

Chemical Reactions And Equations

Multiple Choice Questions

Question 1.

Which of the following is not a physical change?

- A. Boiling of water to give water vapour
- B. Melting of ice to give water
- C. Dissolution of salt in water
- D. Combustion of Liquefied Petroleum Gas (LPG)

Answer:

Combustion of Liquefied Petroleum Gas (LPG) is not a physical change. It is a chemical change because combustion of LPG produces new substances. A lot of heat is produced along with carbon dioxide and water vapour during this reaction. It is also irreversible in nature.

Rest three are physical changes as no new products are formed; the only state of the substance changes.

Note:

During a physical change, the physical state of substance changes. A physical change does not produce a new substance although the initial and final substances appear different. A physical change is reversible.

During a chemical change the chemical composition of substance changes. A chemical change produces a new substance with new properties. Energy is either released or absorbed during a chemical change. A chemical change is irreversible.

Question 2.

The following reaction is an example of a



- 1. displacement reaction
- 2. combination reaction

3. redox reaction

4. neutralisation reaction

A. 1 and 4

B. 2 and 3

C. 1 and 3

D. 3 and 4

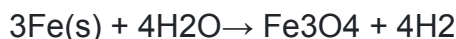
Answer:

This is a redox reaction because oxidation and reduction both are happening simultaneously. It is also a displacement reaction because H of NH_3 is displaced by oxygen. A displacement reaction is also a redox reaction as it is always followed by oxidation as well as reduction.

Note: When oxygen is added to a compound in a reaction, it is called oxidation. Removal of oxygen from a substance during a reaction is called reduction. Here, NH_3 is changing to NO . So, NH_3 is undergoing oxidation. Addition of hydrogen atom is also reduction. Here, oxygen is getting reduced.

Question 3.

Which of the following statements about the given reaction is correct?



a. Iron metal is getting oxidised.

b. Water is getting reduced.

c. Water is acting as reducing agent.

d. Water is acting as oxidising agent.

Answer: Statements a, b and d are correct.

Iron is getting oxidized and forming ferrous ferric oxide (Fe_3O_4)

Water molecule is getting reduced to hydrogen ions.

Water is acting as an oxidizing agent by donating its oxygen atom to Fe.

Question 4.

Which of the following are exothermic processes?

1. Reaction of water with quick lime

2. Dilution of an acid

3. Evaporation of water
4. Sublimation of camphor (crystals)
- A. 1 and 2
- B. 2 and 3
- C. 1 and 4
- D. 3 and 4

Answer:

When quick lime reacts with water, calcium hydroxide is produced and a large amount of heat is released. Similarly, when an acid or a base is diluted with water, heat is released making it a highly exothermic reaction.

Note: Exothermic processes release energy in the form of heat along with the formation of products. Such processes are hot because they give out heat.

Question 5.

Three beakers labelled as A, B and C each containing 25 mL of water were taken. A small amount of NaOH, anhydrous CuSO_4 and NaCl were added to the beakers A, B and C respectively. It was observed that there was an increase in the temperature of the solutions contained in beakers A and B, whereas in case of beaker C, the temperature of the solution falls. Which one of the following statement (s) is (are) correct?

1. In beakers A and B, exothermic process has occurred.
 2. In breakers A and B, endothermic process has occurred.
 3. In breaker C, exothermic process has occurred.
 4. In beaker C, endothermic process has occurred.
- A. Only 1
- B. Only 2
- C. 1 and 4
- D. 2 and 3

Answer:

Chemical reaction in beakers A and B gives out heat. Hence the temperature of the solution increases. Thus, we can call it an exothermic reaction. In beaker C, heat is

absorbed from water instead and hence the temperature decreases. Thus, we can call it an endothermic process.

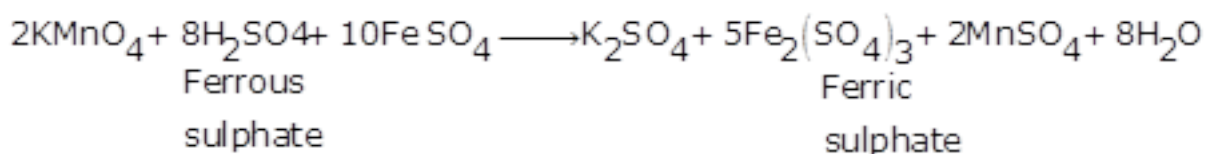
Question 6.

A dilute ferrous sulphate solution was gradually added to the beaker containing acidified permanganate solution. The light purple colour of the solution fades and finally disappears. Which of the following is the correct explanation for the observation?

- A. KMnO_4 is an oxidising agent, it oxidises FeSO_4
- B. FeSO_4 acts as an oxidizing agent and oxidizes KMnO_4
- C. The color disappears due to dilution; no reaction is involved
- D. KMnO_4 is an unstable compound and decomposes in presence of FeSO_4 to a colorless compound.

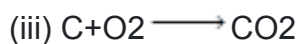
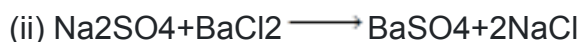
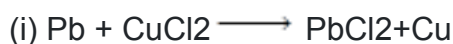
Answer:

KMnO_4 is an oxidising agent, it oxidises FeSO_4 .



