

Chapter 1

Chemical Reactions & Equations

Intext Questions

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Question 1: Why should a magnesium ribbon be cleaned before burning in air?

Solution:

Magnesium is an extremely reactive metal. In presence of oxygen, it forms a layer of magnesium oxide on its surface. This layer is quite stable and doesn't allow further reaction of magnesium with oxygen. Thus, it is necessary to clean magnesium ribbon so that the underlying metal can be available for reaction.

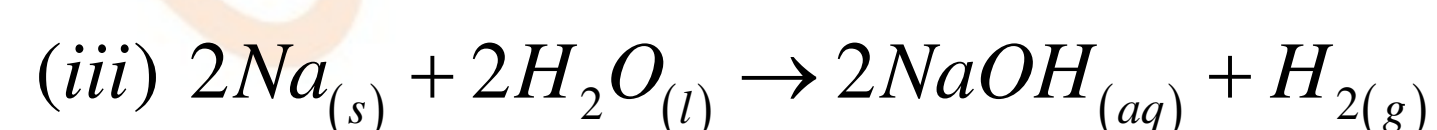
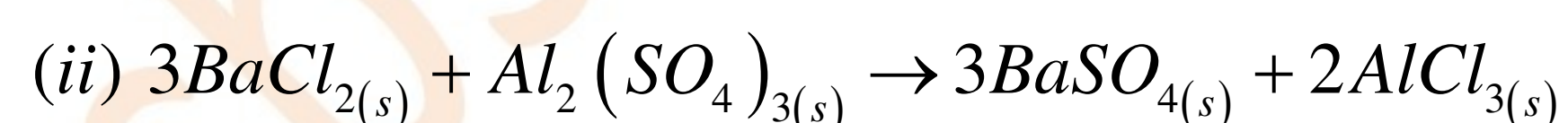
Question 2: Write the balanced equation for the following chemical reactions:

(i) Hydrogen + Chlorine \rightarrow Hydrogen chloride

(ii) Barium chloride + Aluminium sulphate \rightarrow Barium sulphate + Aluminium chloride

(iii) Sodium + Water \rightarrow Sodium hydroxide + Hydrogen

Solution:

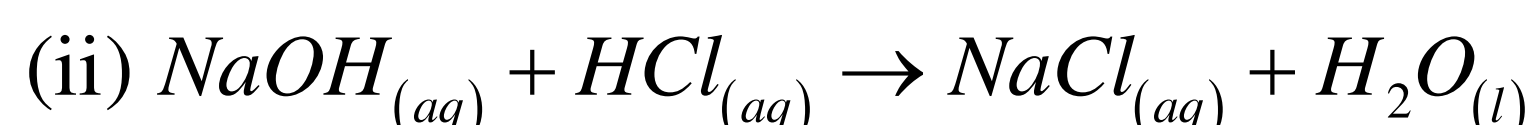
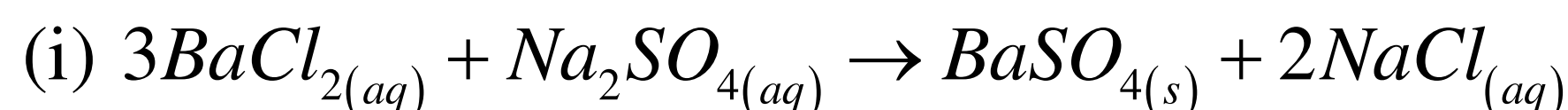


Question 3: Write a balanced chemical equation with state symbols for the following reactions:

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

- (ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water

Solution:



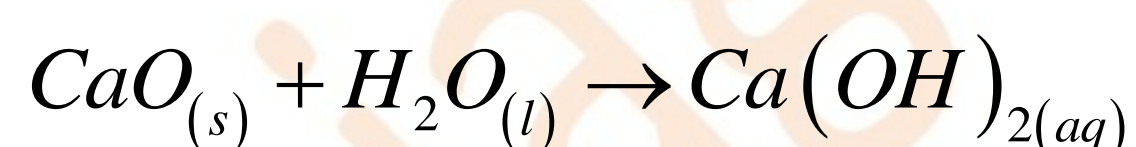
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Question 1: A solution of a substance X' is used for white washing.

- (i) Name the substance 'X' and write its formula
(ii) Write the reaction of the substance 'X' named in (i) above with water

Solution:

- (i) The substance X' is calcium oxide. Its chemical formula is CaO.
(ii) Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime).



