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Chapter 1 Chemical Reactions and Equations

Q 1. Why should a magnesium ribbon be cleaned before burning in air?

Ans. Before burning in air, the magnesium ribbon is cleaned by rubbing with a sandpaper. This is done to remove the protective layer of basic magnesium carbonate from the surface of magnesium ribbon so that it may readily combine with the oxygen of air (on heating).

Q 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

Ans. (i) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$ **(ii)** $3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 3\text{BaSO}_4 + 2\text{AlCl}_3$ **(iii)** $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$

Q 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.

Ans. (i) $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$
Barium chloride Sodium sulphate Barium sulphate Sodium chloride

(ii) $\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}(\text{l})$
Sodium hydroxide Hydrochloric acid Sodium chloride Water

Q 4. 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.

Ans. (i) Substance 'X' is quick lime and its formula is CaO.

(ii) Reaction of (X) CaO with water (H_2O)

$\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca}(\text{OH})_2(\text{aq})$
Quick lime Slaked lime
or
Calcium oxide Calcium hydroxide

Q 5. Why is the amount of gas collected in one of the test tubes in double of the amount collected in the other?

Name this gas.

Ans. electrolysis of acidulated water a few drops of sulphuric acid is carried out using graphite anode and cathode. The gas collected at cathode is hydrogen for which the volume is double to that of the oxygen which is collected at anode.



Q 6. Why does the colour of copper sulphate change when an iron nail is dipped in it?

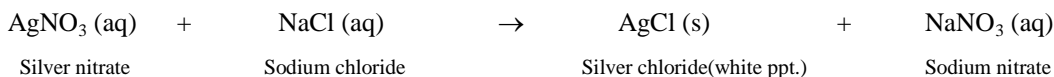
Ans. When an iron nail is dipped in blue coloured copper sulphate solution, the blue colour fades as iron has displaced copper from copper sulphate solution to give iron sulphate and copper metal is produced. The above reaction is an example of displacement reaction:

$\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq}) \rightarrow \text{FeSO}_4(\text{aq}) + \text{Cu}(\text{s})$
Iron Copper sulphate (blue) Iron sulphate Copper

Q 7. Give an example of a double displacement reaction other than the one given in Activity 1.10.

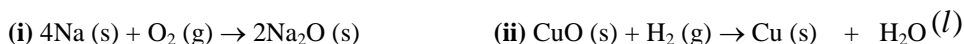
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Ans. An example of double displacement reaction other than activity 1.10 is given here:



An exchange of ions takes place in this reaction. The silver ions (Ag^+) of silver nitrate react with chloride ions (Cl^-) of sodium chloride to form a new compound, silver chloride ($\text{Ag}^+ \text{Cl}^-$ or AgCl). Similarly, the sodium ions (Na^+) of sodium chloride react with the nitrate ions (NO_3^-) of silver nitrate to form another new compound, sodium nitrate ($\text{Na}^+ \text{NO}_3^-$ or NaNO_3). Please note that in the above double displacement reaction, silver chloride is formed as an insoluble white solid called a 'white – precipitate'.

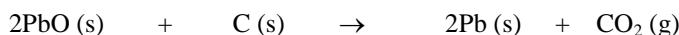
Q 8. Identify the substances that are oxidised and the substances that are reduced in the following reactions.



Ans. (i) In this reaction, Na (s) is oxidised to Na_2O (s) and O_2 (g) is reduced to Na_2O (s).

(ii) In this reaction, CuO (s) is reduced to Cu (s) and H_2 (g) is oxidised to H_2O (l).

Q 9. 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

Ans. (i)

Q10. $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$ This reaction is an example of a

(a) combination reaction **(b)** double displacement reaction. **(c)** decomposition reaction **(d)** displacement reaction

Ans. (d)

Q11. What happens when dilute hydrochloric acid is added to iron fillings? 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.

Ans. (a) Reaction: $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$

Q12. What is a balanced chemical equation? Why should chemical equations be balanced?

Ans. A balanced chemical equation is the one in which number of atoms taking part in a chemical equation are the same on the reactants and products sides of the equation. 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 other words, the number of atoms of each element remains the same before and after a chemical reaction. Hence, we need to balance a chemical equation.

Q13. Translate the following statement in to 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.