Question 7.

Which among the following (are) double displacement reaction (s)?



A. (i) and (iv)

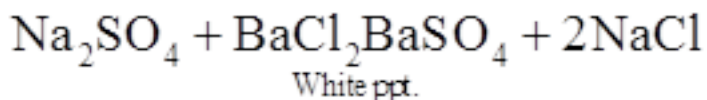
B. Only (ii)

C. (i) and (ii)

D. (iii) and (iv)

Answer:

Double displacement reactions are such chemical reactions in which one component of each reactant exchange to form products. The cations and anions of two compounds exchange their ions to form two new compounds. Here only in reaction (ii), ions of both reactants are exchanged and two entirely different compounds are formed.

**Question 8.**

Which among the following statement (s) is (are) true? Exposure of silver chloride to sunlight for a long duration turns grey due to

(i) the formation of silver by decomposition of silver chloride.

(ii) sublimation of silver chloride.

(iii) decomposition of chlorine gas from silver chloride.

A. Only (i)

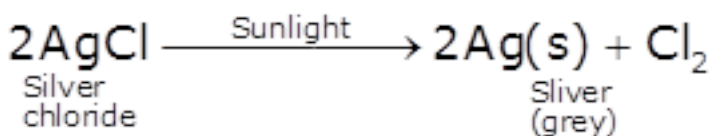
B. (i) and (iii)

C. (ii) and (iii)

D. Only (iv)

Answer:

When silver chloride is exposed to sunlight, it is decomposed to form silver. During this reaction, white silver chloride changes into greyish white silver metal. This is also known as photolytic decomposition reaction as it takes place in the presence of sunlight.

**Question 9.**

Solid calcium oxide reacts vigorously with water to form calcium hydroxide accompanied by the liberation of heat. This process is called slaking of lime water. Which among the following is/are true about slaking of lime water and the solution formed?

(i) It is an endothermic reaction.

(ii) It is exothermic reaction.

(iii) The pH of the resulting solution will be more than seven.

(iv) The pH of the resulting solution will be less than seven.

A. (i) and (ii)

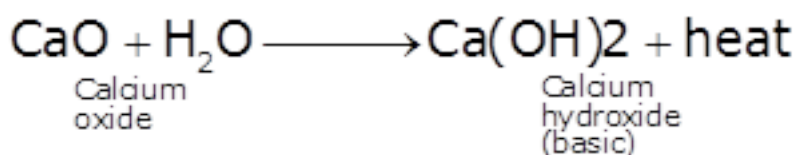
B. (ii) and (iii)

C. (i) and (iv)

D. (iii) and (iv)

Answer:

Slaking of lime is an exothermic reaction because a large amount of heat is produced during the reaction. The heat can be felt by touching the beaker from outside. The resulting compound Ca(OH)_2 , which is also called slaked lime, turns red litmus solution to blue and hence proves it to be a basic solution. Thus, the pH of this solution will be more than seven.



Question 10.

Barium chloride on reacting with ammonium sulphate forms barium sulphate and ammonium chloride. Which of the following correctly represents the type of the reaction involved?

(i) Displacement reaction

(ii) Precipitation reaction

(iii) Combination reaction

(iv) Double displacement reaction

A. Only (i)

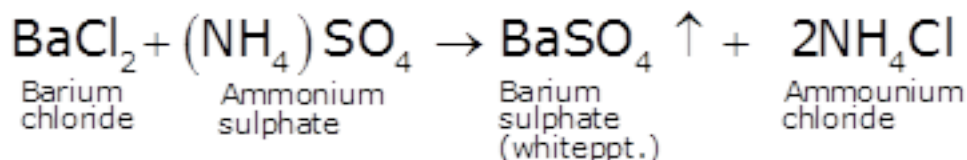
B. Only (ii)

(c) Only (iv)

D. (ii) and (iv)

Answer:

This reaction is a double displacement reaction as well as a precipitation reaction. This is a double displacement reaction because one component of each compound has exchanged places with each other. It is also called a precipitation reaction due to the formation of white precipitate of barium sulphate. Rest other products formed are soluble in water except barium sulphate that precipitates out.



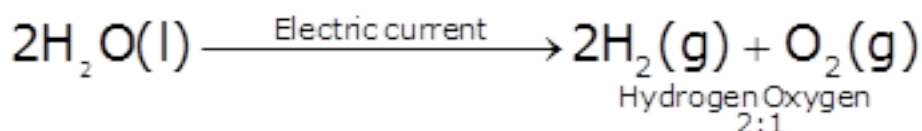
Question 11.

Electrolysis of water is a decomposition reaction. The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is

- A. 1 : 1
- B. 2 : 1
- C. 4 : 1
- D. 1 : 2

Answer:

The mole ratio of hydrogen and oxygen gases liberated during electrolysis of water is 2:1 by volume.



In a decomposition reaction, a compound is broken down into its simpler forms. During electrolysis water is broken down into oxygen gas and hydrogen gas due to passing of electric current through it.

Question 12.

Which of the following is (are) an endothermic process (es)?

