

Class-X

Science

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Chapter-1

Chemical Reactions and Equations

2 MARKS QUESTIONS

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

Solution :

Magnesium is very reactive metal. When stored it reacts with oxygen to form a layer magnesium oxide on its surface. This layer of magnesium oxide is quite stable and prevents further reaction of magnesium with oxygen. The magnesium ribbon is cleaned by sand paper to remove this layer so that the underlying metal can be exposed into air.

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

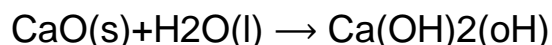
(i) Name the substance 'X' and write its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water.

Solution :

(i) The substance 'X' is calcium oxide. Its chemical formula is CaO.

(ii) Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime).



3. 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.

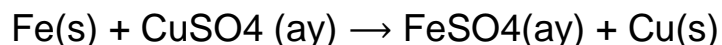
Solution :

The gas which is collected in double the amount in the electrolysis of water experiment is hydrogen. This is because water contains 2 parts of hydrogen element as compared to only 1 part of oxygen element.

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

Solution :

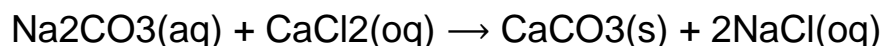
When an iron nail is placed in a copper sulphate solution, iron displaces copper from copper sulphate solution forming iron sulphate, which is green in colour.



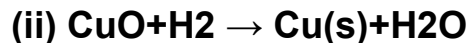
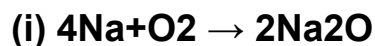
5. Give an example of a double displacement reaction other than the one given in Activity 1.10.

Solution :

Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride.



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

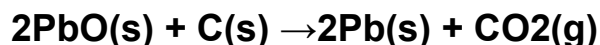


Solution :

(i) Sodium (Na) is oxidised as it gains oxygen and oxygen gets reduced.

(ii) Copper oxide (CuO) is reduced to copper (Cu) while hydrogen(H₂) gets oxidised to water H₂O

7. 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).

9. What happens when dilute hydrochloric acid is added to iron fillings? Tick the correct answer.

(a) Hydrogen gas and iron chloride are produced.

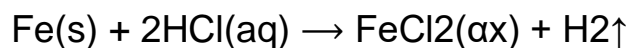
(b) Chlorine gas and iron hydroxide are produced.

(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:



10. 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

11. 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.

4 MARKS QUESTIONS

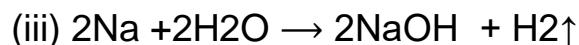
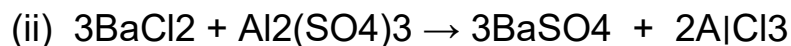
1. Write the balanced equation for the following chemical reactions.

(i) Hydrogen + Chlorine \rightarrow Hydrogen chloride

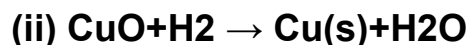
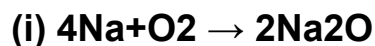
(ii) Barium chloride + Aluminium sulphate \rightarrow Barium sulphate + Aluminium chloride

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

Solution :



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



Solution :

(i) Sodium (Na) is oxidised as it gains oxygen and oxygen gets reduced.

(ii) Copper oxide (CuO) is reduced to copper (Cu) while hydrogen (H₂) gets oxidised to water H₂O

3. 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.

4. Translate the following statements into chemical equations and then balance them.

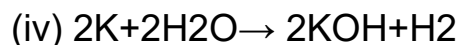
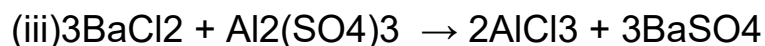
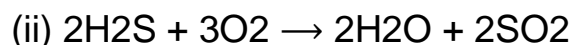
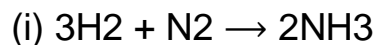
(a) Hydrogen gas combines with nitrogen to form ammonia.

(b) Hydrogen sulphide gas burns in air to give water and sulphur dioxide.

