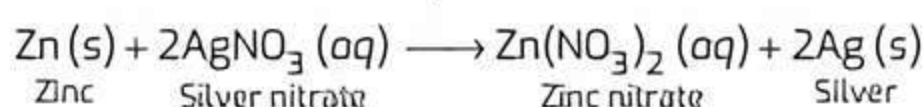
Q 8. Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions.

(i) Zinc reacts with silver nitrate to produce zinc nitrate and silver.

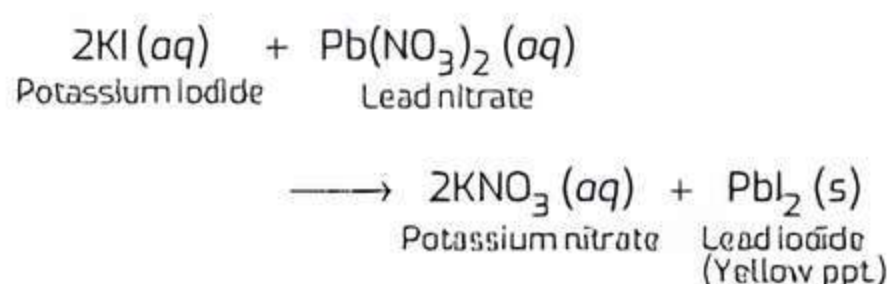
(ii) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.

(CBSE 2019)

Ans. (i) This is a displacement reaction. Zinc being more reactive than silver displaces it from its salt.



(ii) This is a double displacement reaction because mutual exchange of ions takes place between the reactants.



COMMON ERROR

Students often write unbalanced chemical equations. Many of them fail to write correct chemical formula of zinc nitrate or lead iodide.

Q 9. Write down the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(i) Nitrogen gas is treated with hydrogen gas to form ammonia gas.

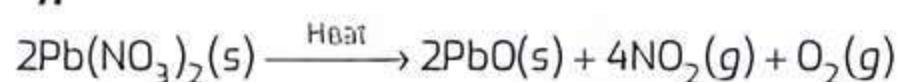
(ii) Lead nitrate is heated strongly to form lead monoxide, nitrogen dioxide and oxygen.

(iii) A copper wire is dipped in silver nitrate solution and a shining deposit of silver is produced.

(CBSE 2023)

Ans. (i) $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \longrightarrow 2\text{NH}_3(\text{g})$

Type of reaction: Combination reaction



Type of reaction: Decomposition reaction.

(iii) $\text{Cu}(\text{s}) + 2\text{AgNO}_3(\text{aq}) \longrightarrow 2\text{Ag}(\text{s}) + \text{Cu(NO}_3)_2(\text{aq})$

Type of reaction: Displacement reaction.

COMMON ERROR

Many students forget to answer the type of chemical reactions in this question.

Q 10. Write the chemical equation of the reaction in which the following changes have taken place with an example of each:

(i) Change in colour.

(ii) Change in temperature.

(iii) Formation of precipitate.

(CBSE 2015)

Ans. (i) $\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq}) \longrightarrow \text{FeSO}_4(\text{aq}) + \text{Cu}(\text{s})$

The blue colour of solution changes to light green.

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

The temperature increases because heat is evolved.

(iii) $\underset{\text{Lead nitrate}}{\text{Pb(NO}_3)_2}(\text{aq}) + 2\underset{\text{Potassium iodide (Yellow ppt)}}{\text{KI}}(\text{aq}) \longrightarrow \underset{\text{Lead iodide (Yellow ppt)}}{\text{PbI}_2}(\text{s}) + 2\text{KNO}_3(\text{aq})$

Yellow precipitate of PbI_2 is formed.

Q 11. Name the type of chemical reaction represented by the following equations:

(i) $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2$

(ii) $3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \longrightarrow 2\text{AlCl}_3 + 3\text{BaSO}_4$

(iii) $2\text{FeSO}_4 \longrightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$ (CBSE 2015)

Ans. The type of chemical reactions are as follows:

(i) Combination reaction.

(ii) Double displacement reaction.

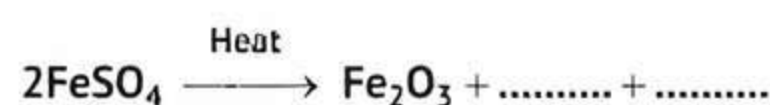
(iii) Decomposition reaction.

