

Science

Chapter 1

Chemical Reactions and Equations

Chemical Reactions and Equations: Balanced and unbalanced chemical equations and balancing of chemical equations.

What is a chemical reaction ?

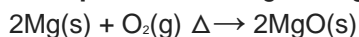
Chemical Reaction: The transformation of chemical substance into another chemical substance is known as Chemical Reaction. For example: Rusting of iron, the setting of milk into curd, digestion of food, respiration, etc.

In a chemical reaction, a new substance is formed which is completely different in properties from the original substance, so in a chemical reaction, a chemical change takes place.

Only a rearrangement of atoms takes place in a chemical reaction.

- The substances which take part in a chemical reaction are called reactants.
- The new substances produced as a result of a chemical reaction are called products.

Example: The burning of magnesium in the air to form magnesium oxide is an example of a chemical reaction.



Before burning in air, the magnesium ribbon is cleaned by rubbing with sandpaper.

This is done to remove the protective layer of basic magnesium carbonate from the surface of the magnesium ribbon.

Reactant: Substances which take part in a chemical reaction are called reactants.

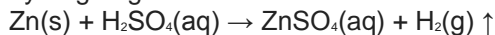
Example: Mg and O₂.

Product: New substance formed after a chemical reaction is called a product.

Example: MgO.

Characteristics of Chemical Reactions :

(i) Evolution of gas: The chemical reaction between zinc and dilute sulphuric acid is characterised by the evolution of hydrogen gas.



(ii) Change in Colour: The chemical reaction between citric acid and purple coloured potassium permanganate solution is characterised by a change in colour from purple to colourless.

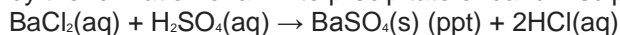
The chemical reaction between sulphur dioxide gas and acidified potassium dichromate solution is characterized by a change in colour from orange to green.

(iii) Change in state of substance: The combustion reaction of candle wax is characterised by a change in state from solid to liquid and gas (because the wax is a solid, water formed by the combustion of wax is a liquid at room temperature whereas, carbon dioxide produced by the combustion of wax is a gas). There are some chemical reactions which can show more than one characteristics.

(iv) Change in temperature: The chemical reaction between quick lime water to form slaked lime is characterized by a change in temperature (which is a rise in temperature).

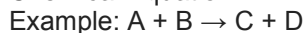
The chemical reaction between zinc granules and dilute sulphuric acid is also characterised by a change in temperature (which is a rise in temperature).

(v) Formation of precipitate: The chemical reaction between sulphuric acid and barium chloride solution is characterised by the formation of a white precipitate of barium sulphate.



What is a chemical Equation?

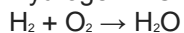
Chemical Equation: Representation of chemical reaction using symbols and formulae of the substances is called Chemical Equation.



In this equation, A and B are called reactants and C and D are called the products. The arrow shows the direction of the chemical reaction. Condition, if any, is written generally above the arrow.

When hydrogen reacts with oxygen, it gives water. This reaction can be represented by the following chemical equation:

Hydrogen + Oxygen \rightarrow Water



In the first equation, words are used and in second, symbols of substances are used to write the chemical equation. For convenience, the symbol of substance is used to represent chemical equations.

A chemical equation is a way to represent the chemical reaction in a concise and informative way.

A chemical equation can be divided into two types: Balanced Chemical Equation and Unbalanced Chemical Equation.

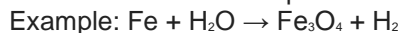
(a) Balanced Chemical Equation: A balanced chemical equation has the number of atoms of each element equal on both sides.



In this equation, numbers of zinc, hydrogen and sulphate are equal on both sides, so it is a Balanced Chemical Equation.

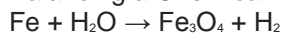
According to the Law of Conservation of Mass, mass can neither be created nor destroyed in a chemical reaction. To obey this law, the total mass of elements present in reactants must be equal to the total mass of elements present in products.

(b) Unbalanced Chemical Equation: If the number of atoms of each element in reactants is not equal to the number of atoms of each element present in the product, then the chemical equation is called Unbalanced Chemical Equation.



In this example, a number of atoms of elements are not equal on two sides of the reaction. For example; on the left-hand side only one iron atom is present, while three iron atoms are present on the right-hand side. Therefore, it is an unbalanced chemical equation.

Balancing a Chemical Equation: To balance the given or any chemical equation, follow these steps:



Write the number of atoms of elements present in reactants and in products in a table as shown here.

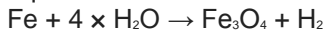
Name of atom	No. of atoms in the reactant	No. of atoms in the product
Iron	1	3
Hydrogen	2	2

Oxygen	1	4
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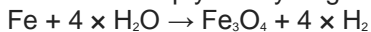
Balance the atom which is maximum in number on either side of a chemical equation.

In this equation, the number of oxygen atom is the maximum on the RHS.

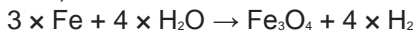
To balance the oxygen, one needs to multiply the oxygen on the LHS by 4, so that, the number of oxygen atoms becomes equal on both sides.



Now, the number of hydrogen atoms becomes 8 on the LHS, which is more than that on the RHS. To balance it, one needs to multiply the hydrogen on the RHS by 4.



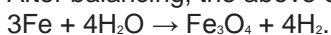
After that, the number of oxygen and hydrogen atoms becomes equal on both sides. The number of iron is one on the LHS, while it is three on the RHS. To balance it, multiply the iron on the LHS by 3.



Now the number of atoms of each element becomes equal on both sides. Thus, this equation becomes a balanced equation.

Name of atom	No. of atoms in the reactant	No. of atoms in the product
Iron	3	3
Hydrogen	8	8
Oxygen	4	4

After balancing, the above equation can be written as follows:



To Make Equations More Informative:

Writing the symbols of physical states of substances in a chemical equation:

By writing the physical states of substances, a chemical equation becomes more informative.

- Gaseous state is represented by symbol (g).
- Liquid state is represented by symbol (l).
- Solid state is written by symbol (s).
- Aqueous solution is written by symbol (aq).
- Writing the condition in which reaction takes place: The condition is generally written above and/or below the arrow of a chemical equation.

Thus, by writing the symbols of the physical state of substances and condition under which reaction takes place, a chemical equation can be made more informative.

What are the types of a chemical reaction ?

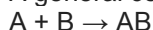
Types of Chemical Reactions: Combination Reaction, Decomposition Reaction, Displacement Reaction, Double Displacement Reaction, Neutralization Reactions, Exothermic – Endothermic Reactions and Oxidation-Reduction Reactions.

Types of Chemical Reactions:

Chemical reactions can be classified in following types:

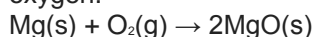
(i) Combination Reaction: Reactions in which two or more reactants combine to form one product are called Combination Reactions.

A general combination reaction can be represented by the chemical equation given here:



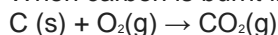
Examples:

When magnesium is burnt in the air (oxygen), magnesium oxide is formed. In this reaction, magnesium is combined with oxygen.