- (i) Dilution of sulphuric acid
- (ii) Sublimation of dry ice
- (iii) Condensation of water vapours

A. Both (i) and (iii)

B. Only (ii)

C. Only (iii)

D. Both (ii) and (iv)

Sublimation of dry ice and evaporation of water both are endothermic processes. These processes pull heat (energy) from their surroundings to change from one state to another. Hence both these processes produce cooling rather than heating. Dry ice absorbs heat from the environment to convert into gas. This feature makes it a good refrigerant.

Processes of dilution of sulphuric acid and condensation of water vapours produce a large amount of heat. That is why these are exothermic processes.

In the double displacement reaction between aqueous potassium iodide and aqueous lead nitrate, a yellow precipitate of lead iodide is formed. While performing the activity if lead nitrate is not available, which of the following can be used in place of lead nitrate?

A. Lead sulphate (insoluble)

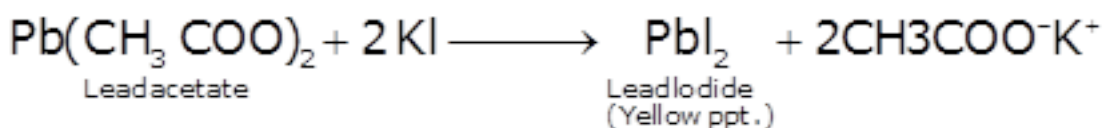
B. Lead acetate

C. Ammonium nitrate

D. Potassium sulphate

Lead acetate can be used in place of lead nitrate because lead acetate is also water soluble like lead nitrate.

The chemical equation for this reaction is



When potassium iodide and lead acetate are mixed, a bright yellow precipitate of lead iodide is seen. Lead iodide is unusually soluble in hot water and forms crystals on cooling.

Question 14.

Which of the following gases can be used for storage of fresh sample of an oil for a long time?

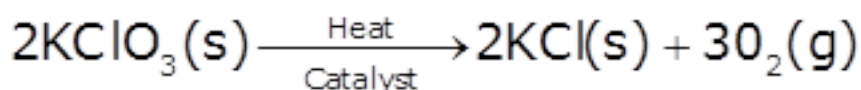
- A. Carbon dioxide or oxygen
- B. Nitrogen or oxygen
- C. Carbon dioxide or helium
- D. Helium or nitrogen

Answer:

Helium or nitrogen both can be used for storage of fresh sample of an oil for a long time. These gases are called inert gases as they do not react with most elements including oxygen. Thus these gases create an inert environment for the oil and prevent its reaction with any element in the environment that prevent from getting it rancid.

Question 15.

The following reaction is used for the preparation of oxygen gas in the laboratory:



Which of the following statements (s) is/are correct about the reaction?

- A. It is a decomposition reaction and endothermic in nature
- B. It is a combination reaction
- C. It is a decomposition reaction and accompanied by release of heat
- D. It is a photochemical decomposition reaction and exothermic in nature

Answer:

In a decomposition reaction, a compound is broken down into two or more simpler substances. This reaction is a decomposition reaction as KClO_3 is broken down into KCl and O_2 . It is also endothermic reaction because during decomposition of KClO_3 heat is taken in for the formation of desired products.

Question 16.

Which one of the following processes involve chemical reactions?

- A. Storing of oxygen gas under pressure in a gas cylinder
- B. Liquefaction of air

- C. Keeping petrol in China dish in the open
- D. Heating copper wire in the presence of air at high temperature

Answer:

During a chemical reaction the chemical composition of a substance changes. A chemical reaction produces a new substance with new properties. Energy is either released or absorbed during a chemical reaction. It is an irreversible reaction.



Question 17.

In which of the following chemical equations, the abbreviations represent the correct states of the reactants and products involved at reaction temperature?

- A. $2\text{H}_2(\text{l}) + \text{O}_2(\text{l}) \longrightarrow 2\text{H}_2\text{O}(\text{g})$
- B. $2\text{H}_2(\text{g}) + \text{O}_2(\text{l}) \longrightarrow 2\text{H}_2\text{O}(\text{l})$
- C. $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{H}_2\text{O}(\text{l})$
- D. $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \longrightarrow 2\text{H}_2\text{O}(\text{g})$

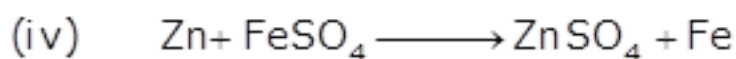
Answer:

It is because, the standard state for hydrogen and oxygen is gas and for water is liquid at reaction temperature.

Question 18.

Which of the following are combination reactions?

- (i) $2\text{KClO}_3 \xrightarrow{\text{Heat}} 2\text{KCl} + 3\text{O}_2$
- (ii) $\text{MgO} + \text{H}_2\text{O} \longrightarrow \text{Mg}(\text{OH})_2$
- (iii) $4\text{Al} + 3\text{O}_2 \longrightarrow 2\text{Al}_2\text{O}_3$



- A. Both (i) and (iii)
- B. Both (iii) and (iv)
- C. Both (ii) and (iv)
- D. Both (ii) and (iii)

Answer:

A combination reaction is one in which or more reactants combine to form a single product. In reaction (ii), MgO and H₂O combine to form Mg (OH)₂. In reaction (iii), Al and O₂ combine to form Al₂O₃. A combination reaction is also known as synthesis reaction.