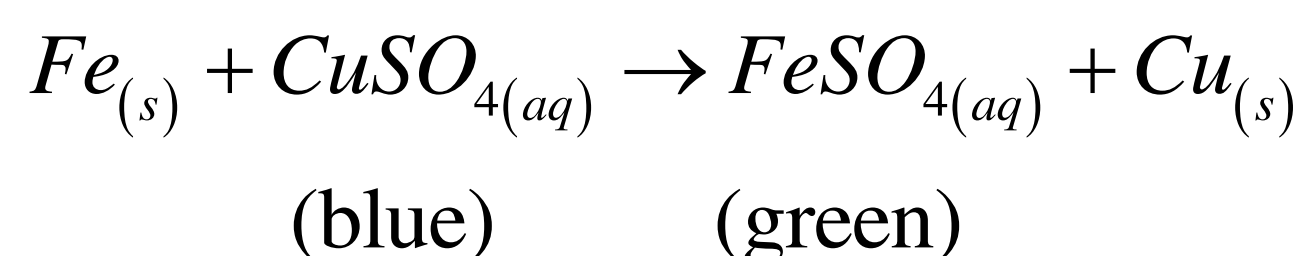
Question 2: Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas.

Solution: Water contains hydrogen and oxygen in the ratio of 2:1. Hence, the amount of hydrogen and oxygen produced during electrolysis of water is in a 2:1 ratio. During electrolysis, since hydrogen goes to one test tube and oxygen goes to another, the amount of gas collected in one of the test tubes is double of the amount collected in the other.

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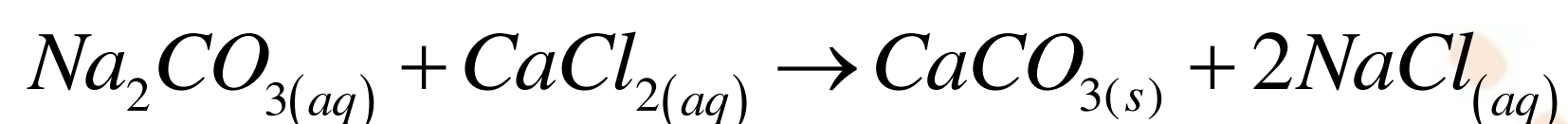
Question 1: Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Solution: When an iron nail is placed in a copper sulphate solution, iron displaces copper from copper sulphate solution and forms iron sulphate.

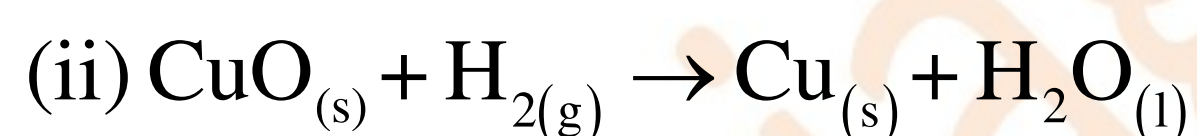
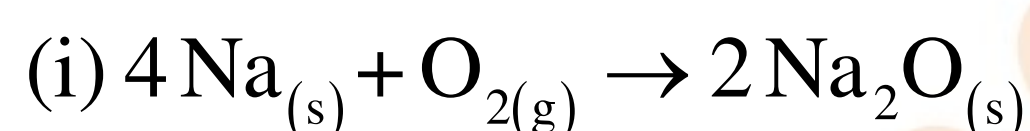


Question 2: Give an example of a double displacement reaction other than the one given in Activity 1.10.

Solution: Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride



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

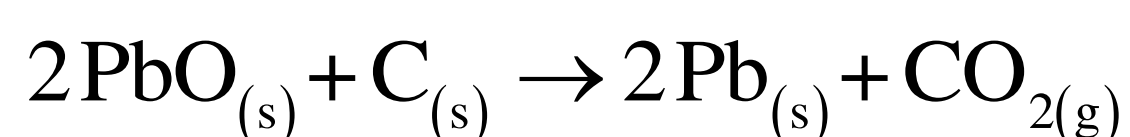


Solution: Sodium is oxidised and oxygen gets reduced

(i) Copper oxide is reduced to copper while hydrogen gets oxidised to water.

Exercise

Question 1: Which of the statements about the reaction below are incorrect?