Magnesium + Oxygen \rightarrow Magnesium Oxide

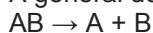
When carbon is burnt in oxygen (air), carbon dioxide is formed. In this reaction, carbon is combined with oxygen.



Carbon + Oxygen \rightarrow Carbon dioxide

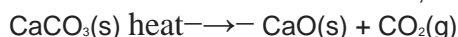
(ii) Decomposition Reaction: Reactions in which one compound decomposes in two or more compounds or elements are known as Decomposition Reaction. A decomposition reaction is just the opposite of combination reaction.

A general decomposition reaction can be represented as follows :



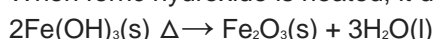
Examples:

When calcium carbonate is heated, it decomposes into calcium oxide and carbon dioxide.



Calcium carbonate \rightarrow Calcium oxide + Carbon dioxide

When ferric hydroxide is heated, it decomposes into ferric oxide and water

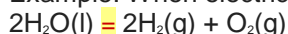


Thermal Decomposition: The decomposition of a substance on heating is known as Thermal Decomposition.

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

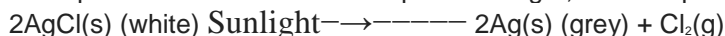
Electrolytic Decomposition: Reactions in which compounds decompose into simpler compounds because of passing of electricity, are known as Electrolytic Decomposition. This is also known as Electrolysis.

Example: When electricity is passed in water, it decomposes into hydrogen and oxygen.



Photolysis or Photo Decomposition Reaction: Reactions in which a compound decomposes because of sunlight are known as Photolysis or Photo Decomposition Reaction.

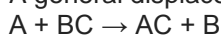
Example: When silver chloride is put in sunlight, it decomposes into silver metal and chlorine gas.



Photographic paper has a coat of silver chloride, which turns into grey when exposed to sunlight. It happens because silver chloride is colourless while silver is a grey metal.

(iii) Displacement Reaction: The chemical reactions in which a more reactive element displaces a less reactive element from a compound is known as Displacement Reactions. Displacement reactions are also known as Substitution Reaction or Single Displacement/ replacement reactions.

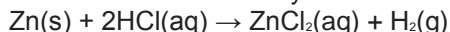
A general displacement reaction can be represented by using a chemical equation as follows :



Displacement reaction takes place only when 'A' is more reactive than B. If 'B' is more reactive than 'A', then 'A' will not displace 'C' from 'BC' and reaction will not be taking place.

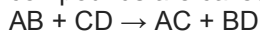
Examples:

When zinc reacts with hydrochloric acid, it gives hydrogen gas and zinc chloride.



When zinc reacts with copper sulphate, it forms zinc sulphate and copper metal.
 $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

(iv) Double Displacement Reaction: Reactions in which ions are exchanged between two reactants forming new compounds are called Double Displacement Reactions.

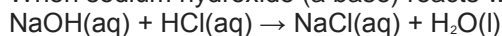


Examples:

When the solution of barium chloride reacts with the solution of sodium sulphate, white precipitate of barium sulphate is formed along with sodium chloride.



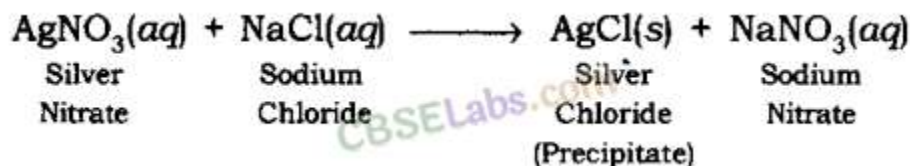
When sodium hydroxide (a base) reacts with hydrochloric acid, sodium chloride and water are formed.



Note: Double Displacement Reaction, in which precipitate is formed, is also known as precipitation reaction. Neutralisation reactions are also examples of double displacement reaction.

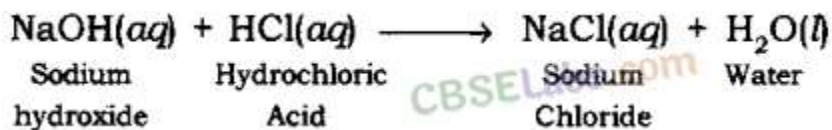
Precipitation Reaction: The reaction in which precipitate is formed by the mixing of the aqueous solution of two salts is called Precipitation Reaction.

Example:



Neutralization Reaction: The reaction in which an acid reacts with a base to form salt and water by an exchange of ions is called Neutralization Reaction.

Example:



(v) Oxidation and Reduction Reactions:

Oxidation: Addition of oxygen or non-metallic element or removal of hydrogen or metallic element from a compound is known as Oxidation.

Elements or compounds in which oxygen or non-metallic element is added or hydrogen or metallic element is removed are called to be Oxidized.

Reduction: Addition of hydrogen or metallic element or removal of oxygen or non-metallic element from a compound is called Reduction.

The compound or element which goes under reduction is called to be Reduced.

Oxidation and Reduction take place together.

Oxidizing agent:

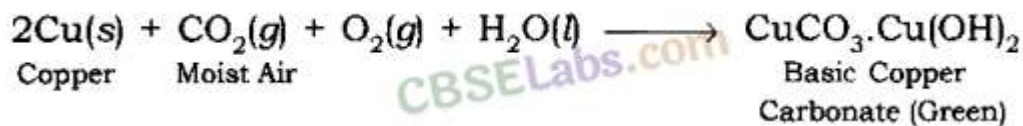
- The substance which gives oxygen for oxidation is called an Oxidizing agent.
- The substance which removes hydrogen is also called an Oxidizing agent.

Reducing agent:

- The substance which gives hydrogen for reduction is called a Reducing agent.
- The substance which removes oxygen is also called a Reducing agent.

- By galvanisation.

Corrosion of Copper: Copper objects lose their lustre and shine after some time because the surface of these objects acquires a green coating of basic copper carbonate, $\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$ when exposed to air.



Corrosion of Silver Metal: The surface of silver metal gets tarnished (becomes dull) on exposure to air, due to the formation of a coating of black silver sulphide (Ag_2S) on its surface by the action of H_2S gas present in the air.



Rancidity: The taste and odour of food materials containing fat and oil changes when they are left exposed to air for a long time. This is called Rancidity. It is caused due to the oxidation of fat and oil present in food materials.

Methods to prevent rancidity:

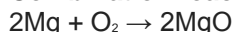
- By adding anti-oxidant.
- Vacuum packing.
- Replacing air by nitrogen.
- Refrigeration of foodstuff.

1. **Chemical Reaction:** During chemical reactions, the chemical composition of substances changes or new substances are formed.

2. **Chemical Equation:** Chemical reactions can be written in chemical equation form which should always be balanced.

3. **Types of Chemical Reactions:**

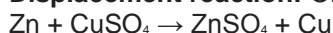
Combination reaction: A single product is formed from two or more reactants.