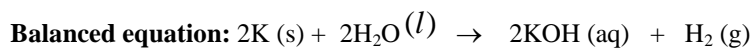
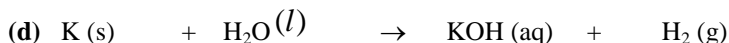
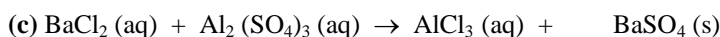
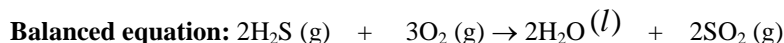
Ans. (a) $\text{H}_2 (\text{g}) + \text{N}_2 (\text{g}) \rightarrow \text{NH}_3 (\text{g})$

Balanced equation: $3\text{H}_2 (\text{g}) + \text{N}_2 (\text{g}) \rightarrow 2\text{NH}_3 (\text{g})$

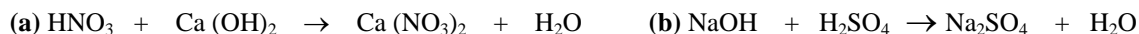
(b) $\text{H}_2\text{S} (\text{g}) + \text{O}_2 (\text{g}) \rightarrow 2\text{H}_2\text{O} (\text{l}) + \text{SO}_2 (\text{g})$

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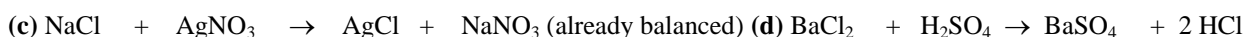
Oxygen from air



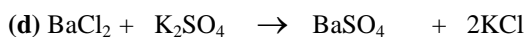
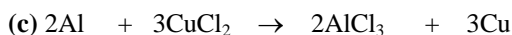
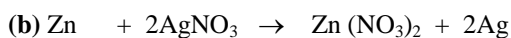
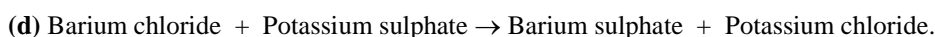
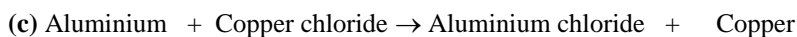
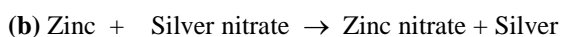
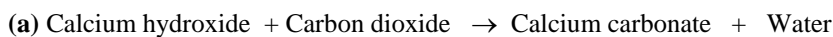
Q14. Balance the following chemical equations.



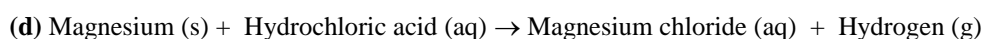
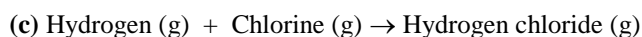
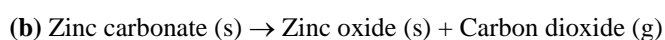
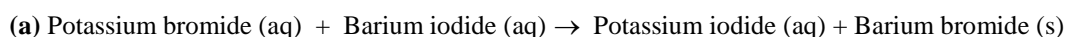
Ans. Balanced chemical equations are as follows:



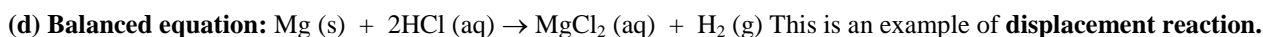
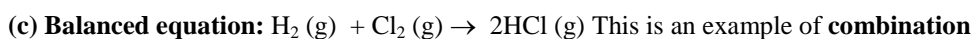
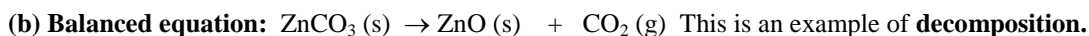
Q15. Write the balanced chemical equations for the following reactions.



Q16. Write the balanced chemical equation for the following and identify the type of reaction in each case.

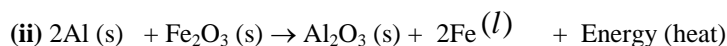
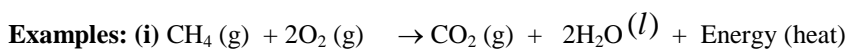


Ans. (a) **Balanced equation:** $2\text{KBr}(\text{aq}) + \text{BaI}_2(\text{aq}) \rightarrow 2\text{KI}(\text{aq}) + \text{BaBr}_2(\text{s})$ This is an example of double displacement.



Q17. What does one mean by exothermic and endothermic reactions? Give examples.

Ans. A chemical reaction is said to be exothermic when it releases energy in the form of heat and light.



A chemical reaction is said to be endothermic in which the energy is absorbed in the form of heat and light i.e. cooling is

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produced. **Examples:** $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}(\text{s}) + 2\text{NH}_4\text{SCN}(\text{s}) \rightarrow \text{Ba}(\text{SCN})_2(\text{aq}) + 2\text{NH}_3(\text{aq}) + 10\text{H}_2\text{O}(\text{l})$

In the above reaction, the reaction mixture becomes so cold that moisture from the air forms a layer of frost on the surface of water.