Q 12. (i) Write the essential condition for the following reaction to take place:



Write one application of this reaction.

(ii) Complete the following chemical equation of a chemical reaction:



(iii) What happens when water is added to quick lime? Write chemical equation. (CBSE 2015)

Ans. (i) $2\text{AgBr} \xrightarrow{\text{Sunlight}} 2\text{Ag} + \text{Br}_2$

Sunlight is required to decompose silver bromide into silver and bromine.

This reaction is used in black and white photography.

(ii) $2\text{FeSO}_4(\text{s}) \xrightarrow{\text{Heat}} \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$

(iii) Slaked lime is formed with hissing sound and a large amount of heat is evolved.



COMMON ERROR

Usually students get confused in the essential conditions and liberation of gases in the reaction.

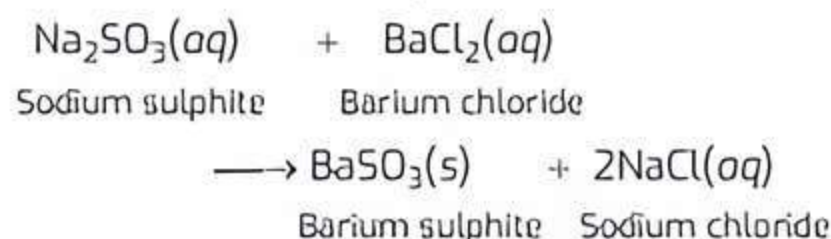
Q 13. On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, a white precipitate is obtained.

(i) Write a balanced chemical equation of the reaction involved.

(ii) What other name can be given to this precipitation reaction?

- (iii) On adding dilute hydrochloric acid to the reaction mixture, white precipitate disappears. Why?

Ans. (i) **Balanced Chemical Equation:**



- (ii) This precipitation reaction is also known as double displacement reaction.

- (iii) BaSO_3 is a salt of weak acid (H_2SO_3), therefore dilute HCl decomposes barium sulphite to produce sulphur dioxide gas which has the smell of burning sulphur.



BaCl_2 is soluble in water, hence white precipitate disappears.

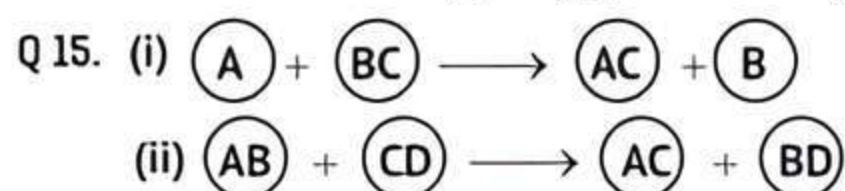
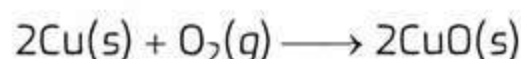
Q 14. You might have noted that when copper powder is heated in a China dish, the surface of copper powder becomes coated with a black colour substance.

- How has this black-coloured substance formed?
- What is that black substance?
- Write the chemical equation of the reaction that takes place.

Ans. (i) When copper powder is heated, it reacts with oxygen to form copper oxide which is a black colour substance.

- (ii) The black substance is copper oxide.

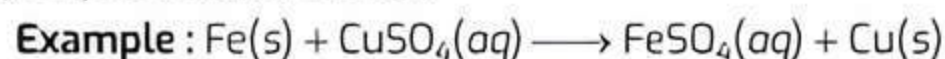
(iii) Chemical Reaction:



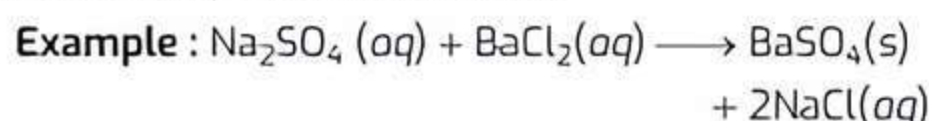
Identify the types of reaction mentioned above in (i) and (ii). Give one example for each type in the form of a balanced chemical equation.

(CBSE SQP 2022-23)

Ans. (i) Displacement reaction.



(ii) Double displacement reaction



Q 16. Mention with reason the colour changes observed when:

- Silver chloride is exposed to sunlight.
- Copper powder is strongly heated in the presence of oxygen.
- A piece of zinc is dropped in copper sulphate solution.