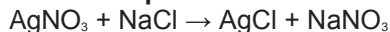
Decomposition reaction: A single reactant breaks down to yield two or more products.

- **Thermal decomposition:** $2\text{Pb}(\text{NO}_2)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$
- **Electrolysis:** $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
- **Photochemical reaction:** $2\text{AgBr} \rightarrow 2\text{Ag} + \text{Br}_2$

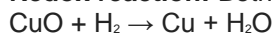
Displacement reaction: One element is displaced by another element.



Double displacement reaction: Exchange of ions between reactants.



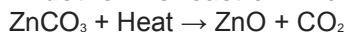
Redox reaction: Both oxidation and reduction take place simultaneously.



Exothermic reaction: A chemical reaction in which heat energy is evolved.



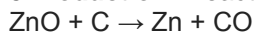
Endothermic reaction: A chemical reaction in which heat energy is absorbed.



Redox reaction: Chemical reaction in which both oxidation and reduction take place simultaneously.

4. **Oxidation:** Reaction that involves the gain of oxygen or loss of hydrogen.

5. **Reduction:** Reaction that shows the loss of oxygen or gain of hydrogen.



ZnO is reduced to Zn—reduction. C is oxidized to CO—Oxidation.

6. Effects of Oxidation Reactions in Our Daily Life:

Corrosion: It is an undesirable change that occurs in metals when they are attacked by moisture, air, acids and bases.

Example, Corrosion (rusting) of Iron: $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ (Hydrated iron oxide)

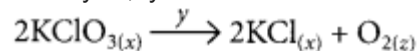
Rancidity: Undesirable change that takes place in oil containing food items due to the oxidation of fatty acids.

Preventive methods of rancidity: Adding antioxidants to the food materials, storing food in the airtight container, flushing out air with nitrogen gas and refrigeration.

Important Questions of Chemical Reactions and Equations

Question 1.

Identify 'x', 'y' and 'z' in the following reaction :



(a) x = gas; y = reaction condition; z = gas

(b) x = solid; y = liquid; z = gas

(c) x = number of moles of KClO_3 ; y = reaction condition; z = number of molecules of oxygen

(d) x = physical state of KClO_3 and KCl ;

y = reaction condition, z = physical state of O_2 . (2020)

Answer:



Question 2.

Assertion (A) : Following is a balanced chemical equation for the action of steam on iron : $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$

Reason (R): The law of conservation of mass holds good for a chemical equation.

(a) Both (A) and (R) are true and reason (R) is the correct explanation of the assertion (A)

(b) Both (A) and (R) are true, but reason (R) is not the correct explanation of the assertion (A).

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true. (2020)

Answer:

A balanced chemical equation must obey the law of conservation of mass.

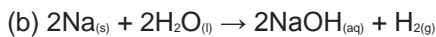
Question 3.

(a) State the law that is followed by balancing a chemical equation.

(b) Balance the following chemical equation: $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$ (Board Term I, 2013)

Answer:

(a) Law of conservation of mass is followed for balancing a chemical equation which states that mass can neither be created nor destroyed in a chemical reaction. That is, the total mass of the elements present in the products of a chemical reaction has to be equal to the total mass of the elements present in the reactants in a balanced equation.



Question 4.

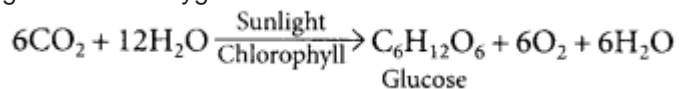
Explain the significance of photosynthesis.

Write the balanced chemical equation involved in the process. (Board Term I, 2017)

Answer:

Photosynthesis means synthesis with the help of light. It is the process that gives life to all living beings.

Photosynthesis is a process by which plants utilize carbon dioxide and water in the presence of sunlight to produce glucose and oxygen.



Question 5.

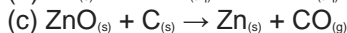
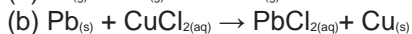
Write balanced chemical equations for the following chemical reactions:

(a) Hydrogen + Chlorine \rightarrow Hydrogen chloride

(b) Lead + Copper chloride \rightarrow Lead chloride + Copper

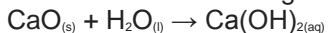
(c) Zinc oxide + Carbon \rightarrow Zinc + Carbon monoxide (Board Term I, 2014)

Answer:



Question 6.

Calcium oxide reacts vigorously with water to produce slaked lime.



This reaction can be classified as

(A) Combination reaction

(B) Exothermic reaction

(C) Endothermic reaction

(D) Oxidation reaction

Which of the following is a correct option? (2020)

(a) (A) and (C)

(b) (C) and (D)

(c) (A), (C) and (D)

(d) (A) and (B)

Answer:

(d) The reaction between CaO and H₂O to form Ca(OH)₂ is an exothermic combination reaction.

Question 7.

When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution. The reaction is an example of a (2020)

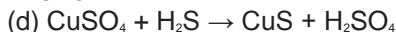
(a) combination reaction

(b) displacement reaction

(c) decomposition reaction

(d) double displacement reaction.

Answer:



It is a double displacement reaction as in this reaction CuSO₄ and H₂S reacting by exchange of Cu²⁺ and H⁺ ions to form two new compounds i.e., CuS and H₂SO₄.

Question 8.

In a double displacement reaction such as the reaction between sodium sulphate solution and barium chloride solution :

(A) exchange of atoms takes place

(B) exchange of ions takes place

(C) a precipitate is produced

(D) an insoluble salt is produced

The correct option is (2020)

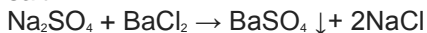
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- (a) (B) and (D)
- (b) (A) and (C)
- (c) only (B)
- (d) (B), (C) and (D)

Answer:

(d) In this reaction exchange of Na^+ and Ba^{2+} ions takes place forming BaSO_4 which is a white precipitate i.e., an insoluble salt.



Question 9.

In which of the following, the identity of initial substance remains unchanged? (2020)

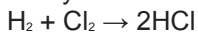
- (a) Curdling of milk
- (b) Formation of crystals by process of crystallisation
- (c) Fermentation of grapes
- (d) Digestion of food

Answer:

(b): Formation of crystals is a physical change rest others are chemical change.

Question 10.

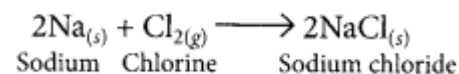
Study the following equation of a chemical reaction: (Board Term 1, 2015)



- (i) Identify the type of reaction.
- (ii) Write a balanced chemical equation of another example of this type of reaction.

Answer:

- (i) Combination reaction.
- (ii) Another example of combination reaction is



Question 11.