(a) Lead is getting reduced

(b) Carbon dioxide is getting oxidised

(c) Carbon is getting oxidised

(d) Lead oxide is getting reduced

(i) (a) and (b)

(ii) (a) and (C)

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

(iv) All

Solution: (i) (a) and (b)

Question 2: $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

The above reaction is an example of a:

(a) Combination reaction.

(b) Double displacement reaction.

(c) Decomposition reaction

(d) Displacement reaction.

Solution: (d) The given reaction is an example of a displacement reaction

Question 3: What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer:

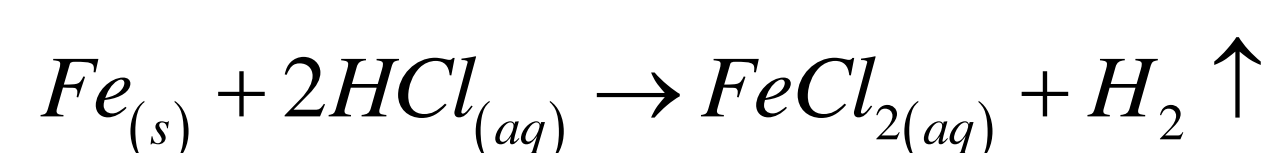
(a) Hydrogen gas and iron chloride are produced

(b) Chlorine gas and iron hydroxide are produced

(C) No reaction takes place

(d) Iron salt and water are produced

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



Question 4: What is a balanced chemical equation? Why should chemical equations be balanced?

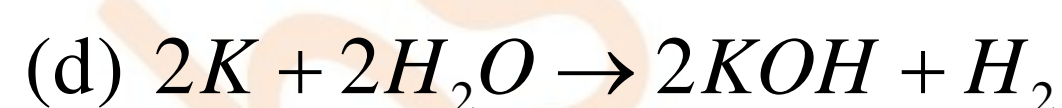
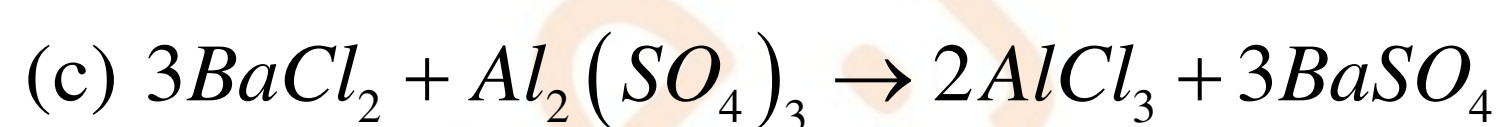
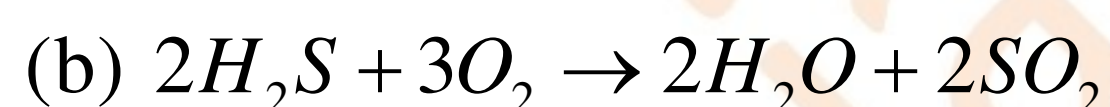
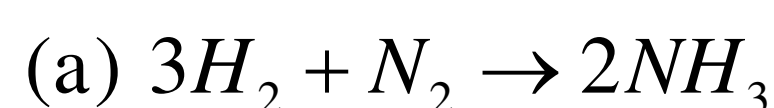
Solution: Balanced chemical equation: - A reaction which has an equal number of atoms of all the elements on both sides of the chemical equation is called a balanced chemical equation.

As per the law of conservation of mass, mass can neither be created nor destroyed. Hence, in a chemical reaction, the total mass of reactants should be equal to the total mass of the products. Thus, the total number of atoms of each element should be equal on both sides of a chemical equation.