(CBSE 2020)

Ans.



TiP

Learn and understand the basic concepts of each type of chemical reaction and make a list of few examples for each.

- (i) White silver chloride turns grey due to the decomposition of silver chloride into silver and chlorine by sunlight.

- (ii) A black coating is formed on the surface of brown copper powder because oxygen is added to copper and copper oxide is formed.

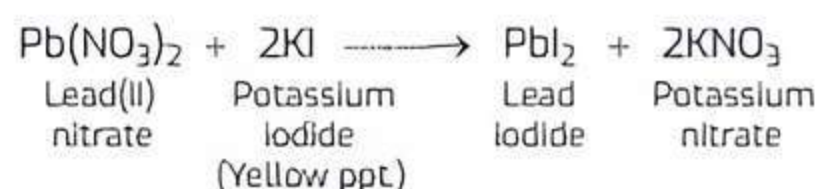
- (iii) When a piece of zinc is dropped in CuSO_4 solution, zinc being more reactive displaces copper from CuSO_4 and forms ZnSO_4 solution. During this process, the colour of the solution changes from blue to light green.

Q 17. When potassium iodide solution is added to a solution of lead(II) nitrate in a test tube, a precipitate is formed.

- What is the colour of this precipitate? Name the compound precipitated.
- Write the balanced chemical equation for this reaction.
- List two types of reactions in which this reaction can be placed. (CBSE 2019)

Ans. (i) The colour of the precipitate formed is yellow and the compound precipitated is lead iodide (PbI_2).

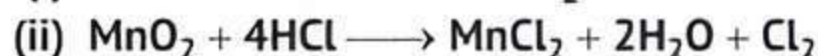
- (ii) The balanced chemical equation for this reaction is:



- (iii) The two types of reactions in which the given reaction can be placed are:

- Precipitation reaction.
- Double displacement reaction.

Q 18. What is redox reaction? Identify the substance oxidised and the substance reduced in the following reactions:



Ans. The reaction in which oxidation and reduction take place simultaneously is called redox reaction.



TiP

Practice a number of questions based on identifying oxidising and reducing agents.

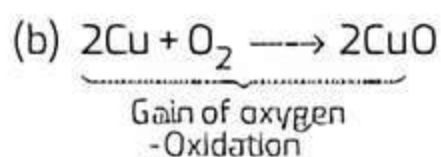
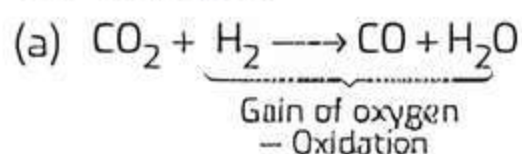
- Substance Oxidised: C
Substance Reduced: PbO
- Substance Oxidised: HCl
Substance Reduced: MnO_2

Q 19. Explain the following in terms of gain or loss of oxygen with two examples each:

(i) Oxidation (ii) Reduction (NCERT)

Ans. (i) Oxidation is the gain of oxygen.

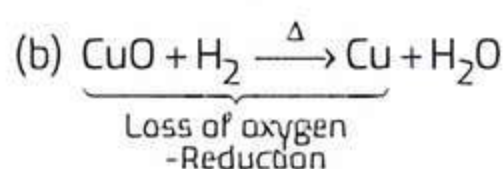
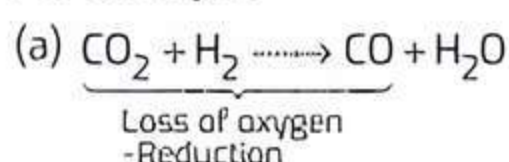
For example:



In equation (a), H_2 is oxidised to H_2O and in equation (b), Cu is oxidised to CuO .

(ii) Reduction is the loss of oxygen.

For example:



In equation (a), CO_2 is reduced to CO and in equation (b), CuO is reduced to Cu .



Long Answer Type Questions

Q 1. (i) Define a balanced chemical equation. Why should an equation be balanced?