State the type of chemical reactions, represented by the following equations : (Board Term I, 2014)

- (a) $\text{A} + \text{BC} \rightarrow \text{AC} + \text{B}$
- (b) $\text{A} + \text{B} \rightarrow \text{C}$
- (c) $\text{PQ} + \text{RS} \rightarrow \text{PS} + \text{RQ}$
- (d) $\text{A}_2\text{O}_3 + 2\text{B} \rightarrow \text{B}_2\text{O}_3 + 2\text{A}$

Answer:

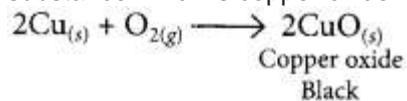
- (a) Displacement reaction.
- (b) Combination reaction.
- (c) Double displacement reaction.
- (d) Displacement reaction or redox reaction.

Question 12.

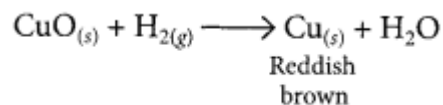
1 g of copper powder was taken in a China dish and heated. What change takes place on heating? When hydrogen gas is passed over this heated substance, a visible change is seen in it. Give the chemical equations of reactions, the name and the colour of the products formed in each case. (2020)

Answer:

When copper powder is heated in a China dish, the reddish brown surface of copper powder becomes coated with a black substance which is copper oxide.



When hydrogen gas is passed over CuO , the black coating on the surface turned reddish brown due to the formation of Cu .



Question 13.

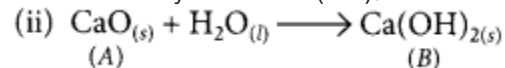
A compound 'A' is used in the manufacture of cement. When dissolved in water, it evolves a large amount of heat and forms compound 'B'.

- Identify A and B.
- Write chemical equation for the reaction of A with water.
- List two types of reaction in which this reaction may be classified. (2020)

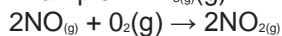
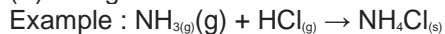
Answer:

(i) A is calcium oxide, CaO which is used in the manufacturing of cement.

B is calcium hydroxide Ca(OH)₂.



(iii) The given reaction is a combination reaction.



Question 14.

Mention with reason the colour changes observe 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. (2020)

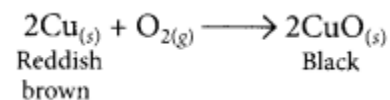
Answer:

(i) When white silver chloride is left exposed to sunlight, its colour changes to grey as it decomposes to silver in the presence of sunlight.

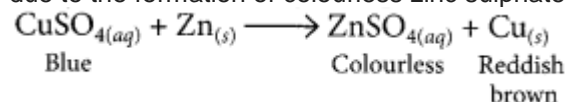


This type of reaction is called photodecomposition reaction.

(ii) When copper powder is strongly heated in presence of oxygen, the reddish brown surface of copper powder becomes coated with a black substance which is copper oxide.



(iii) When a piece of zinc is dropped in copper sulphate solution, then the blue colour of copper sulphate fades gradually due to the formation of colourless zinc sulphate solution and reddish brown copper metal gets deposited on zinc piece.



Question 15.

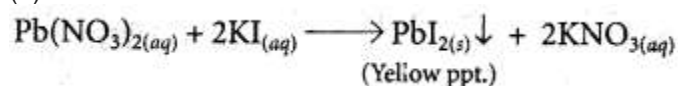
Lead nitrate solution is added to a test tube containing potassium iodide solution.

- Write the name and colour of the compound precipitated.
- Write the balanced chemical equation for the reaction involved.
- Name the type of this reaction justifying your answer. (2020)

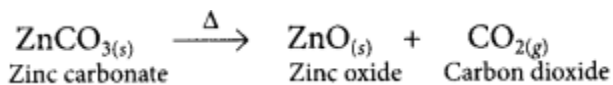
Answer:

(a) When lead nitrate is added to potassium iodide then yellow precipitate of lead iodide is formed along with potassium nitrate.

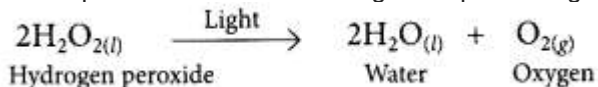
(b) Balanced chemical reaction is as follows :



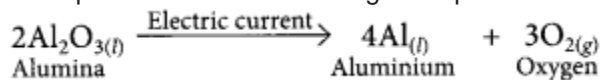
(c) This type of reaction is called precipitation reaction in which one of the products formed is an insoluble substance or this is also called double displacement reaction.



Decomposition reaction involving absorption of light:



Decomposition reaction involving absorption of electrical energy:



Question 21.

Take 3 g of barium hydroxide in a test tube, now add about 2 g of ammonium chloride and mix the contents with the help of a glass rod. Now touch the test tube from outside.

- (i) What do you feel on touching the test tube?
- (ii) State the inference about the type of reaction occurred.
- (iii) Write the balanced chemical equation of the reaction involved. (Board Term I, 2017)

Answer:

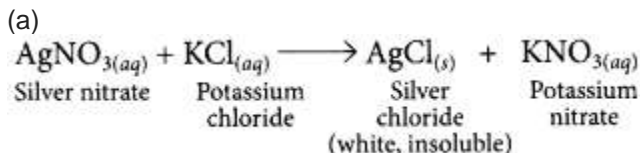
- (i) When barium hydroxide is added into ammonium chloride, the bottom of test tube is found to be cooler.
- (ii) It is an endothermic reaction.
- (iii) $\text{Ba}(\text{OH})_2 + 2\text{NH}_4\text{Cl} \rightarrow \text{BaCl}_2 + 2\text{NH}_4\text{OH}$

Question 22.

(a) 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 the chemical reaction.

(b) Ferrous sulphate when heated, 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. (Board Term I, 2016)

Answer:



It is a double displacement reaction.

(b) Refer to answer 18(b) and (c).

Question 23.

Name the type of chemical reaction represented by the following equation: (Board Term I, 2016)

- (i) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
- (ii) $3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 2\text{AlCl}_3 + 3\text{BaSO}_4$
- (iii) $2\text{FeSO}_4 \xrightarrow{\text{Heat}} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$

Answer:

- (i) Combination reaction.
- (ii) Precipitation reaction or double displacement reaction.
- (iii) Thermal decomposition reaction.

Question 24.

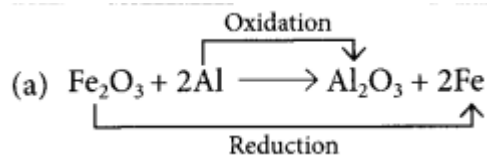
What is a reduction reaction?

Identify the substances that are oxidised and the substances that are reduced in the following reactions. (Board Term I, 2015)

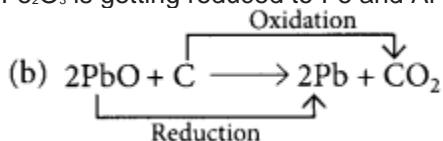
- (a) $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$
- (b) $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$

Answer:

Those reactions in which addition of hydrogen to a substance or removal of oxygen from a substance take place are called reduction reactions.



Fe_2O_3 is getting reduced to Fe and Al is getting oxidised to Al_2O_3 .



PbO is reduced to Pb and C is oxidised to CO_2 .

Question 25.