Reaction (i) is decomposition reaction and reaction (iv) is displacement reaction.

Short Answer Questions

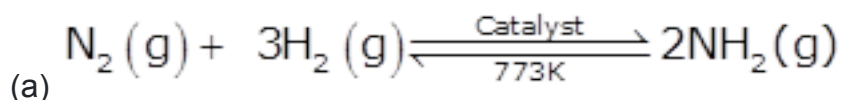
Question 1.

Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

- (a) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.
- (b) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.
- (c) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H₂SO₄.
- (d) Ethane is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

Chemical Reactions and Equations

Answer:



This is an example of combination reaction. A combination reaction is one in which or more reactants combine to form a single product.



This is an example of neutralisation reaction between a strong base and weak acid. A neutralisation occurs between an acid and a base to form water and salt. This reaction releases H^+ and OH^- ions. It is also a double displacement reaction. In such reaction cations and anions of both reactants exchange their places.



This is an example of neutralisation reaction as double displacement reaction.

A neutralisation occurs between an acid and a base to form water and salt. This reaction releases H^+ and OH^- ions. It is also a double displacement reaction. In such reaction cations and anions of both reactants exchange their places.



This is an example of oxidation reaction. The reactant burns in oxygen to produce carbon dioxide and water. It is also an exothermic reaction as it evolves a lot of heat. It is also known as oxidation reaction.

Question 2.

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

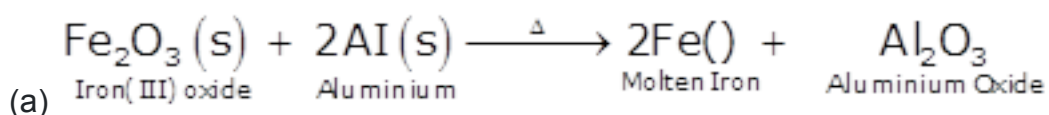
(a) In Thermite reaction, iron (III) oxide reacts with aluminium and gives molten iron and aluminium oxide.

(b) Magnesium ribbon is burnt in an atmosphere of nitrogen gas to form solid magnesium nitride

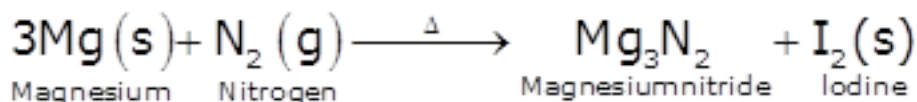
(c) Chlorine gas is passed in an aqueous potassium iodide solution to form potassium chloride solution and solid iodine.

(d) Ethanol is burnt in air to form carbon dioxide, water and releases heat.

Answer:

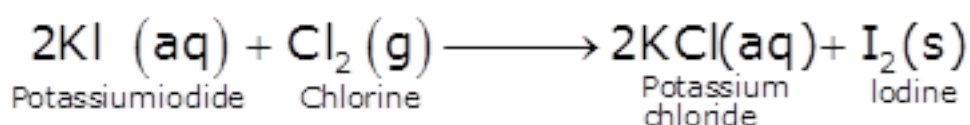


This is an example of displacement reaction. Displacement reaction is one in which more reactive component of a reactant displaces the comparatively lesser reactive component.



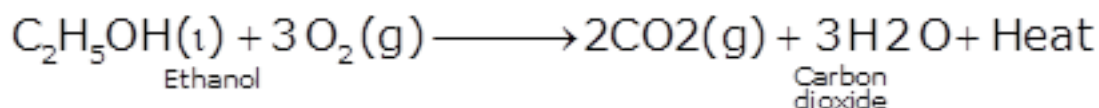
(b)

When magnesium is burned in air, then the magnesium reacts with nitrogen in the air and some magnesium nitride is also formed.



(c)

This is an example of displacement reaction. Displacement reaction is one in which more reactive component of a reactant displaces the comparatively lesser reactive component.

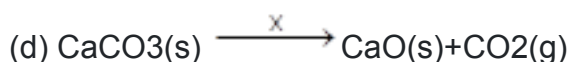
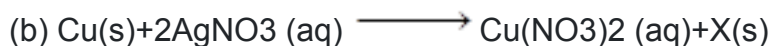


(d)

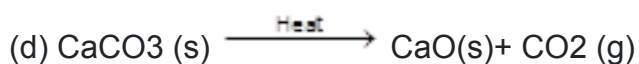
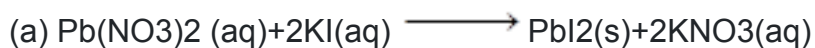
This is an example of combustion reaction. In such a reaction the reactant burns in oxygen to produce carbon dioxide and water. It is also an exothermic reaction as it evolves a lot of heat. It is also known as oxidation reaction.

Question 3.

Complete the missing components/variables given as X and Y in the following.



Answer:



Question 4.

Which among the following changes are exothermic or endothermic in nature?

- (a) Decomposition of ferrous sulphate
- (b) Dilution of sulphuric acid
- (c) Dissolution of sodium hydroxide in water
- (d) Dissolution of ammonium chloride in water

Answer:

(a) Decomposition of ferrous sulphate is an endothermic reaction because heat is absorbed from the environment during the reaction.