(ii) Write the balanced chemical equation for the following reaction:

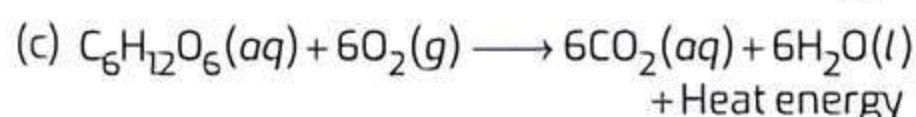
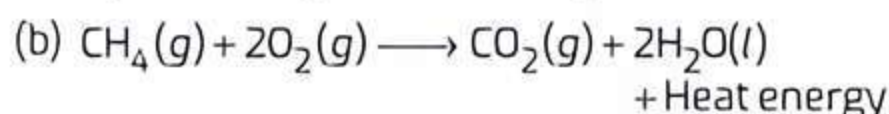
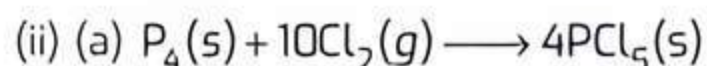
(a) Phosphorus burns in presence of chlorine to form phosphorus pentachloride.

(b) Burning of natural gas.

(c) The process of respiration. (CBSE 2015)

Ans. (i) A balanced chemical equation consists of an equal number of atoms of different elements in the reactants and products.

According to law of conservation of mass, matter can neither be created nor be destroyed in a chemical reaction. So to follow the law, an equation should be balanced.



Q 2. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case:

(i) Thermit reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.

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

(iii) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.

(iv) Ethanol is burnt in air to form carbon dioxide, water and releases heat.

(v) Lead acetate solution is treated with dilute hydrochloric acid to form lead chloride and acetic acid solution. (NCERT EXEMPLAR)

Ans. (i) $\text{Fe}_2\text{O}_3(\text{s}) + 2\text{Al}(\text{s}) \longrightarrow \text{Al}_2\text{O}_3(\text{s}) + 2\text{Fe}(\text{l}) + \text{Heat}$
It is a displacement reaction/redox reaction.

(ii) $3\text{Mg}(\text{s}) + \text{N}_2(\text{g}) \longrightarrow \text{Mg}_3\text{N}_2(\text{s})$
It is a combination reaction.

(iii) $2\text{KI}(\text{aq}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{KCl}(\text{aq}) + \text{I}_2(\text{s})$
It is a displacement reaction.

(iv) $\text{C}_2\text{H}_5\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{l}) + \text{Heat}$
It is a combustion reaction/redox reaction.

(v) $\text{Pb}(\text{CH}_3\text{COO})_2(\text{aq}) + 2\text{HCl}(\text{aq}) \longrightarrow \text{PbCl}_2(\text{aq}) + 2\text{CH}_3\text{COOH}(\text{aq})$
It is a double displacement reaction.

Q 3. Write the balanced chemical equations for the following reactions and identify the type of reaction in each case:

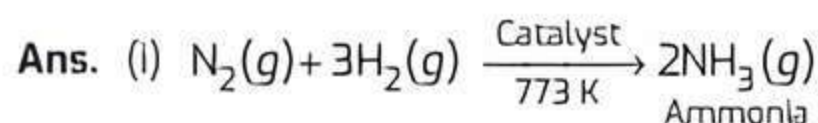
(i) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.

(ii) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.

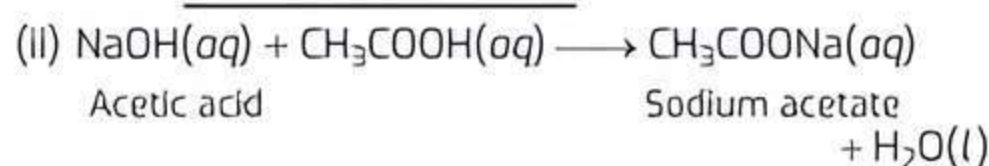
(iii) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H_2SO_4 .

(iv) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

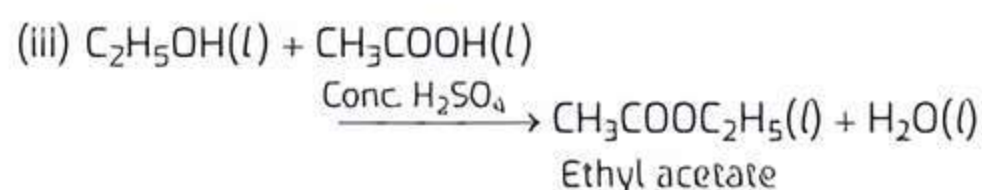
(v) Copper (II) nitrate is heated to form copper oxide, oxygen gas and nitrogen dioxide gas. (NCERT EXEMPLAR)



It is a combination reaction.