(a) Can a displacement reaction be a redox reaction? Explain with the help of an example.

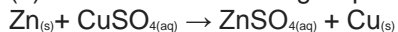
(b) Write the type of chemical reaction in the following:

(i) Reaction between an acid and a base

(ii) Rusting of iron. (Board Term I, 2017)

Answer:

(a) Consider the following displacement reaction:



Here, Zn has changed into ZnSO_4 (i.e., Zn^{2+} ions) by loss of electrons. Hence, Zn has been oxidised. CuSO_4 (i.e., Cu^{2+}) has changed into Cu by gain of electrons. Hence, CuSO_4 has been reduced. Thus, the above reaction is a displacement reaction as well as a redox reaction.

(b) (i) Neutralisation reaction

(ii) Oxidation reaction.

Question 26.

Mention the type of chemical reaction that takes place when: (Board Term I, 2013)

(i) a magnesium ribbon is burnt in air.

(ii) limestone is heated.

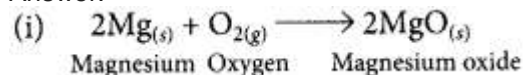
(iii) silver bromide is exposed to sunlight.

(iv) electricity is passed through acidified water.

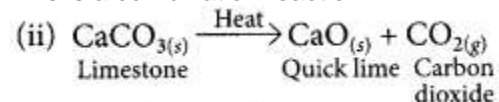
(v) ammonia and hydrogen chloride are mixed with each other.

Write the chemical equation for each reaction.

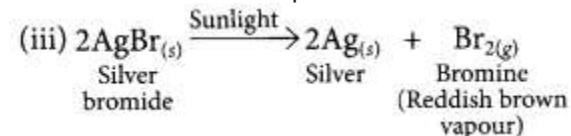
Answer:



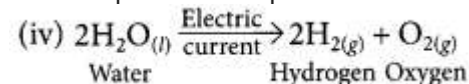
This is a combination reaction.



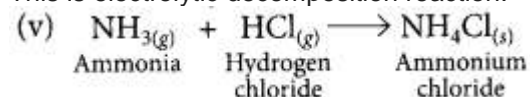
This is a thermal decomposition reaction.



This is a photo decomposition reaction.



This is electrolytic decomposition reaction.



This is a combination reaction.

Question 27.

What happens when food materials containing fats and oils are left for a long time? List two observable changes and suggest three ways by which this phenomenon can be prevented. (2020)

Answer:

Food materials containing fats and oils change their taste and smell due to a process called rancidity. Rancidity is a process in which air reacts with fats and oils which changes the smell and taste of food.

Methods of prevention:

Vacuum packing,
refrigeration of food materials,
placing of food materials, away from direct sunlight.

Question 28.

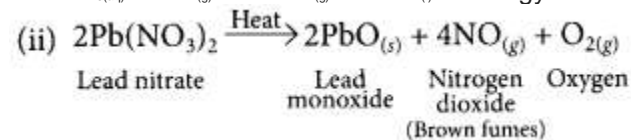
(i) Why is respiration considered as an exothermic reaction?

(ii) Write chemical name and the formula of the brown gas produced during thermal decomposition of lead nitrate.

(iii) Why do chips manufacturers flush bags of chips with gas such as nitrogen? (Board Term I, 2015)

Answer:

(i) The glucose produced in our body during digestion combines with oxygen in the cells of our body and provides energy. The special name of this reaction is respiration. Thus respiration is an exothermic process because energy is produced during this process.



Brown gas evolved is nitrogen dioxide (NO₂).

(iii) Chips manufacturers usually flush bags of chips with gas such as nitrogen because atmospheric oxygen can react with chips which may cause change in colour, change in taste. So to cut the contact between air and the chips, nitrogen gas is used which do prevent its oxidation.

Short Answer Type Questions[I] [2 Marks] -Year 2015

29. "We need to balance a skeletal chemical equation." Give reason to justify the statement.

Answer:

Skeletal chemical equation are unbalanced. We need to balance chemical equation because of law of conservation of mass. It states that 'matter can neither be created nor be destroyed'. Therefore chemical equation must be balanced in each and every chemical reaction.

30. Name the reducing agent in the following reaction:



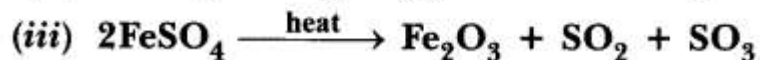
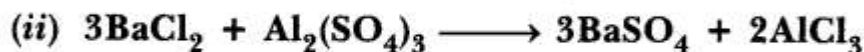
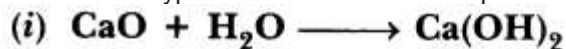
State which is more reactive, Mn or Al and why?

Answer. 'Al' is reducing agent.

'Al' is more reactive than Mn v 'Al' displaces Mn from its oxide.

Short Answer Type Questions[II] [3 Marks] -Year 2015

31.A Name the type of chemical reaction represented by the following equation:



Answer.

(i) Combination reaction

(ii) Double displacement reaction (Precipitation reaction)

(iii) Decomposition reaction.

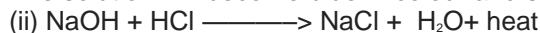
32. Write the chemical equation of the reaction in which the following changes have taken place with an example of each:

- (i) Change in colour
- (ii) Change in temperature
- (iii) Formation of precipitate

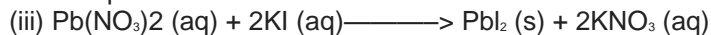
Answer.



The solution will become blue in colour and shiny silver metal will be deposited.



The temperature will increase because heat will be evolved.



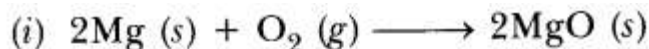
Yellow ppt

Yellow precipitate of PbI_2 will be formed.

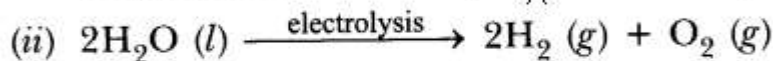
33. State the type of chemical reactions and chemical equations that take place in the following:

- (i) Magnesium wire is burnt in air.
- (ii) Electric current is passed through water.
- (iii) Ammonia and hydrogen chloride gases are mixed.

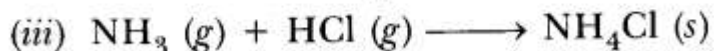
Answer.



Combination reaction (Redox reaction).



Electrical decomposition reaction.



Combination reaction.

34. 2g of ferrous sulphate crystals are heated in a dry boiling tube.

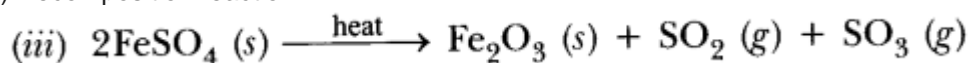
- (i) List any two observations.
- (ii) Name the type of chemical reaction taking place.
- (iii) Write the chemical equation for the reaction.

Answer.

(i) • Green colour of FeSO_4 disappears and reddish brown solid is formed.

• Smell of burning sulphur.

