

Chemical Reactions and Equations

Access Answers to NCERT Class 10 Science Chapter 1 – Chemical Reactions and Equations

In-text questions set 1 Page number – 6

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

Solution:

Magnesium ribbon should be cleaned before burning in air because Magnesium metal reacts with the atmospheric oxygen and forms Magnesium Oxide (MgO) layer which is a very stable compound. In order to prevent further reactions with Oxygen, it is therefore necessary to clean the ribbon by to remove the layer of MgO.

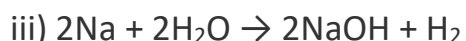
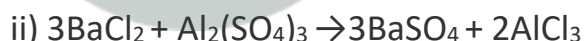
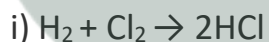
2. Write a balanced equation for the following chemical reactions.

i) Hydrogen + Chloride $\rightarrow$ Hydrogen chloride

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

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

Solution:



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.

Ans: A balanced chemical equation has the same number of moles of reactants and products. The balanced chemical equation is:
 $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$

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

Ans: A balanced chemical equation has the same number of moles of reactants and products. The balanced chemical equation is: $\text{NaOH(aq)} + \text{HCl(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$

In-text questions set 2 Page number – 10

1. A solution of a substance 'X' is used for whitewashing.

(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' which is used in whitewashing is quick lime or **Calcium Oxide** and its formula is **CaO**.

ii) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$

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:

In activity 1.7, gas collected in one of the test tubes is double of the amount collected in the other because water gets hydrolysed to release H_2 and O_2 gas. Here, after electrolysis two molecules of Hydrogen and one molecule of oxygen gas is released, hence the amount of Hydrogen collected would be double than that of oxygen.

In-text questions set 3 Page number – 13

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

Solution:

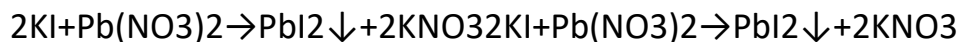
When an iron nail dipped in the copper sulphate solution, iron displaces copper from the copper sulphate because iron is more reactive than copper. Therefore the colour of the copper sulphate solution changes. The reaction is:



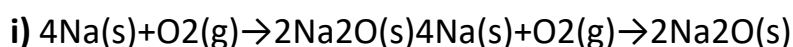
2. Give an example of a double displacement reaction other than the one given in Activity 1.10.

Ans:

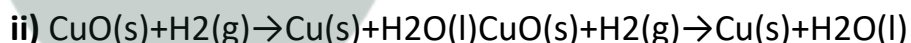
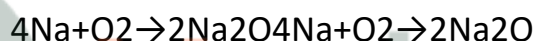
A double displacement reaction consists of two ions replacing each other's position from the reactants to form new compounds in the products. A double displacement reaction occurs when Potassium iodide reacts with lead nitrate to form lead iodide (yellow precipitate) and potassium nitrate.



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



Ans: Any species is said to be oxidised when it loses electrons and increases the oxidation state, while any species is said to be reduced when it gains electrons and decreases the oxidation state. Sodium (Na) is oxidised and oxygen gets reduced.



Ans: Any species is said to be oxidised when it loses electrons and increases the oxidation state, while any species is said to be reduced when it gains electrons and decreases the oxidation state. Copper oxide (CuO) is reduced to copper (Cu) as it loses oxygen and hydrogen (H₂) is oxidized to water (H₂O).



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

Solution : As statement (a) and (b) are incorrect, answer (i) is correct.



The above reaction is an example of a

(a) combination reaction.

(b) double displacement reaction. Chemical Reactions and Equations 15

(c) decomposition reaction.

(d) displacement reaction.

Solution : This is an example of displacement reaction because Fe in Fe_2O_3 has been displaced by Al. Hence correct answer is (d).

11. 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.

Solution : (a) Hydrogen gas and iron chloride are produced. The reaction is as follows:



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

Solution : The reaction in which the number of atoms of each element is equal on the reactant side and product side is called balanced equation.

Chemical reaction should be balanced because only a balanced equation tells us the relative quantities of different reactants and products involved in the reaction.

13. 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 :

- (i) $3\text{H}_2 + \text{N}_2 \rightarrow 2\text{NH}_3$
- (ii) $2\text{H}_2\text{S} + 3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{SO}_2$
- (iii) $3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 2\text{AlCl}_3 + 3\text{BaSO}_4$
- (iv) $2\text{K} + 2\text{H}_2\text{O} \rightarrow 2\text{KOH} + \text{H}_2$

14. Balance the following chemical equations.

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

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) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{HCl}$

15. 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) $\text{BaCl}_2 + \text{K}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2\text{KCl}$

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

- (a) Potassium bromide(aq) + Barium iodide(aq) $\rightarrow$ Potassium iodide(aq) + Barium bromide(s)
- (b) Zinc carbonate(s) $\rightarrow$ Zinc oxide(s) + Carbon dioxide(g)
- (c) Hydrogen(g) + Chlorine(g) $\rightarrow$ Hydrogen chloride(g)
- (d) Magnesium(s) + Hydrochloric acid(aq) $\rightarrow$ Magnesium chloride(aq) + Hydrogen(g)

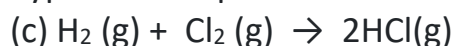
Solution :

- (a) $2\text{KBr}(\text{aq}) + \text{BaI}_2(\text{aq}) \rightarrow 2\text{KI}(\text{aq}) + \text{BaBr}_2(\text{s})$

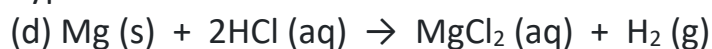
Type : Double displacement reaction



Type : Decomposition reaction



Type : Combination reaction



Type : Displacement reaction

9. What is meant by exothermic and endothermic reactions? Give examples.

Solution:

An endothermic reaction occurs when energy is absorbed from the surroundings in the form of heat. (Example: Photosynthesis, melting of ice, evaporation). Conversely, an exothermic reaction is one in which energy is released from the system into the surroundings. (Example: Explosions, concrete setting, nuclear fission and fusion).

10. Why is respiration considered to be an exothermic reaction?

Solution:

For the survival of life, we require energy. We obtain this energy from the food we eat. The food molecules, through the process of digestion, is broken down into a simpler molecule like glucose. These substances come in contact with the Oxygen present in our body cells to form Carbon dioxide and water along with a certain amount of energy (Respiration process). Since the energy is in the form of heat (that maintains our body temperature) the respiration is considered to be an exothermic reaction. The reaction taking place is:



11. Why are decomposition reactions called the opposite of Combination reactions? Write equations for decomposition reactions.

Solution:

Combination reaction is said to be the reaction between two or more molecules to form a larger molecule; whereas the decomposition reaction is defined as the splitting of larger molecules into two or more smaller molecules. This essentially explains that the decomposition reaction is the opposite of the combination reaction.

In most of the cases the decomposition reaction is endothermic since heat from the surrounding or induced heat is used to break the bonds of the larger molecule. Few examples of decomposition reactions are:



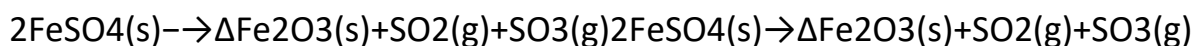
12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

Ans:

Decomposition reactions are the reactions where a reactant breaks down into two or more products.

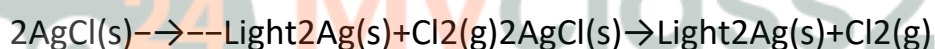
a) Decomposition by heat:

Ferrous sulphate decomposes to give ferrous oxide, sulphur dioxide and sulphur trioxide as,



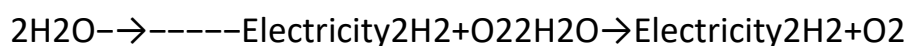
b) Decomposition by light:

Silver chloride decomposes in light to form silver and chlorine as,



c) Decomposition by electricity:

Water decomposes in presence of electricity to form hydrogen and oxygen gases as,

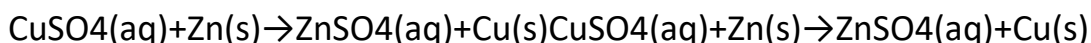


13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

Ans:

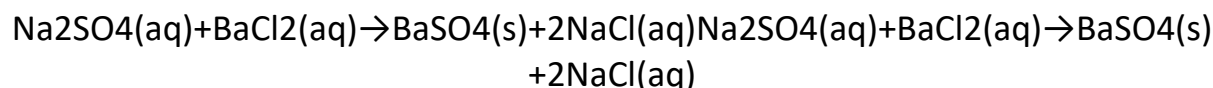
A displacement reaction is a reaction in which a more reactive element displaces a less reactive element from its compound. The elements at the top in the activity series can replace the elements at the bottom.

Example: Zinc is more reactive than copper and replaces copper from copper sulphate as:



Double displacement reaction is the type of reaction where two compounds react in the way that there is exchange of positive and negative ions and new compounds are formed as products.

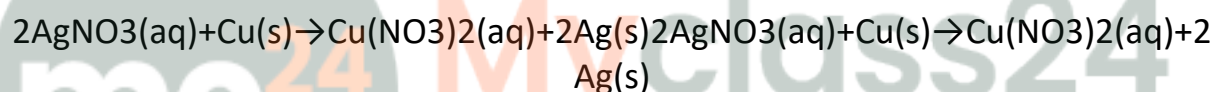
Example: On mixing sodium sulphate solution with barium chloride solution, a white precipitate of barium sulphate is formed as:



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

Ans:

The equation of recovery of silver from silver nitrate solution in silver refining is as follows:



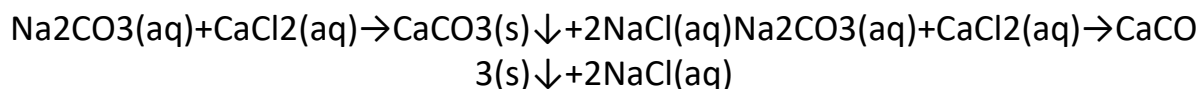
Here displacement of silver by copper happens as copper is more reactive than silver.

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

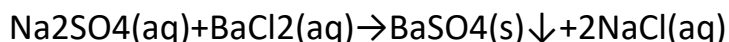
Ans:

The type of reaction where an insoluble substance called a precipitate is formed when there is exchange of ions between the reactants is called a precipitation reaction.

Example 1: On mixing sodium carbonate solution with calcium chloride solution, a white precipitate of calcium carbonate is formed.



Example 2: On mixing sodium sulphate solution with barium chloride solution, a white precipitate of barium sulphate is formed.



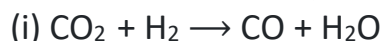
24. Explain the following in terms of gain or loss of oxygen with two examples each.

(a) Oxidation

(b) Reduction

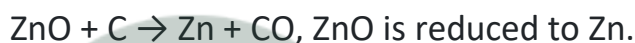
Solution :

(a) Oxidation is the gain of oxygen. For example:



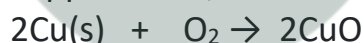
In equation (i), H_2 is oxidized to H_2O and in equation (ii), Cu is oxidised to CuO.

(b) Reduction : Reduction- addition of hydrogen or removal of oxygen in a chemical reaction is called oxidation reaction. For example



25. 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 : The brown coloured element 'X' is copper. On heating in air it forms copper oxide, which is black in colour.



Brown (from air) Black

26. Why do we apply paint on iron articles?

Solution : We apply paint on iron articles to prevent rusting. Iron articles do not come in contact of atmospheric oxygen and moisture and thus the rusting is prevented.

27. 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. On the other hand, 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.

28. Explain the following terms with one example each.

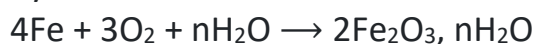
(a) Corrosion

(b) Rancidity

Solution :

(a) Corrosion : Corrosion is defined as a process where materials, usually metals, deteriorate as a result of a chemical reaction with air, moisture, chemicals, etc.

For example, iron, in the presence of moisture, reacts with oxygen to form hydrated iron oxide.



(b) Rancidity : The condition produced by aerial oxidation of fats and oils in foods marked by unpleasant smell and taste is called rancidity.

Rancidity spoils the food materials prepared in fats and oils which have been kept for a considerable time and makes them unfit for eating.

Rancidity can be prevented by adding anti-oxidants to foods containing fats and oils. It can also be prevented by flushing fat and oil containing foods with nitrogen before sealing.



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