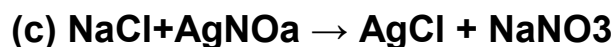
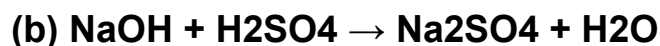
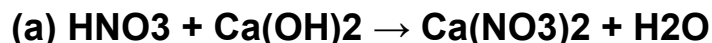
(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

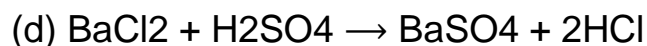
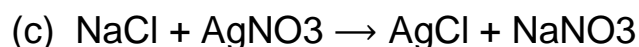
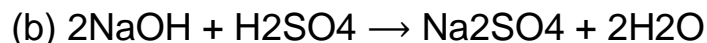
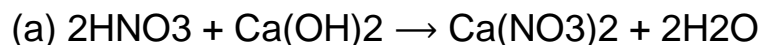
Solution :



5. Balance the following chemical equations.



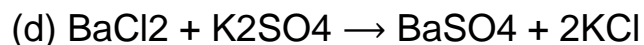
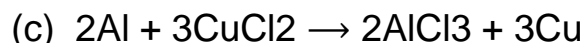
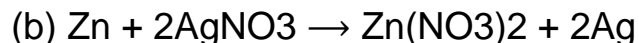
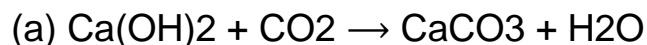
Solution :



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



Solution :



7.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.

8. $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

The above reaction is an example of a

Combination reaction

Double displacement reaction

Decomposition reaction

Displacement reaction

Solution:

The answer is 4. Displacement reaction.

Explanation: The Oxygen from the Ferrous oxide is getting displaced to the Aluminium metal to form Aluminium Oxide. In this reaction, Aluminum is a more reactive metal than Fe. Therefore, Al will displace Fe from its oxide. This type of chemical reaction, called displacement reaction, is in which one of the elements displaces another. Here, less reactive metal is displaced by more reactive metal. Since one-time displacement is occurring, it is called a single displacement reaction.

7 MARKS QUESTIONS

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

(a) Potassium bromide(aq) + Barium iodide(aq) → Potassium iodide(aq) + Barium bromide(s)

(b) Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g)

(c) Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)

(d) Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen(g)

Solution :

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

Type : Double displacement reaction

(b) $\text{ZnCO}_3 (\text{s}) \rightarrow \text{ZnO (s)} + \text{CO}_2 (\text{g})$

Type : Decomposition reaction

(c) $\text{H}_2 (\text{g}) + \text{Cl}_2 (\text{g}) \rightarrow 2\text{HCl(g)}$

Type : Combination reaction

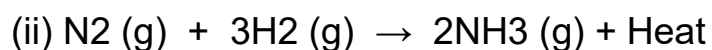
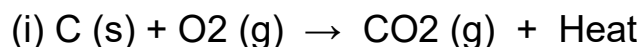
(d) $\text{Mg (s)} + 2\text{HCl (aq)} \rightarrow \text{MgCl}_2 (\text{aq}) + \text{H}_2 (\text{g})$

Type : Displacement reaction

2. What does one mean by exothermic and endothermic reactions? Give examples?**Solution :**

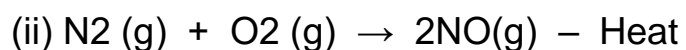
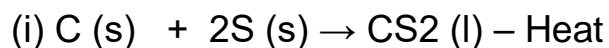
Exothermic reactions : Those reactions in which heat is evolved are known as exothermic reactions. An exothermic reaction is indicated by writing “+ Heat” on the products side of an equation.

Example :



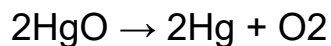
Endothermic reactions : Those reactions in which heat is absorbed are known as endothermic reactions. An endothermic reaction is usually indicated by writing “Heat” on the product side of a chemical equation.