(ii) Decomposition reaction



Long Answer Type Questions [5 Marks] -Year 2015

35. (a) Define a balanced chemical equation. Why should an equation be balanced?

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

(i) Phosphorus burns in presence of chlorine to form phosphorus penta chloride.

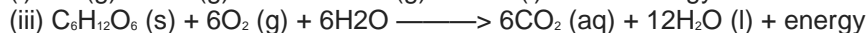
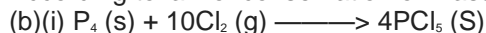
(ii) Burning of natural gas.

(iii) The process of respiration.

Answer.

(a) Balanced chemical equation has 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.



- 36.(a) Explain two ways by which food industries prevent rancidity.
(b) Discuss the importance of decomposition reaction in metal industry with three points.

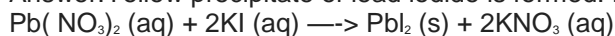
Answer.

- (a) (i) Rancidity can be prevented by adding antioxidants to food containing fat and oil, e.g. butylated hydroxy anisole is added to butter as antioxidant.
(ii) It can be prevented by packaging fat and oil containing foods in nitrogen gas.
(b) (i) Molten NaCl is electrolytically decomposed to form sodium metal.
(ii) Aluminium metal is obtained by electric decomposition of bauxite ore mixed with cryolite.
(iii) Carbonate ores are thermally decomposed to give metal oxide which on reduction give metal.

Short Answer Type Question[I] [2 Marks] -Year 2014

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

Answer. Yellow precipitate of lead iodide is formed. It is precipitation reaction.



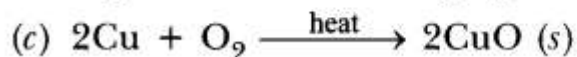
It is also called double displacement reaction.

short Answer Type Question[II] [3 Marks] -Year 2014

38. Write chemical equation reactions taking place when carried out with the help of

- (a) Iron reacts with steam
(b) Magnesium reacts with dil HCl
(c) Copper is heated in air.

Answer.



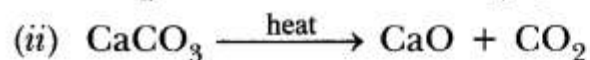
Long Answer Type Question [5 Marks] -Year 2014

- 39.(a) Write one example for each of decomposition reaction carried out with help of

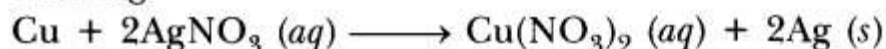
(i) Electricity (ii) Heat (iii) Light

- (b) Which of the following statements is correct and why copper can displace silver from silver nitrate and silver can displace copper from copper sulphate solution.

Answer.



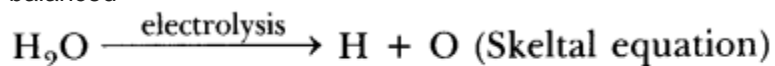
- (b) Copper can displace silver from AgNO_3 because copper is more reactive than Ag



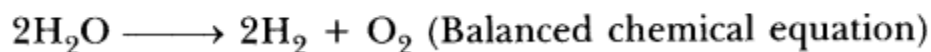
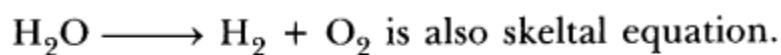
Short Answer Type Questions[II] [3 Marks] -Year 2013

40. 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.

Answer. The equations in which gaseous are written in atomic form instead of molecular form and equation is not balanced, are called skeltal type equation. They represent gaseous elements formed in atomic state and equation is not balanced

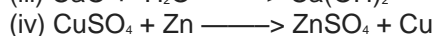
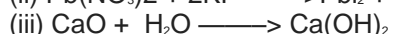
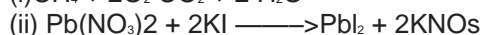
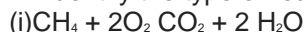


Hydrogen and oxygen are written in atomic forms and equation is not balanced.



Short Answer Type Questions[] [2 Marks]-Year 2012

41. Identify the type of reaction(s) in the following equations.



Answer.

(i) Combustion reaction and oxidation reaction.

(ii) Double displacement reaction and precipitation reaction.

(iii) Combination reaction.

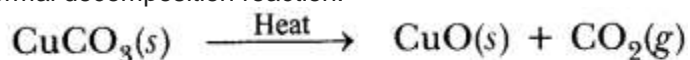
(iv) Displacement reaction.

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

Answer. The colour of ferrous sulphate is pale green. The colour changes to reddish brown on heating due to formation of iron (III) oxide.

Give an example each for thermal decomposition and photochemical decomposition reactions. Write relevant balanced chemical equations also.

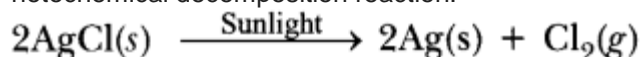
Thermal decomposition reaction:



Copper carbonate
(Green)

Copper oxide
(Black)

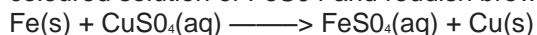
Photochemical decomposition reaction:



43. Why does the colour of copper sulphate solution change when an iron nail is dipped in it? Write two observations.

Answer. It is because displacement reaction takes place.

Iron displaces copper from copper sulphate solution and forms pale green coloured solution of FeSO_4 and reddish brown copper metal gets deposited.



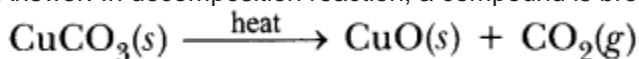
44. Translate the following statement into chemical equation and then balance it Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate. State the two types in which this reaction can be classified.



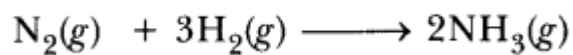
It can be classified as double displacement as well as precipitation reaction.

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

Answer. In decomposition reaction, a compound is broken down into simpler compounds or elements, e.g.



Combination reaction is a reaction in which two or more elements or compounds combine to form a new compound, e.g.



Thus, decomposition and combination reactions are opposite to each other.

Short Answer Type Questions[III] [3 Marks] -Year 2012

46. What is rancidity? Mention any two ways by which rancidity can be prevented.

Answer. The process in which taste and smell of food gets spoiled is called rancidity. It happens due to oxidation.

Prevention from rancidity:

(i) Antioxidants are added to fatty acids to prevent oxidation, e.g. chips are packed in presence of nitrogen gas which prevents spoilage by oxidation.

(ii) Food should be kept in airtight container in refrigerator.

47. 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.

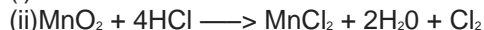
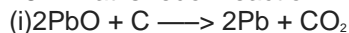
Answer. $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \longrightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{heat}$

It is an exothermic combination reaction because heat is evolved.



Combustion of methane is another example of exothermic combination reaction.

48. What is redox reaction? Identify the substance oxidised and the substance reduced in the following reactions.



Answer. Those reactions in which oxidation and reduction takes place simultaneously are called redox reactions.