It is a double displacement reaction.



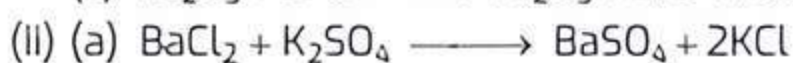
It is a double displacement reaction.


$$(b) \text{PbO} + \text{C} \longrightarrow \text{Pb} + \text{CO}_2$$


(a) Barium chloride + Potassium sulphate

(b) Zinc + Silver nitrate $\longrightarrow$ Zinc nitrate + Silver

(CBSE 2017)



(a) Barium chloride solution is mixed with copper sulphate solution and a white precipitate is obtained.

(b) On heating copper powder in air, the surface of the copper powder turns black.

(ii) What happens when hydrogen gas is passed over the heated copper oxide? Write the chemical equation involved in this reaction.

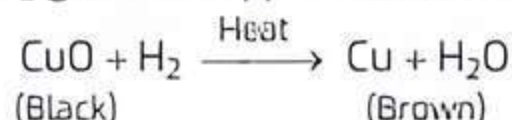
Chemical Equation:



(b) The reaction is a combination/redox reaction.



(ii) If hydrogen gas is passed over heated copper oxide (CuO), the black coating on the surface turns brown as the reaction takes place between CuO and H_2 gas and copper is obtained.

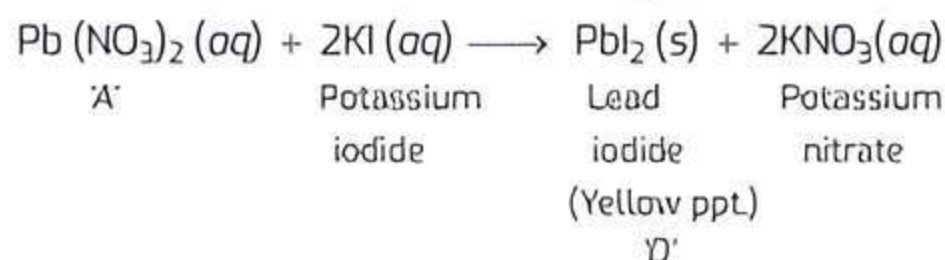


Q 6. A metal nitrate *A* on heating gives yellowish brown coloured metal oxide along with brown gas *B* and a colourless gas *C*. Aqueous solution of *A* on reaction with potassium iodide forms a yellow precipitate of compound *D*. Identify *A*, *B*, *C* and *D*. Also identify the types of both the reactions. Metal present in *A* is used in alloy which is used for soldering purposes.

$$2\text{Pb}(\text{NO}_3)_2(s) \xrightarrow{\Delta} 2\text{PbO}(s) + 4\text{NO}_2(g) + \text{O}_2(g)$$

Lead nitrate Lead (II) oxide Nitrogen Oxygen
'A' (Yellowish dioxide (Colourless)
 brown) (Brown) 'C'

B'



So, 'A' is lead nitrate, 'B' is nitrogen dioxide, 'C' is oxygen and 'D' is lead iodide.

Here, the first reaction is decomposition reaction while the second one is double displacement reaction or a precipitation reaction.

Q 7. (i) Explain the following terms with one example each:

(a) Corrosion

(b) Rancidity

(ii) Explain two ways by which food industries prevent rancidity.

Ans.



TIP

Carefully understand the concept of corrosion and rancidity with examples.

(i) (a) **Corrosion:** It is a natural process in which metals are slowly eaten up by the action of air, moisture or chemicals. **For example,** rusting is a form of corrosion in which iron is eaten up by the action of air and moisture and a reddish brown coating of iron oxide is formed as shown in the following chemical reaction.



(b) **Rancidity:** When the substance containing oils and fats are exposed to air, they get oxidised and become rancid due to which their smell taste and colour change. This process is known as rancidity. **For example,** when butter is kept open for a long time, then its smell and taste gets changed.

(ii) Rancidity can be prevented in the following ways:

(a) By adding antioxidants to food containing fats and oils.