(b) Dilution of sulphuric acid is an exothermic reaction because heat is released into the environment during the reaction.

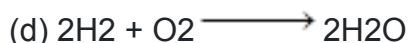
(c) Dissolution of sodium hydroxide in water is an exothermic reaction because heat is released into the environment during the reaction. in water.

(d) Dissolution of ammonium chloride in water is an endothermic reaction because heat is absorbed from the environment during the reaction.

Question 5.

Identify the reducing agent in the following reactions.





Answer:

(a) NH_3 is the reducing agent because it gets oxidised to NO by the removal of hydrogen and addition of oxygen. O_2 has been reduced to H_2O by the addition of hydrogen.

(b) H_2O is the reducing agent because of the addition of electronegative F to get oxidised to HOF . It reduces F_2 to HF by the addition of hydrogen.

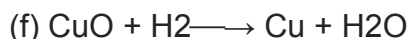
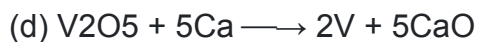
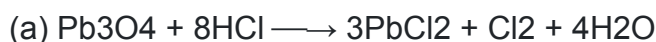
(c) CO is a reducing agent. Here, CO has been oxidised to CO_2 by the addition of oxygen. Fe_2O_3 has been reduced to Fe by the removal of oxygen.

(d) H_2 is the reducing agent as it gets oxidised to H_2O by the addition of oxygen. O_2 has been reduced to H_2O by the addition of hydrogen.

Note: A substance that donates electrons in a redox reaction is called a reducing agent. It helps in reduction by oxidising itself in a chemical reaction. A reducing agent also loses hydrogen.

Question 6.

Identify the oxidising agent (oxidant) in the following reactions



Answer:

(a) Pb_3O_4 is the oxidising agent.

Here, in Pb_3O_4 the oxidation state of Pb is +6. And in PbCl_2 , the oxidation state is +2. Since the oxidation state is decreased thus, Pb_3O_4 is the oxidant.

(b) O_2 is the oxidising agent.

Because O_2 is an element and the oxidation state of any element is 0. Thus, the oxidation state of oxygen is 0. Now, in MgO , the oxidation state of oxygen is -2.

Since, the oxidation state of oxygen is decreased from 0 to -2. Thus, O_2 is the oxidising agent.

(c) $CuSO_4$ is the oxidising agent.

The oxidation state of Cu in $CuSO_4$ is +2. On the reactants side, the oxidation state of Cu changes to 0, as it is in its elemental form. On the other hand, the oxidation state on Zn changes from 0 to +2. Therefore, Cu has been Reduced and Zn has been oxidised. Cu has gained electrons and hence, $CuSO_4$ is the Oxidising agent.

(d) V_2O_5 is the oxidising agent.

The oxidation state of Calcium goes from 0 (in its elemental state) to +2 on the products side. On the other hand, the oxidation state of V changes for +5 to 0. Therefore, we can see that V has been reduced (and has gained electrons). Therefore, V_2O_5 is the oxidising agent.

(e) H_2O is the oxidising agent.

The oxidation state of Oxygen on the reactants side is -2 whereas on the products side is -3. This gain of electrons leads us to believe that H_2O is the oxidising agent in the above reaction.

(f) CuO is the oxidising agent.

The oxidising state of Cu has changed from +2 on the reactants side to 0 on the products side. It has been reduced and hence, CuO is the oxidising agent in this reaction.

Question 7.

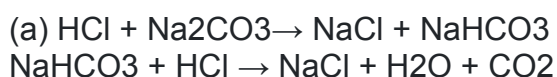
Write the balanced chemical equations for the following reactions

(a) Sodium carbonate on reaction with hydrochloric acid in equal molar concentrations gives sodium chloride and sodium hydrogen carbonate.

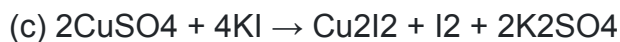
(b) Sodium hydrogen carbonate on reaction with hydrochloric acid gives sodium chloride, water and liberates carbon dioxide.

(c) Copper sulphate on treatment with potassium iodide precipitates cuprous iodide (Cu_2I_2), liberates iodine gas and also forms potassium sulphate.

Answer:



However, this reaction can be summed up as.



Question 8.

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?

Answer:

When a solution of Potassium Chloride is mixed with Silver Nitrate solution, we get a precipitate of Silver Chloride. *Chlorides are usually soluble but one important exception to this rule is Silver Chloride.*

The chemical reaction is $\text{KCl} + \text{AgNO}_3 \rightarrow \text{KNO}_3 (\text{aq}) + \text{AgCl}(\text{s})$

This type of chemical reaction is called a *double displacement reaction*.

Note: *A double displacement reaction is a type of chemical reaction in which two chemical compounds react and the positive ions and the negative ions of the two compounds switch places.*

Question 9.

Ferrous sulphate 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.

Answer:

The thermal decomposition or thermolysis of Ferrous Sulphate results in the formation of Iron (III) Oxide and Sulphur dioxide and sulphur trioxide.