Q18. Why is respiration considered an exothermic reaction? Explain.

Ans. We all know that we need energy to stay alive. We get this energy from the food we eat. During digestion, food is broken down into simpler substances. For example, rice, potatoes and bread contain carbohydrates. These carbohydrates are broken down to form glucose. Glucose during respiration (inhalation of oxygen) is oxidised with the liberation of

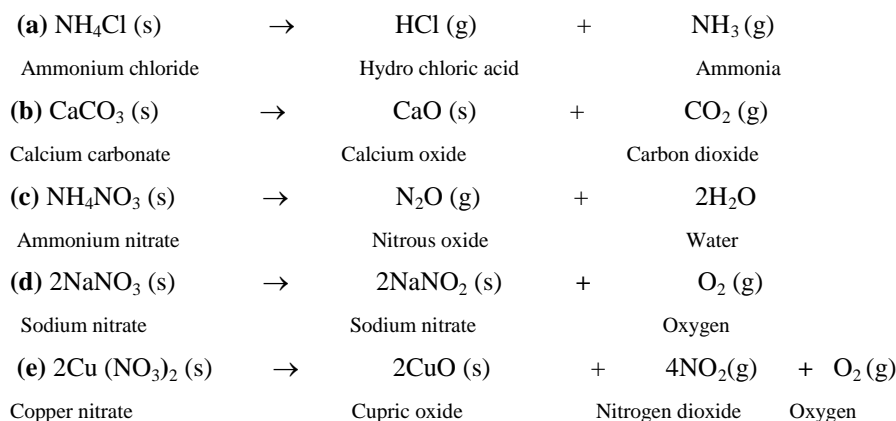
Energy as shown below: $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) + 6\text{CO}_2(\text{g}) \rightarrow 6\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{l}) + \text{Heat}$

The above reaction occurs at body temperature of 37°C .

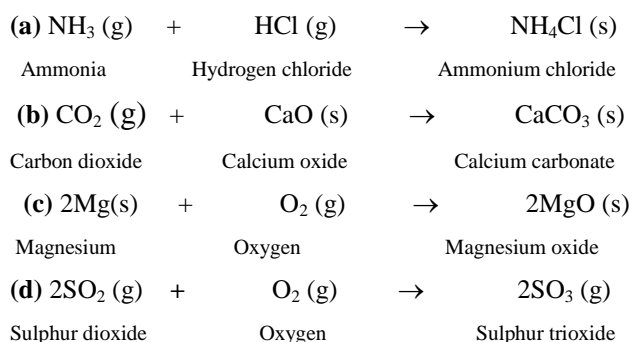
Q19. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

Ans. A decomposition reaction is considered as the opposite of combination reaction; because in decomposition reaction, a single substance decomposes to produce two or more substances; whereas in combination reaction two or more substances combine to give a single substance.

Examples of decomposition reaction:

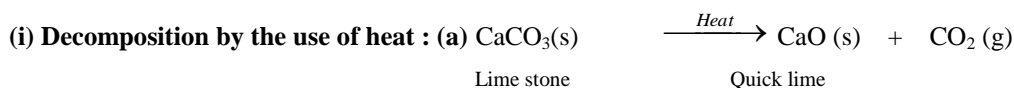


Examples of combination reaction:

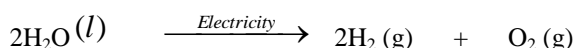


Q20. Write one equation each for decomposition reactions where energy is supplied in the form of heat light of electricity.

Ans. Examples of decomposition reactions :



(ii) Decomposition by the use of electricity:



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With few drops of H_2SO_4 At anode At cathode

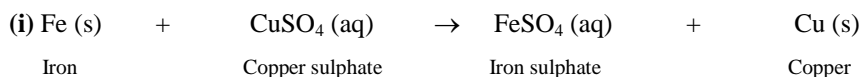
(iii) Decomposition by the use of light:



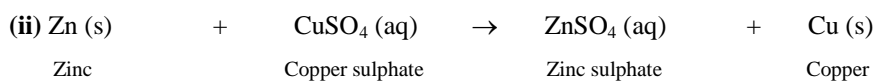
Q21. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans. In displacement reactions, an element displaces or removes another element, whereas in double displacement reactions Exchange of ions between the reactants take place.

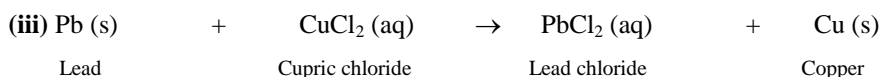
Examples of displacement reactions:



In this the element iron has displaced copper from its salt solution copper sulphate.