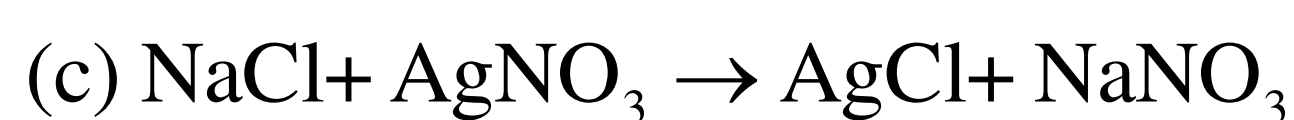
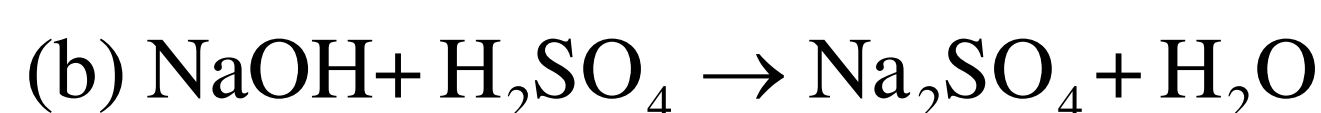
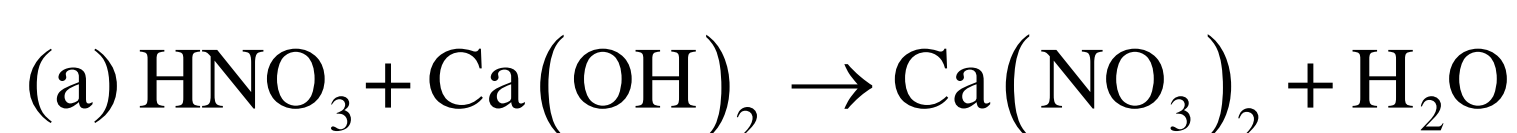
Question 5: Translate the following statements into chemical equations and then balance them:

- (a) Hydrogen gas combines with nitrogen to form ammonia.
- (b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.
- (c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.
- (d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

Solution:



Question 6: Balance the following chemical equations:



Solution:

- (a) $2\text{HNO}_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Ca}(\text{NO}_3)_2 + 2\text{H}_2\text{O}$
- (b) $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
- (c) $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3$
- (d) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$

Question 7: Write the balanced chemical equations for the following reactions:

- (a) Calcium hydroxide + Carbon dioxide \rightarrow Calcium carbonate + Water
- (b) Zinc + Silver nitrate \rightarrow Zinc nitrate + Silver
- (c) Aluminium + Copper chloride \rightarrow Aluminium chloride + Copper
- (d) Barium chloride + Potassium sulphate \rightarrow Barium sulphate + Potassium chloride

Solution:

- (a) $\text{Ca}(\text{OH})_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
- (b) $\text{Zn} + 2\text{AgNO}_3 \rightarrow \text{Zn}(\text{NO}_3)_2 + 2\text{Ag}$
- (c) $2\text{Al} + 3\text{CuCl}_2 \rightarrow 2\text{AlCl}_3 + 3\text{Cu}$
- (d) $\text{BaCl}_2 + \text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{KCl}$

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

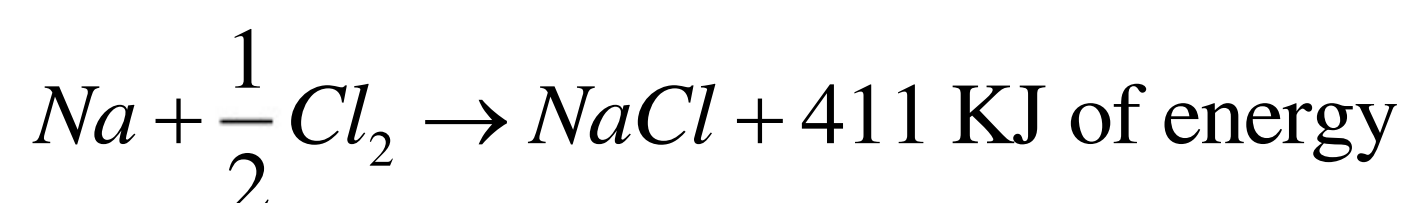
- (a) Potassium bromide + barium iodide \rightarrow Potassium iodide + Barium bromide
- (b) Zinc carbonates \rightarrow zinc oxide + carbon dioxide
- (c) Hydrogen + chlorine \rightarrow Hydrogen chloride
- (d) Magnesium + Hydrochloric acid \rightarrow Magnesium Chloride + Hydrogen

Solution:

- (a) $2\text{KBr} + \text{BaI}_2 \rightarrow 2\text{KI} + \text{BaBr}_2$ - Double displacement reaction
- (b) $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$ - Decomposition reaction
- (c) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ - Combination reaction
- (d) $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ - displacement reaction

Question 9: What does one mean by exothermic and endothermic reactions? Give examples

Solution: Exothermic reactions: Chemical reactions that release energy are called exothermic reactions. For example:

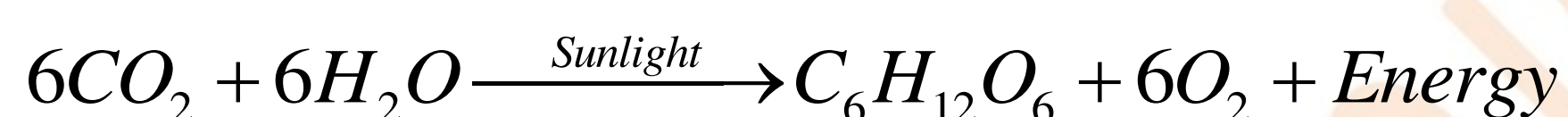


Endothermic reactions: Reactions that absorb energy or require energy in order to proceed are called endothermic reactions. For example:



Question 10: Why respiration is considered an exothermic reaction? Explain.

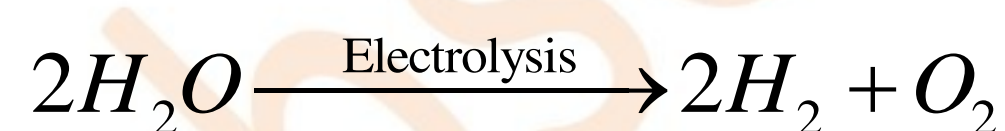
Solution: During respiration, large molecules of food are broken down into simpler substances such as glucose. Glucose combines with oxygen in the cells and provides energy. Since energy is released in the whole process, it is an exothermic process.



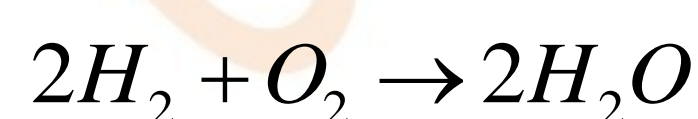
Question 11: Why decomposition reactions are called the opposite of combination reactions? Write equations for these reactions.

Solution: Decomposition reactions are those in which a compound breaks down to form two or more substances. These reactions require a source of energy to proceed. Thus, they are the exact opposite of combination reactions in which two or more substances combine to give a new substance with the release of energy

Decomposition reaction:



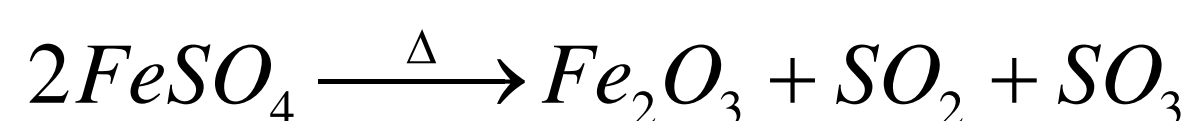
Combination reaction:



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

Solution:

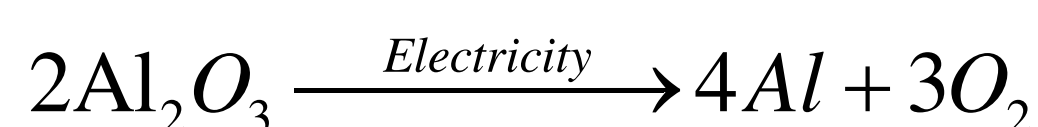
(a) Thermal decomposition:



(b) Decomposition by light



(c) Decomposition by electricity



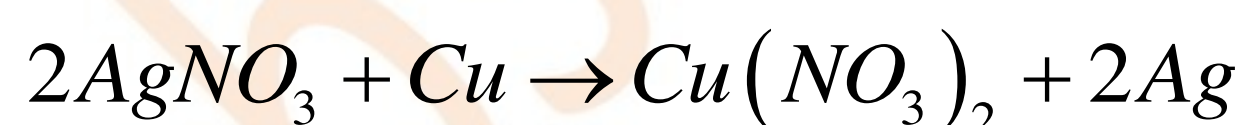
Question 13: What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Solution:

| Displacement reaction | Double displacement reaction |
|--|--|
| In this, a more reactive element replaces a less reactive element from a compound. | In this, two atoms or a group of atoms switch places to form new compounds |
| $CuSO_4 + Zn \rightarrow ZnSO_4 + Cu$ | $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$ |

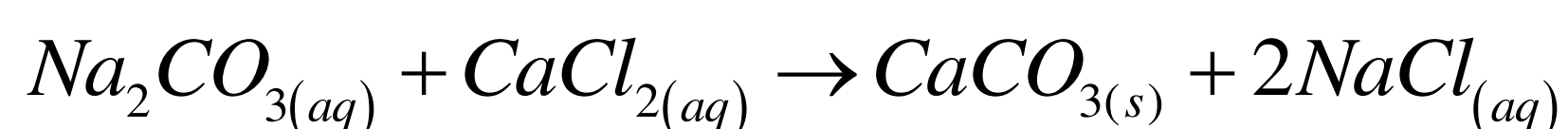
Question 14: In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

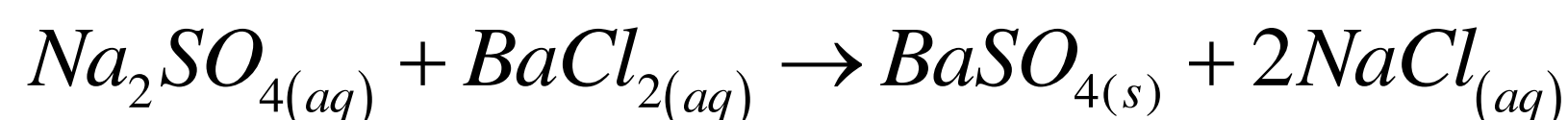
Solution:



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

Solution: A reaction in which an insoluble solid is formed is called a precipitation reaction. For example:





Question 16: Explain the following in terms of gain or loss of oxygen with two examples each:

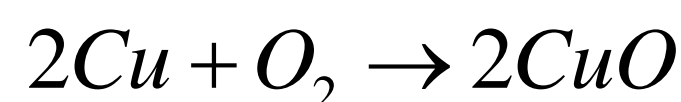
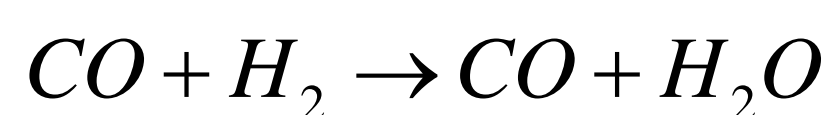
(a) Oxidation

(b) Reduction

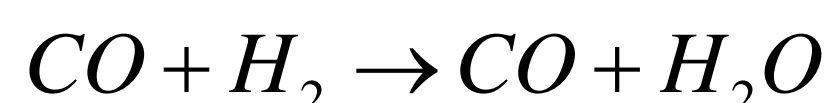
Solution:

(a) Oxidation is the gain of oxygen

For example



(b) Reduction is the loss of oxygen. For example-



Question 17: A shiny brown-coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Solution:

'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below:



Shiny black
brown

Question 18: Why do we apply paint on iron articles?

Solution: Iron articles are painted because it prevents them from rusting. When painted, the contact of iron articles from moisture and air is cut off. Hence, rusting is prevented.

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

Solution: Nitrogen is an inert gas and does not easily react with these substances whereas oxygen reacts with food substances and makes them rancid. Thus, bags used in packing food items are flushed with nitrogen gas to remove oxygen inside the pack. When oxygen is not present inside the pack, rancidity of oil and fat containing food items is avoided.

Question 20: Explain the following terms with one example each:

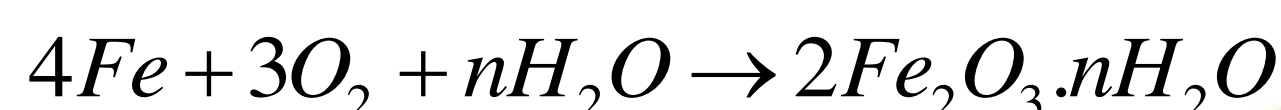
(a) Corrosion

(b) Rancidity

Solution:

(a) Corrosion: It is defined as a process where materials deteriorate as a result of a chemical reaction in the presence of moisture, chemicals, etc.

For example- iron, in the presence of moisture, reacts with oxygen to form rust.



(b) Rancidity: - The process of oxidation of fats and oils that makes change in taste and smell is known as rancidity. For example, the taste and smell of butter changes when kept for long.

Rancidity can be avoided by:

1. Strong food in air tight containers
2. Storing food in refrigerators
3. Adding antioxidants
4. Storing food in an environment of nitrogen

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