Sulphur dioxide is the gas that has a distinctive odour of burning sulphur. The type of reaction is Thermal decomposition.

Question 10.

Why do fireflies glow at night?

Answer:

Fireflies have a luminous bag at their lower abdomen region that contain a protein called Luciferin. This luminous bag also secretes a certain enzyme called, Luciferase. This enzyme on reaction with Luciferin, emits light in the presence of Magnesium and oxygen. Therefore, fireflies glow in the night.

Question 11.

Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented. Under what conditions do these grapes ferment? Is it a chemical or a physical change?

Answer:

When the grapes are attached to the plants, they are still considered as living. They have their immune system intact, due to which they cannot undergo fermentation. After the grapes are plucked, microbes are made to attack them, in the absence of air, to form alcohol. This process is called fermentation and it is a chemical process.

Question 12.

Which among the following are physical or chemical changes?

- (a) Evaporation of petrol
- (b) Burning of Liquefied Petroleum Gas (LPG)
- (c) Heating of an iron rod to red hot.
- (d) Curdling of milk
- (e) Sublimation of solid ammonium chloride

Answer:

(a) This is a Physical change.

Petrol just changes its state from the liquid form to the gaseous form because of the presence of energy in the form of heat. A change of state is a reversible reaction and hence, this is a Physical change.

(b) This is a Chemical change.

Burning of Liquefied Petroleum Gas releases energy and heat as its by products which cannot be converted back to the original reactant. The chemical composition of LPG has changed. Hence, it is a chemical reaction.

(c) This is a Physical change.

The temperature affects the metal temporarily. On reversing the temperature change, the metal goes back to its previous state. Hence, it is a physical state.

(d) This is a Chemical change.

The process of curdling of milk takes place due to bacteria. It is an irreversible reaction in which the composition of milk is changed and hence, a chemical change.

(e) This is a Physical change.

Energy in the form of heat has prompted solid ammonium chloride to evaporate. On reversing the temperature, it goes back to its previous solid state. Hence, this is a physical change.

A physical change in a substance doesn't change what the substance is. In a chemical change where there is a chemical reaction, a new substance is formed and energy is either given off or absorbed.

Question 13.

During the reaction of some metals with dilute hydrochloric acid, following observations were made.

(a) Silver metal does not show any change

(b) The temperature of the reaction mixture rises when aluminium (Al) is added.

(c) The reaction of sodium metal is found to be highly explosive

(d) Some bubbles of a gas are seen when lead (Pb) is reacted with the acid. Explain these observations giving suitable reasons.

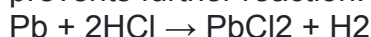
Answer:

(a) Silver is less reactive than Hydrogen and hence, cannot displace Hydrogen in a chemical reaction. (Silver lies below Hydrogen in the activity series.)

(b) This reaction is exothermic in nature and hence the temperature of the mixture rises.

(c) Sodium is a highly reactive metal and combines with moisture to form Hydrogen gas. This reaction is highly exothermic and quick which leads to Sodium catching fire.

(d) The bubbles are observed due to the formation of Hydrogen gas. The reaction gradually becomes slow due to the formation of a coating of Lead chloride on Lead, which prevents further reaction.

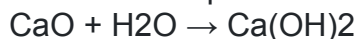


Question 14.

A substance X, which is an oxide of a group 2 element, is used intensively in the cement industry. This element is present in bones also. On treatment with water it forms a solution which turns red litmus blue. Identify X and also write the chemical reactions involved.

Answer:

The element is Calcium and the substance X is Calcium Oxide (CaO). Calcium oxide is used extensively in the cement industry and Calcium is present in our bones in the form of Calcium Phosphate.



Calcium oxide dissolves in water to form a basic solution which turns red litmus blue.

Question 15.

Write a balanced chemical equation for each of the following reactions and also classify them.

(a) Lead acetate solution is treated with dilute hydrochloric acid to form lead chloride and acetic acid solution.

(b) A piece of sodium metal is added to absolute ethanol to form sodium ethoxide and hydrogen gas.

(c) Iron (III) oxide on heating with carbon monoxide gas reacts to form solid iron and liberates carbon dioxide gas.

(d) Hydrogen sulphide gas reacts with oxygen gas to form solid sulphur and liquid water.

Answer:



This is a Double Displacement reaction.

(b) $2\text{Na} + 2\text{C}_2\text{H}_5\text{OH} \rightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2$
This is a Displacement reaction.

(c) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
This is a redox reaction.

(d) $2\text{H}_2\text{S} + \text{O}_2 \rightarrow 2\text{S} + 2\text{H}_2\text{O}$
This is a replacement reaction.

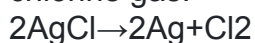
Question 16.

Why do we store silver chloride in dark coloured bottles?

Answer:

We store Silver Chloride in dark coloured bottles to prevent the breakdown of the salt into its elements. (Photo decomposition)

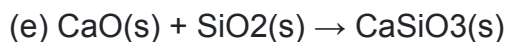
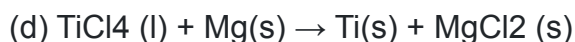
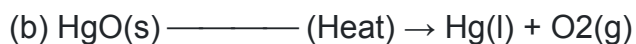
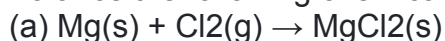
When Silver Chloride is exposed to light, then it breaks down into elemental silver and chlorine gas.