(b) By filling nitrogen gas to the packaging of fat and oil
containing foods.

COMMON ERROR

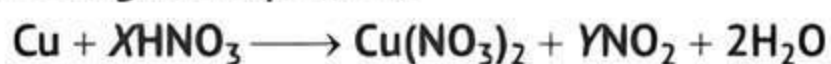
Students often give wrong ways to prevent rancidity.



Chapter Test

Multiple Choice Questions

Q 1. In the given equation,



The values of X and Y are:

- a. 3 and 5 b. 8 and 6
c. 4 and 2 d. 7 and 1

Q 2. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and sulphuric acid is formed in the solution. The reaction is an example of:

- a. combination reaction
b. displacement reaction
c. decomposition reaction
d. double displacement reaction

Q 3. Which among the following statement(s) is/are true? Exposure of silver chloride to sunlight for a long duration turns grey due to:

- (i) the formation of silver by decomposition of silver chloride
(ii) sublimation of silver chloride
(iii) decomposition of chlorine gas from silver chloride
(iv) oxidation of silver chloride
- a. Only (i) b. (i) and (iii)
c. (ii) and (iii) d. Only (iv)

Q 4. Identify the substance that is oxidised and the substance that is reduced in the following reaction:



- a. CuO, H₂ b. H₂, CuO
c. H₂O, Cu d. Cu, H₂O

Assertion and Reason Type Questions

Directions (Q. Nos. 5-6): Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

- a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true but Reason (R) is false.
d. Assertion (A) is false but Reason (R) is true.

Q 5. **Assertion (A):** Reaction between sodium sulphate and barium chloride is a double displacement and precipitation reaction.

Reason (R): Reaction between sodium sulphate and barium chloride involves the exchange of ions between the reactants and a white precipitate of barium sulphate is formed.

Q 6. **Assertion (A):** Quicklime reacts vigorously with water releasing a large amount of heat.

Reason (R): A solution of quicklime is used for whitewashing walls.

Case Study Based Question

Q 7. Reactions in which one element takes place of another element in a compound, are known as displacement reactions. In general, more reactive elements displace a less reactive element from its compound. In all single displacement reactions, only one element displaces another element from its compound. The single displacement reactions are, however, written as just displacement reactions.

Read the above passage carefully and give the answer of the following questions:

(i) Copper displaces which of the following metals from its salt solution?

- a. ZnSO₄ b. FeSO₄
c. AgNO₃ d. Pb(NO₃)₂

(ii) During the experiment of dipping iron nail in copper sulphate solution, four students recorded their observation as:

- (A) green colour of CuSO₄ changes to blue colour of FeSO₄
(B) red brown coating is formed on iron nail
(C) deep blue colour of CuSO₄ changes to light green colour of FeSO₄
(D) Greyish white coating is formed on iron nail

Which of the above observations are correct?

- a. (A) and (B) b. (A) and (D)
c. (B) and (C) d. (C) and (D)

(iii) Which of the following reactions is a displacement reaction?

- a. $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2$
b. $\text{MgCO}_3 \longrightarrow \text{Mg} + \text{CO}_2$
c. $\text{Mg} + \text{CuSO}_4 \longrightarrow \text{MgSO}_4 + \text{Cu}$
d. $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$

(iv) A strip of copper was placed in a beaker containing zinc sulphate solution. On observing the strip next day, it was noticed that:

- a. colour of copper strip has changed
b. copper strip became thicker
c. copper strip became thinner
d. copper strip remained as it was

Very Short Answer Type Questions

Q 8. Write a balanced chemical equation with state symbols for the following reaction:

Iron filings react with steam to produce solid iron (II, III) oxide and hydrogen gas.

Q 9. Consider the following reaction:



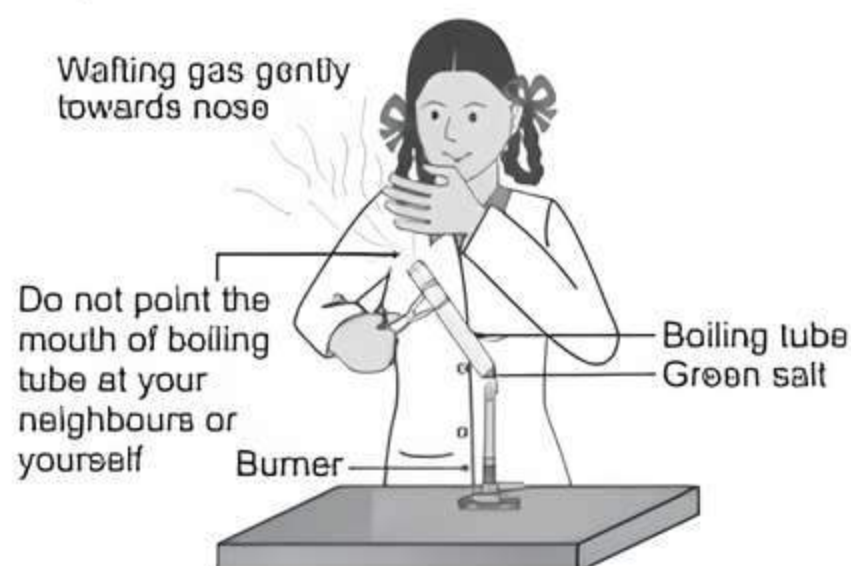
Is it a redox reaction or not? If yes, which substance acts as oxidising agent and which one as the reducing agent?

Short Answer Type-I Questions

Q 10. Classify each of the following reactions as Combination, decomposition, displacement or double displacement reactions:

- (i) $2\text{KNO}_3(s) \longrightarrow 2\text{KNO}_2(s) + \text{O}_2(g)$
- (ii) $\text{Zn}(s) + 2\text{AgNO}_3(aq) \longrightarrow \text{Zn}(\text{NO}_3)_2(aq) + 2\text{Ag}(s)$
- (iii) $\text{Ni}(\text{NO}_3)_2(aq) + 2\text{NaOH}(aq) \longrightarrow \text{Ni}(\text{OH})_2(s) + 2\text{NaNO}_3(aq)$
- (iv) $2\text{Mg}(s) + \text{O}_2(g) \xrightarrow{\text{Burn}} 2\text{MgO}(s)$

Q 11. A green salt on heating decomposes to produce a colourless suffocating gas and leaves behind a reddish brown residue. Name the salt and write the decomposition reaction.



Q 12. Distinguish between an exothermic and an endothermic reaction. Amongst the following reactions, identify the exothermic and the endothermic reaction.

- (i) Heating of coal in air to form carbon dioxide
- (ii) Heating limestone in a lime kiln to form quick lime

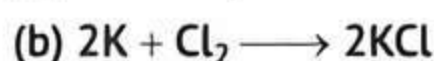
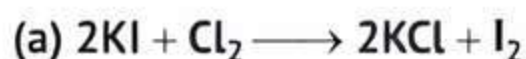
Short Answer Type-II Questions

Q 13. (i) Write the essential condition for the following reaction to take place:



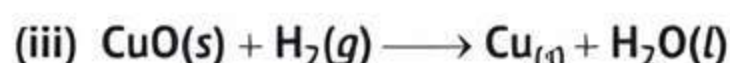
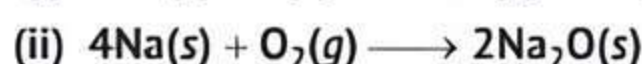
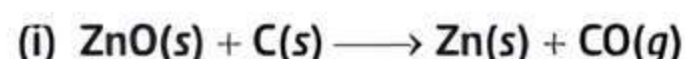
Also, write application of this reaction.

(ii) Two reactions are given below:



Identify the type of reaction giving justification in each case.

Q 14. Identify the substance that is oxidised and the substance that is reduced in the following reactions:



Q 15. A metal X acquires a green colour coating on its surface on exposure to air.

- (i) Identify the metal X and name the process responsible for this change.
- (ii) Name and write chemical formula of the green coating formed on the metal.
- (iii) List two important methods to prevent the process.

Long Answer Type Questions

Q 16. Identify the type of chemical reaction in the following statements and define each of them.

- (i) Electric current is passed through acidified water to give hydrogen and oxygen gas.
- (ii) Rusting of iron
- (iii) Heating of manganese dioxide with aluminium powder
- (iv) Blue colour of copper sulphate solution disappears when iron filings are added to it.
- (v) Magnesium ribbon is burnt in oxygen

Q 17. Define a chemical reaction. State four observations which help us to determine that a chemical reaction has taken place. Write one example of each observation with a balanced chemical equation.