(i) PbO is getting reduced and C is getting oxidised.

(ii) MnO₂ is getting reduced and HCl is getting oxidised.

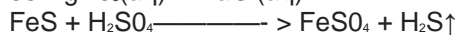
Very Short Answer Type Questions [1 Mark] -Year 2011

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

Answer. In physical change, no new substance is formed, whereas in a chemical change, new substance(s) is/are formed.

50. What is meant by a chemical reaction?

Answer. The reaction representing a chemical change is called a chemical reaction.



Consider the above mentioned two chemical equations with two different kinds of arrows (\uparrow and \downarrow) along with product. What do these two different arrows indicate?

Ans. \uparrow shows the gas is evolved whereas \downarrow shows insoluble substance (precipitate) is formed.

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

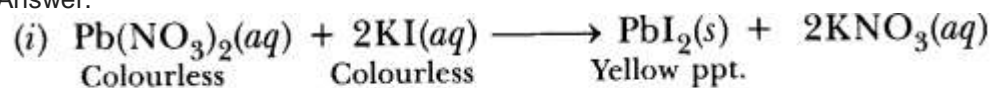
Answer. It is because properties of compound (H_2O) are different from properties of its constituting elements, i.e. H_2 and O_2 .

Short Answer Type Questions[II] [2 Marks] -Year 2011

52. Using a suitable chemical equation, justify that some chemical reactions are determined by:

(i) change in colour, (ii) change in temperature.

Answer.

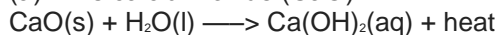


53.(a) A solution of substance 'X' is used for white washing. What is the substance 'X'? State the chemical reaction of 'X' with water.

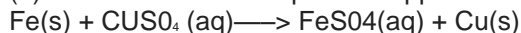
(b) Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Answer.

(a) 'X' is calcium oxide (CaO).



(a) It is because iron displaces copper from CuSO_4 to form FeSO_4 which is pale green.



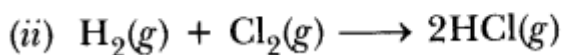
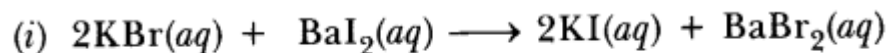
Blue Pale green

54. Write the balanced equation for the following reaction and identify the type of reaction in each case.

(i) Potassium bromide + Barium iodide \longrightarrow Potassium iodide + Barium bromide.

(ii) Hydrogen(g) + Chlorine(g) \longrightarrow Hydrogen chloride(g)

Answer.



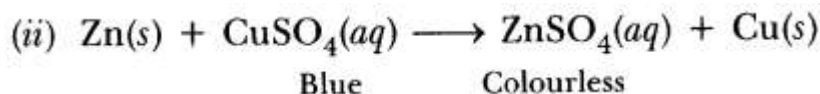
55. A zinc plate was put into a solution of copper sulphate kept in a glass container. It was found that blue colour of the solution gets fader and fader with the passage of time. After few days, when zinc plate was taken out of the solution, a number of holes were observed on it.

(i) State the reason for changes observed on the zinc plate.

(ii) Write the chemical equation for the reaction involved.

Answer.

(i) It is because zinc has displaced copper from CuSO_4 . Zinc metal has been used to form zinc sulphate, therefore, number of holes were observed.



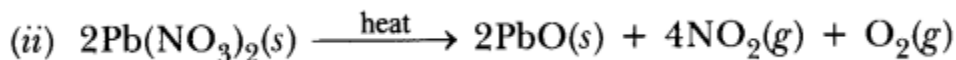
56. A white salt on heating decomposes to give brown fumes and a residue is left behind.

(i) Name the salt.

(ii) Write the equation for the decomposition reaction.

Answer.

(i) Lead nitrate is white salt.



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

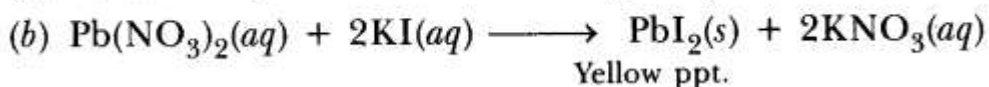
(a) What type of reaction is this?

(b) Write a balanced chemical equation to represent the above reaction.

Answer.

(a) Double displacement as well as precipitation reaction.

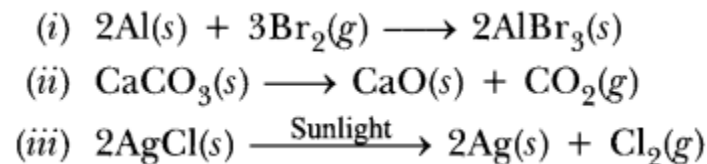
(a) Double displacement as well as precipitation reaction.



58. Write balanced equations for the following mentioning the type of reaction involved.

- (i) Aluminium + Bromine \longrightarrow Aluminium bromide
(ii) Calcium carbonate \longrightarrow Calcium oxide + Carbon dioxide
(iii) Silver chloride \longrightarrow Silver + Chlorine

Answer.



59.(a) Why is respiration considered as an exothermic reaction?

(b) Define the terms oxidation and reduction.

(c) Identify the substance that is oxidised and reduced in the following reaction.



Answer. (a) It is because heat is evolved during respiration.

(b) Oxidation is a process in which O_2 is added or H_2 is removed or loss of electrons take place. Reduction is a process in which H_2 is added or O_2 is removed or gain of electrons take place.

(c) Zn is getting oxidised, CuO is getting reduced.

60. 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.

(i) How has this black coloured substance formed?

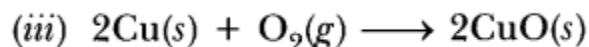
(ii) What is that black substance?

(iii) Write the chemical equation of the reaction that takes place.

Answer.

(i) Copper reacts with oxygen to form copper oxide which is black, i.e. oxidation of copper takes place.

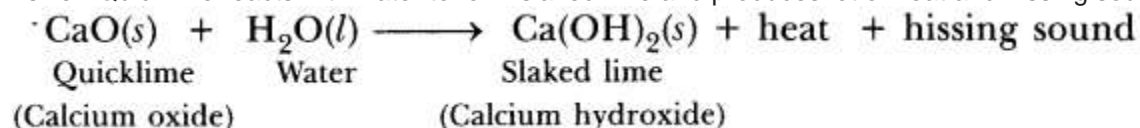
(ii) Copper oxide



Very Short Answer Type Questions [1 Mark] -Year 2010

61. What happens chemically when quicklime is added to water filled in a bucket?

Answer. Quicklime reacts with water to form slaked lime and produces lot of heat and hissing sound.



62. On what basis is a chemical equation balanced?

Answer. A chemical reaction is balanced on the basis of law of conservation of mass.

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

Answer. Silver chloride becomes grey. It is a photochemical decomposition reaction.

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

Answer.



Short Answer Type Questions[] [2 Marks]

65. 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.

Answer. White precipitate of barium sulphate is formed.

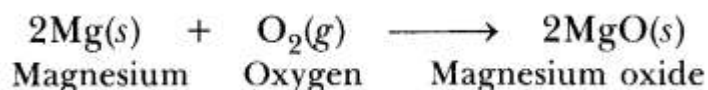
If both reactants are in solid state, then the reaction will not take place between them.



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

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

Answer. The reactions in which oxidation (loss of electrons) and reduction (gain of electrons) take place simultaneously are called redox reactions.



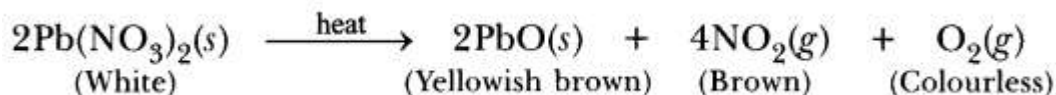
Magnesium is getting oxidised because it is losing electrons to form Mg^{2+} and oxygen is gaining electrons to form O^{2-} , therefore it is getting reduced.

67. 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.

Answer. Any two of these observations will suggest chemical reaction has taken place.

- (i) Change in state.
- (ii) Change in colour.
- (iii) Evolution of gas.
- (iv) Change in temperature.

For example, lead nitrate is white crystalline solid which on heating gives yellowish brown solid (lead monoxide). A brown gas and a colourless gas is also evolved. It shows chemical reaction has taken place.



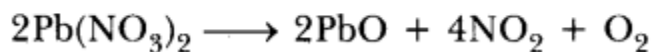
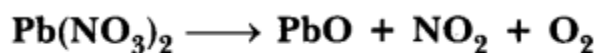
Very Short Answer Type Questions [1 Mark] -Year 2009

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

Answer. It is because water contains hydrogen and oxygen in the ratio of 2 : 1.

69. Balance the following chemical equations.

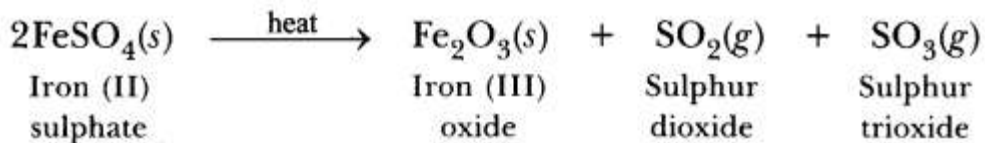
Answer.



Short Answer Type Questions[] [2 Marks] -Year 2009

70. Name the products formed on strongly heating ferrous sulphate crystals. What type of chemical reaction occurs in this change?

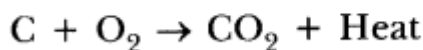
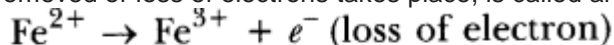
Answer.



It is decomposition reaction.

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

Answer. The reaction in which oxygen or electronegative element is added or hydrogen or electropositive element is removed or loss of electrons takes place, is called an oxidation reaction, e.g. ,



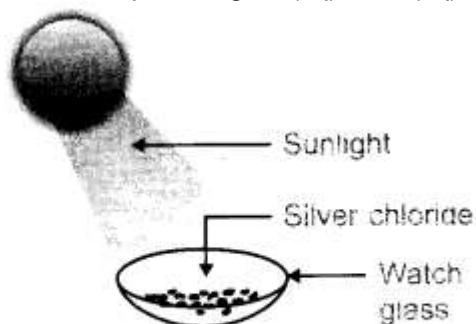
Oxidation reactions are mostly exothermic in nature because heat is evolved in this process.

72. Describe an activity to demonstrate the change that takes place when white silver chloride is kept in sunlight. State the type of chemical reaction which takes place.

Answer.

Aim: To demonstrate the change that takes place when white silver chloride is kept in sunlight.

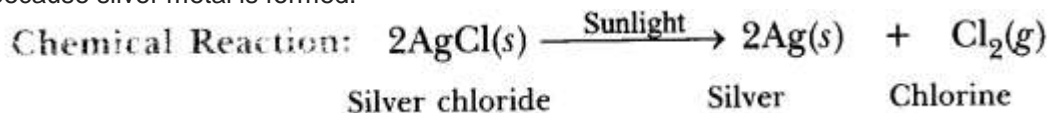
Materials Required: $\text{AgNO}_3(\text{aq})$, $\text{NaCl}(\text{aq})$, test tubes.



Photochemical decomposition of silver chloride to grey silver metal

Procedure:

1. Take 5 ml of silver nitrate solution in a test tube.
2. Prepare sodium chloride solution in another test tube.
3. Add sodium chloride solution into test tube containing silver nitrate solution.
4. Observe the colour of silver chloride formed chloride to grey silver metal Dry it with the help of filter papers and place it on the watch glass.
5. Place the watch glass under sunlight for sometime.
6. Observe the colour of the silver chloride after sometime. Observation: White silver chloride turns grey in sunlight because silver metal is formed.

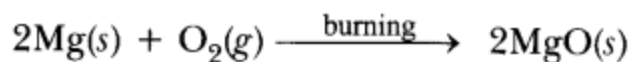


Explanation: Silver chloride is photosensitive. It decomposes in presence of sunlight to form silver metal and chlorine gas.

Conclusion: Decomposition of silver chloride in presence of sunlight is photochemical decomposition reaction.

73. When magnesium ribbon burns 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 of this reaction.

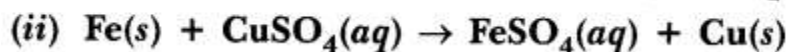
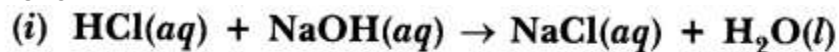
Answer.



The type of reaction is combination reaction and the product formed is magnesium oxide.

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

Answer.



Displacement reaction is a reaction in which more reactive metal can displace less reactive metal from its salt solution. Double displacement reaction are those reactions in which compounds exchange their ions to form two new compounds
(?) Double displacement reaction (ii) Displacement reaction

75. When you have mixed the solutions of lead(II) nitrate and potassium iodide,

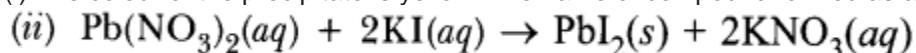
(i) what was the colour of the precipitate formed and can you name the precipitate?

(ii) write the balanced chemical equation for this reaction.

(iii) is this also a double displacement reaction?

Answer.

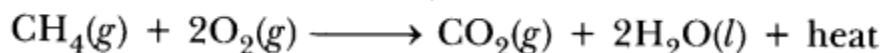
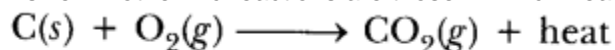
(i) The colour of the precipitate is yellow. The name of compound formed as a precipitate is PbI_2 (lead iodide).



(iii) Yes, it is also a double displacement reaction.

76. What do you mean by exothermic and endothermic reactions? Give examples.

Answer. Exothermic reactions are those in which heat is evolved, e.g.



Endothermic reactions are those reactions in which heat is absorbed, e.g.