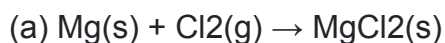
In order to prevent the contamination of Silver chloride with Silver, we store them in dark coloured bottles which block the light.

Question 17.

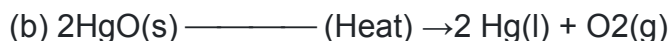
Balance the following chemical equations and identify the type of chemical reaction.



Answer:



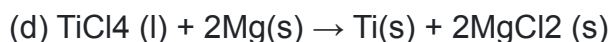
This type of reaction is called a *combination reaction* or a *synthesis reaction*.



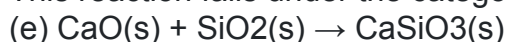
This is an example of thermal *decomposition reaction*.



This is an example of a *Combination reaction*.



This reaction falls under the category of *Displacement reactions*.



This is a synthesis reaction.



This is a decomposition reaction.

Note:

- A *synthesis reaction* is a chemical reaction in which multiple reactants combine to form a single product.
- A *decomposition reaction* is a type of chemical reaction in which a single reactant breaks down into two or more elements or chemical compounds. If this decomposition is brought about by heat, then it is termed as thermal decomposition.
- *Displacement reaction* is a chemical reaction in which a more reactive element displaces a less reactive element from its compound.

Question 18.

A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light. If the burning ribbon is now placed in an atmosphere of nitrogen, it continues to burn and forms a compound Y.

(a) Write the chemical formulae of X and Y.

(b) Write a balanced chemical equation, when X is dissolved in water.

Answer:

(a) X is Magnesium Oxide - MgO and Y is Magnesium nitride - Mg_3N_2 .



Question 19.

Zinc liberates hydrogen gas when reacted with dilute hydrochloric acid, whereas copper does not. Explain why?

Answer:

Zinc reacts with hydrochloric acid to liberate Hydrogen gas as it is more reactive than Hydrogen and hence, displace it. Copper is less reactive when compared to Hydrogen and hence cannot displace it.

The same can be understood by looking at the activity series of metals. The activity series of metals refers to the list of metals ranked in the decreasing order of their reactivity in order to displace Hydrogen gas from water or acid solutions. It helps us in predicting which metal will displace which metal in Acidic solutions.

Zinc lies above Hydrogen whereas Copper lies below Hydrogen.

Question 20.

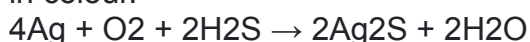
A silver article generally turns black when kept in the open for a few days. The article when rubbed with toothpaste again starts shining.

(a) Why do silver articles turn black when kept in the open for a few days? Name the phenomenon involved.

(b) Name the black substance formed and give its chemical formula.

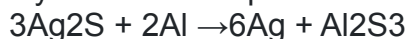
Answer:

(a) When silver articles are kept in the open, then a layer of silver oxide is formed on the articles due to the reaction of silver with the oxygen present in the air. Silver oxide is black in colour. Finally, after sufficient time, it will form silver sulphide after coming in contact with oxygen and Hydrogen sulphide present in the atmospheric air. Silver sulphide is also black in colour.



This process is termed as tarnishing of silver or corrosion.

As toothpastes consist of several abrasive substances (like, Aluminium hydroxide), this layer of silver sulphide can be removed by rubbing the article with toothpaste.



This reaction leaves the silver metal all shiny. This particular cleaning process can be improved by using hot water and sodium bicarbonate.

(b) The black substance that is formed over the silver metal on exposure to atmospheric air is silver sulphide. The chemical formula of silver sulphide is Ag_2S .

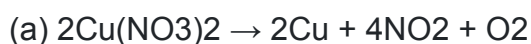
Long Answer Questions

Question 1.

On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed

- (a) Write a balanced chemical equation of the reaction.
- (b) Identify the brown gas X evolved.
- (c) Identify the type of reaction.
- (d) What could be the pH range of aqueous solution of the gas X?

Answer:



(b) The brown gas 'X' has to be nitrogen dioxide.

(c) This type of reaction falls under the category of Decomposition reactions.

(d) The pH of the aqueous solution of gas X would be less than 7.
The oxides of non metals are generally acidic in nature. Therefore, their aqueous solutions would exhibit acidic nature.

Question 2.

Give the characteristic tests for the following gases

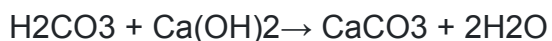
- (a) CO_2
- (b) SO_2
- (c) O_2
- (d) H_2

Answer:

(a) When carbon dioxide is made to run through lime water, the gas turns the solution milky. This is unique only to carbon dioxide.

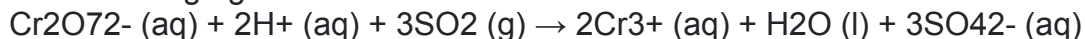
The reaction produces Calcium carbonate which is a white precipitate, thus giving rise to the milky appearance. Lime water is nothing but a solution of Calcium hydroxide.





(b) The unique identifying feature of sulphur dioxide is its odour. It smells like burning of sulphur. Also, Sulphur dioxide turns moist litmus paper from blue to red.

When SO_2 is passed through acidified potassium permanganate solution (pink/purple in colour), the solution turns green due to the formation of Chromium sulphate. It is a redox reaction where Potassium dichromate acts as an oxidising agent and sulphur dioxide acts as a reducing agent.



(c) When any fire element - a matchstick or a candle - is brought into an oxygen atmosphere, it starts burning more brightly. Oxygen supports combustion.

(d) When a fire element - a matchstick or a candle - is brought into a Hydrogen atmosphere, it burns with a pop sound. This is unique to Hydrogen.

Question 3.

What happens when a piece of

(a) zinc metal is added to copper sulphate solution?

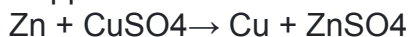
(b) aluminium metal is added to dilute hydrochloric acid?

(c) silver metal is added to copper sulphate solution?

Also, write the balanced chemical equation if the reaction occurs.

Answer:

(a) When zinc reacts with a solution of copper sulphate, we obtain Zinc Sulphate and Copper.



Zinc lies above Copper in the activity series.

The activity series of metals refers to the list of metals ranked in the decreasing order of their reactivity in order to displace Hydrogen gas from water or acid solutions. It helps us in predicting which metal will displace which metal in Acidic solutions.

(b) Aluminium chloride is formed and Hydrogen gas is evolved when Aluminium is made to

react with dilute Hydrochloric acid.



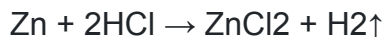
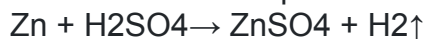
(c) Silver being less reactive than Copper, we see no reaction taking place when silver metal is added to copper sulphate solution.

Question 4.

What happens when zinc granules are treated with dilute solution of H_2SO_4 , HCl , HNO_3 , NaCl and NaOH , also write the chemical equations if reaction occurs.

Answer:

In the case of the reaction of zinc granules with Sulphuric acid or Hydrochloric acid, a salt is formed - Zinc sulphate or Zinc Chloride respectively - and the Hydrogen gas is released.

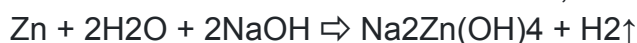


Similarly, Hydrogen gas and Zinc Nitrate is formed when the Zinc granules are treated with HNO_3 .



In the case of NaCl , Zinc being less reactive than Sodium, no reaction occurs.

When zinc is made to react with NaOH , it forms Sodium zincate and hydrogen gas.



Question 5.

On adding a drop of barium chloride solution to an aqueous solution of sodium sulphite, white precipitate is obtained.

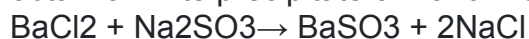
(a) Write a balanced chemical equation of the reaction involved

(b) What other name can be given to this precipitation reaction?

(c) On adding dilute hydrochloric acid to the reaction mixture, white precipitate disappears. Why?

Answer:

(a) When Barium chloride solution is added to an aqueous solution of sodium sulphite, we obtain a white precipitate of Barium Sulphite along with Sodium Chloride.



(b) This precipitation reaction can also be categorised as a double displacement reaction.

A double displacement reaction is a type of chemical reaction in which two chemical compounds react and the positive ions(cations) and the negative ions(anions) of the two compounds switch places.

(c) The white precipitate of sodium chloride reacts with hydrochloric acid to form Barium Chloride and water and release sulphur dioxide. Barium chloride is a soluble salt which is why the white precipitate of Barium Sulphite disappears.

The chemical reaction for the above process is $\text{BaSO}_3 + \text{HCl} \Rightarrow \text{BaCl}_2 + \text{SO}_2 + \text{H}_2\text{O}$.

Question 6.

You are provided with two containers made up of copper and aluminium. You are also provided with solutions of dilute HCl, dilute HNO₃, ZnCl₂ and H₂O. In which of the above containers these solutions can be kept?

Answer:

The solutions of dilute HCl, ZnCl₂ and H₂O can be kept in the container that is made of Copper. The Aluminium container can hold dilute HNO₃ and H₂O.

We can store a solution in a container with which the solution will not react.

When compared to Aluminium, copper is a less reactive metal. Also, Copper is placed below Hydrogen in the activity series. Therefore, it will not react with dilute HCl or H₂O; due to which we can store them in the copper container. However, dilute HNO₃ being a strong oxidising agent, will react with Copper and hence cannot be stored in a copper container. Copper, being less reactive than Zinc, will not react with ZnCl₂.

Aluminium, on the other hand, is highly reactive and can react with the said solutions.

However when dilute HNO₃ comes in contact with Aluminium, a protective layer of Aluminium Oxide is formed which prevents further reaction. Therefore, dilute HNO₃ can be stored in an Aluminium container.

Also, Aluminium does not react with water. So, water can be stored in the Aluminium container as well.

Note:

The activity series of metals refers to the list of metals ranked in the decreasing order of their reactivity in order to displace Hydrogen gas from water or acid solutions. It helps us in predicting which metal will displace which metal in Acidic solutions.