Examples :

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

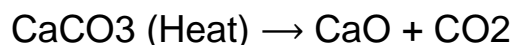
In most of the cases the decomposition reaction is endothermic since heat from the surrounding or induced heat is used to break the bonds of the larger molecule. Few examples of decomposition reactions are:



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

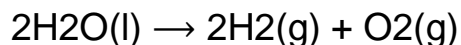
Solution :

(a) Decomposition reaction where heat is supplied for energy: Thermal decomposition



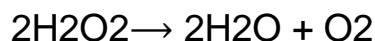
A thermal decomposition reaction can be defined as a decomposition reaction which is activated by thermal energy.

(b) Decomposition reaction where electricity is supplied for energy: Electrolytic decomposition



An electrolytic decomposition reaction is a type of decomposition reaction that in the form of electrical energy, provides the activation energy for decomposition

(c) Decomposition reaction where light is supplied for energy: Photo decomposition



Photolysis or photodecomposition reaction is defined as the decomposition of substances on exposure to light, while photo-oxidation is the oxidation of a substance on exposure to light. Irradiation of tryptophan with UV light results in the formation of a tryptophan radical and a hydrated electron.

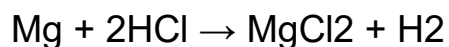
5. What is the difference between displacement and double displacement reactions? Write equations for these reactions?**Solution :**

A displacement reaction is the one when a more reactive substance displaces a less reactive one from its salt solution whereas a double displacement reaction is the one where a mutual exchange of ions happens between two compounds.

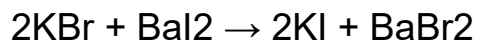
In a displacement reaction, only a single displacement takes place whereas in the double displacement reaction, as the name suggests two displacement takes place between the molecules.

Example:

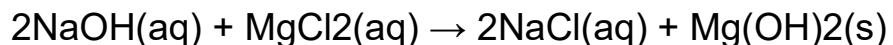
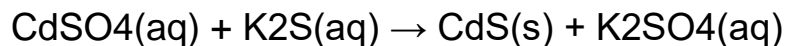
Displacement reaction



Double displacement reaction

**6. What do you mean by a precipitation reaction? Explain by giving examples.****Solution :**

When two solutions containing soluble salts are combined, a double displacement reaction takes place in which the ions are exchanged between the compounds. When one of such compounds formed is in solid form (that is insoluble in aqua) then it settles down at the bottom of the container. This solid is known as the precipitate and the respective reaction is termed as the precipitation reaction. Few examples of precipitation reactions are:



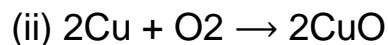
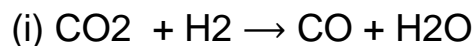
7.Explain the following in terms of gain or loss of oxygen with two examples each.

(a) Oxidation

(b) Reduction

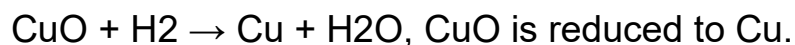
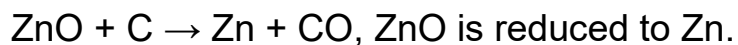
Solution :

(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



8.Explain the following terms with one example each.

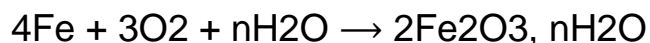
(a) Corrosion

(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.

MULTIPLE CHOICE QUESTIONS

1) Sodium and chlorine are reacted, and as a result, sodium chloride is formed, which is also called table salt. What option gives the reactants and products of the reaction?

- (a) Reactants – sodium; products – chlorine
- (b) Reactants – sodium and table salt; products – chlorine
- (c) Reactants – table salt; products – sodium and chlorine
- (d) Reactants – sodium and chlorine; products – sodium chloride

Correct Answer: Option (d)

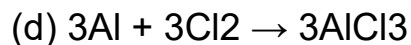
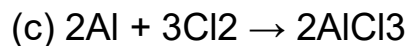
2) Which of the following reaction can also be termed a thermal decomposition reaction?

- (a) Combination reaction
- (b) Decomposition reaction
- (c) Displacement reaction
- (d) Double displacement reaction

Correct Answer: Option (b)

3) A student performs an experiment to form aluminium chloride from aluminium and chlorine. Which of the following option gives the chemical equation of the reaction?

- (a) $\text{Al} + \text{Cl}_2 \rightarrow \text{AlCl}_2$
- (b) $2\text{Al} + \text{Cl}_2 \rightarrow 2\text{AlCl}$



Correct Answer: Option (c)

4. Give the ratio in which hydrogen and oxygen are present in water by volume.

(a) 1:2

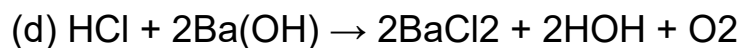
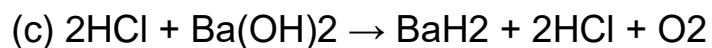
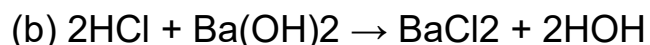
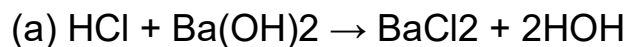
(b) 1:1

(c) 2:1

(d) 1:8

Correct Answer: Option (c)

5) A researcher adds barium hydroxide to hydrochloric acid to form a white-coloured barium chloride. Which of the following option gives the balanced chemical equation of the reaction?



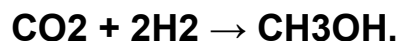
Correct Answer: Option (b)

6. One of the following processes does not involve a chemical reaction, that is:

- (a) Melting of candle wax when heated
- (b) Burning of candle wax when heated
- (c) Digestion of food in your stomach
- (d) Ripening of banana

Correct Answer: Option (a)

7) A student wrote a chemical equation of the reaction between carbon monoxide and hydrogen as,



How can the reaction be classified?

- (a) The reaction is an example of a combination reaction as a compound separates into two compounds.
- (b) The reaction is an example of a decomposition reaction as a compound dissociates into two compounds.
- (c) The reaction is an example of a combination reaction as two compounds react to form a single compound.
- (d) The reaction is an example of a decomposition reaction as two compounds react to form a single compound.

Correct Answer: Option (c)

8) The chemical formula of magnesium oxide is _____.

- (a) MgO_2
- (b) Mg_2O
- (c) MgO
- (d) $\text{Mg}(\text{OH})_2$

Correct Answer: Option (c)

9) A student learns that some products are formed as a result of combining two compounds while some compounds are formed as a result of the dissociation of two compounds. The image shows two reactions.

Which reaction is an example of a combination reaction and a decomposition reaction?

- (a) Both reactions are examples of combination reaction
- (b) Both reactions are examples of a decomposition reaction
- (c) Reaction P is an example of a combination reaction, while reaction Q is an example of a decomposition reaction
- (d) Reaction P is an example of a decomposition reaction, while reaction Q is an example of a combination reaction

Correct Answer: Option (c)

10. From the following, which one is an example of a chemical reaction?

- (a) Grapes get fermented
- (b) Breakdown of food
- (c) Formation of curd
- (d) All of the above

Correct Answer: Option (d)

FILL IN THE BLANKS

1. In a chemical reaction, the total mass of the _____ remains constant.

Answer: reactants/products/matter

2. A chemical equation represents a chemical reaction using _____.

Answer: symbols/formulas

3. The law of conservation of mass states that in a chemical reaction, the total mass of the reactants is equal to the total mass of the _____.

Answer: products

4. The process of making a chemical equation equal on both sides by adjusting coefficients is called _____.

Answer: balancing

5. A reaction in which a single compound breaks down into simpler substances is known as a _____ reaction.

Answer: decomposition

6. The numbers written in front of the chemical formulas in a balanced equation are called _____.

Answer: coefficients

7. In a combustion reaction, a substance reacts with _____ to produce heat and light.

Answer: oxygen

8. A reaction in which one element displaces another element from a compound is a _____ reaction.

Answer: displacement

9. A chemical equation that represents the actual chemical changes taking place in a reaction is called a _____ equation.

Answer: balanced

10. The point at which the rate of the forward reaction equals the rate of the reverse reaction is known as _____.

Answer: chemical equilibrium