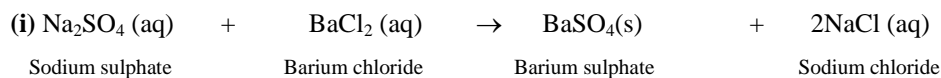


In this the element zinc has displaced copper from its salt solution copper sulphate.

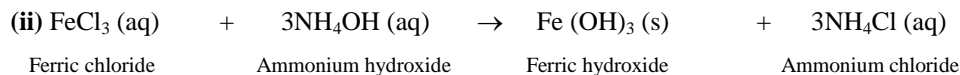


In this the element lead has displaced copper from its salt solution cupric chloride.

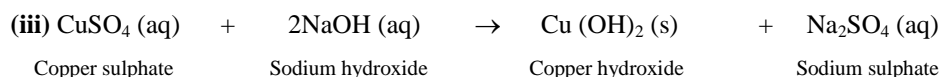
Examples of double displacement reaction:



In the above reaction the exchange of ions has taken place, i.e., Na^+ ion has replaced Ba^{2+} and vice – versa.



In the above reaction, Fe^{3+} has replaced NH_4^+ and vice- versa.



In the above reaction, Cu^{2+} has replaced Na^+ and vice- versa.

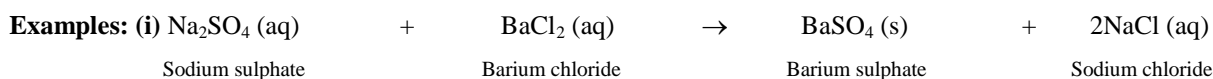
Q22. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement of copper metal.

Write down the reaction involved.

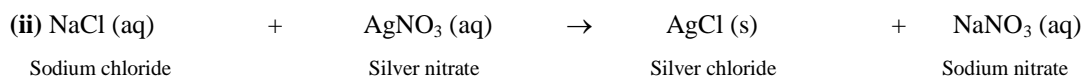


Q23. What do you mean by a precipitation reaction? Explain by giving examples.

Ans. Any reaction that produces a precipitate can be called a precipitation reaction. A double displacement reaction is also called precipitation reaction.



In the above reaction, a white precipitate of barium sulphate is formed.



In the above reaction, a white precipitate of silver chloride is formed.

Q24. Explain the following in terms of loss of oxygen or removal of hydrogen with two examples each.

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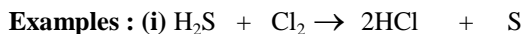
(a) Oxidation (b) Reduction.

Ans. (a) Oxidation : Addition of oxygen or removal of hydrogen is termed as oxidation.

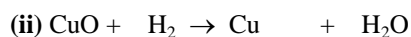


In above two reactions gain of oxygen has taken place.

(b) Reduction : Addition of hydrogen or removal of oxygen is termed as reduction.



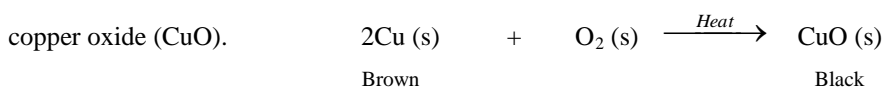
In this reaction, chlorine is being reduced to hydrogen chloride.



In this reaction copper oxide is being reduced to copper.

Q25. A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

Ans. The element 'X' seems to be copper metal. When copper metal is heated in air, it forms a black coloured compound



Q26. Why do we apply paint on iron articles?

Ans. You must have observed that iron articles are shiny when new but get coated with a reddish brown powder when left for some time. The process is called corrosion. In the case of iron, corrosion is replaced by term rusting. To check the rusting of iron paint is applied on iron articles.

Q27. Oil and fat containing food items are flushed with nitrogen. Why?

Ans. Oil and fat containing food items are flushed with nitrogen because the food containing fats and oil become rancid after some time because of oxidation and give smell having a bad taste. Presence of nitrogen helps food to save from rancidity.

Q28. Explain the following terms with one example each.

(i) Corrosion (ii) Rancidity

Ans. (a) Corrosion: When a metal is attacked by substances in atmosphere such as moisture, acids, etc, it is said to corrode and the process itself is called corrosion. When iron is corroded, it is called rusting.

The black coating on silver and the green coating on copper are the examples of corrosion. Corrosion causes damage to car bodies, bridges, iron railing, ships and to all objects made of metals, specially those of iron. Corrosion of iron is a serious problem. Every year an enormous amount of money is spent to replace damaged iron.

(b) Rancidity: When fats and oils containing food materials are left for a long time they start giving bad taste and smell. This occurs due to the oxidation of oil and fats and they are said to be rancid and the process itself is called rancidity.

To prevent rancidity antioxidants (which prevent oxidation) are added to foods containing fats and oil. Keeping food in air tight containers helps to slow down oxidation. Chips manufacturers usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidised.