

Chapter – 1 Chemical Reactions and Equations

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Q1. Why should a magnesium ribbon be cleaned before burning in air?

Answer:

A magnesium ribbon is scrubbed to remove protective layer of magnesium oxide from its surface so that it combines with the oxygen of air on heating.

Q2. Write the balanced equation for the following chemical reactions.

- i) **Hydrogen + chlorine → Hydrogen chloride**
- ii) **Barium chloride + Aluminum sulphate → Barium sulphate + Aluminum chloride**
- iii) **Sodium + water → Sodium hydroxide + Hydrogen**

Answer:

- i) $H_2 + Cl_2 \rightarrow 2HCl$
- ii) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 3BaSO_4 + 2AlCl_3$
- iii) $2Na + 2H_2O \rightarrow 2NaOH + H_2$

Q3. Write balanced chemical equations with state symbol for the following reactions:

- i) **Solutions of barium chloride and sodium sulphate in water react to give insoluble barium sulphate and the solution of sodium chloride.**
- ii) **Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.**

Answer:

- i) $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
- ii) $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$

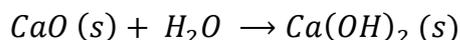
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Q1. A solution of substance X is used for white washing.

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

Answer:

- i) The substance whose solution in water we use for white-washing is calcium oxide. Hence, the substance X is calcium oxide, which is represented by the formula CaO .
- ii) The equation for the reaction of calcium oxide with water is:



Q2. Why is the amount of gas collected in one of the test tubes in the electrolysis is double of the amount collected in the other? Name the gas.

Answer:

The gas collected is double the amount in the electrolysis of water experiment because water (H_2O) contain 2 parts of hydrogen element.

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Q1. Why does the color of copper sulphate change when an iron nail is dipped in it?

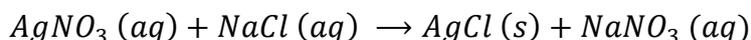
Answer:

When an iron nail dipped in copper sulphate solution, then the blue color of copper sulphate solution changes because iron displaces copper from copper sulphate solution to form a light green solution of iron sulphate.

Q2. Give an example of a double displacement reaction.

Answer:

When a silver nitrate solution is added to sodium chloride solution, then a double displacement reaction takes place in which a white precipitate of silver chloride is formed along with sodium nitrate solution.



Q3. Identify the substances that are oxidized and the substances that are reduced in the following reactions:

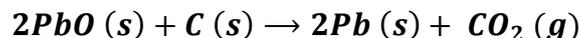
- i) $4Na (s) + O_2 (g) \rightarrow 2Na_2O (s)$
- ii) $CuO (s) + H_2 (g) \rightarrow Cu (s) + H_2O (l)$

Answer:

- i) Substance oxidized : Na ; Substance reduced : O_2
- ii) Substance oxidized : H_2 ; Substance reduced : CuO

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Q1. Which of the statements about the reaction below are incorrect?

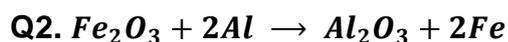


- a) Lead is getting reduced
- b) Carbon dioxide is getting oxidized
- c) Carbon is getting oxidized
- d) Lead oxide is getting reduced

- i) a) and b)
- ii) a) and c)
- iii) a), b) and c)
- iv) all

Answer: Option i)

This is because the oxygen is being removed and the removed oxygen from the Lead is added to the elemental Carbon.



The above reaction is an example of a:

- a) combination reaction
- b) double displacement reaction
- c) decomposition reaction
- d) displacement reaction

Answer: Option d)

Double Displacement Reaction

Q3. What happens when dilute hydrochloric acid is added to iron filings? Tick the correct answer.

- a) Hydrogen gas and iron chloride are produced
- b) Chlorine gas and iron hydroxide are produced
- c) No reaction takes place
- d) Iron salt and water are produced

Answer: Option a)

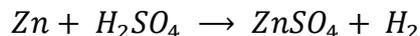
Hydrogen gas and iron chloride are produced.

Q4. What is a balanced chemical equations? Why should chemical equations be balanced?

Answer:

A chemical equation with equal number of atoms of different elements is balanced chemical equation.

Example: Zinc reacts with dilute sulphuric acid to form zinc sulphate and hydrogen:



The above equation has an equal number of Zn atoms (1 each), H atoms (2 each), S atoms (1 each) and O atoms (4 each) in reactants and products, hence it is a balanced chemical equation.

The chemical equations need to be a balanced one, so that it satisfies the law of conservation of mass which says that 'matter can neither be created nor destroyed in a chemical reaction'. Hence, the total mass of all the elements present in the products of a chemical reaction should be equal to the mass of all the elements present in the reactant.

Q5. Translate the following statements into chemical equations and then balance them:

- Hydrogen gas combines with nitrogen to form ammonia.
- Hydrogen sulphide gas burns in air to give water and Sulphur dioxide
- Barium chloride reacts with aluminum sulphate to give aluminum chloride and a precipitate of barium sulphate
- Potassium metal reacts with water to give potassium hydroxide and hydrogen gas

Answer:

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

Q6. Balance the following chemical equations.

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

Answer:

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

Q7. Write the balanced chemical equation for the following reactions:

- a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water
- b) Zinc + Silver Nitrate → Zinc nitrate + Silver
- c) Aluminum + Copper chloride → Aluminum chloride + Copper
- d) Barium chloride + Potassium sulphate → Barium sulphate + Potassium chloride

Answer:

- a) $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$
- b) $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$
- c) $2Al + 3CuCl_2 \rightarrow 2AlCl_3 + 3Cu$
- d) $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

Q8. Write 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)

Answer:

- a) $2KBr (aq) + BaI_2 (aq) \rightarrow 2KI (aq) + BaBr_2 (s)$
This is a double displacement reaction.

- b) $ZnCO_3 (s) \rightarrow ZnO (s) + CO_2$
This is a decomposition reaction.

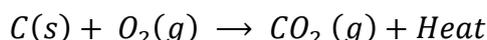
- c) $H_2 (g) + Cl_2 (g) \rightarrow 2HCl (g)$
This is a combination reaction.

- d) $Mg (s) + 2HCl (aq) \rightarrow MgCl_2 (aq) + H_2 (g)$
This is a displacement reaction.

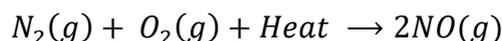
Q9. What does one mean by exothermic and endothermic reactions? Give examples.

Answer:

Exothermic reactions are those in which the heat is involved. Example; carbon burns with oxygen forming carbon dioxide and large amount of heat is produced.



In Endothermic reactions is heat is absorbed. Example; when nitrogen and oxygen are heated to high temperature (about $3000^{\circ}C$) they combine to form nitrogen monoxide and large amount of heat is absorbed.



Q10. Why is respiration considered an exothermic reaction? Explain.

Answer:

Respiration is considered an exothermic reaction because energy is released in this process. In respiration, glucose reacts with oxygen in the cells of body to form carbon dioxide and water releasing energy.

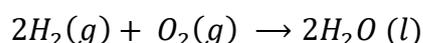


Q11. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.

Answer:

The decomposition reactions are opposite of combination reactions because in a combination reaction two or more substances combine to form product whereas in decomposition reaction, a substance splits up to form two or more simpler substances.

a) When hydrogen burns in oxygen, it forms water:



In this reaction, two substances hydrogen and oxygen combine to form a single substance water, so this is a combination reaction.

b) When acidified water is electrolyzed, hydrogen and oxygen are formed:

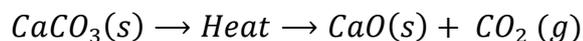


Here a single substance water breaks up into simpler substance, hydrogen and oxygen. Hence, this is a decomposition reaction.

Q12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light or electricity.

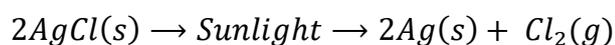
Answer:

- a) When calcium carbonate is heated, it decomposes to form calcium oxide and carbon dioxide:



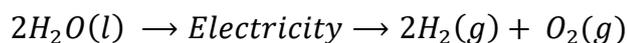
Here, the energy is supplied in the form of Heat.

- b) When silver chloride is exposed to sunlight, it decomposes to form silver metal and chlorine gas:



The energy is supplied in the form of sunlight.

- c) When acidified water is electrolyzed, it decomposes to form hydrogen and oxygen:



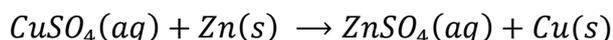
The energy is supplied in the form of electricity.

Q13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.

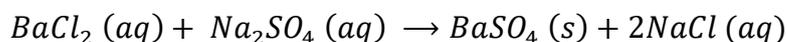
Answer:

In a displacement reaction, a more reactive element displaces a less reactive element from its compound whereas in a double displacement reaction, two compounds combine to form two new compounds.

- i) A displacement reaction takes place between copper sulphate solution and zinc to form zinc sulphate solution and copper:

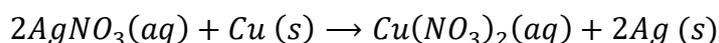


- ii) A double displacement reaction takes place between barium chloride and sodium sulphate solution to form a white precipitate of barium sulphate and sodium chloride solution:



Q14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.

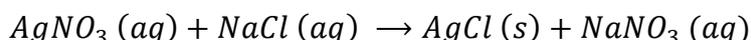
Answer:



Q15. What do you mean by precipitation reaction? Explain by giving example.

Answer:

Any reaction in which an insoluble solid (called precipitate) is formed that suddenly separates from the solution, is called a precipitation reaction. The reaction between silver nitrate solution and sodium chloride solution to form silver chloride precipitate is an example of a precipitation reaction:



In this reaction, silver chloride is formed as a white, insoluble solid which separates out suddenly from the solution.

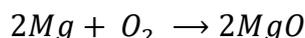
Q16. Explain the following in terms of gain or loss of oxygen with two examples each:

- a) Oxidation
- b) Reduction

Answer:

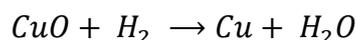
a) Oxidation is gain of oxygen by a substance in a reaction.

- i) When magnesium is burned in air, then magnesium is formed:



In the reaction, magnesium (Mg) has gained oxygen to form magnesium oxide (MgO), so magnesium oxidized to magnesium oxide.

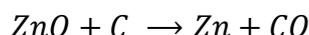
- ii) When copper oxide react with hydrogen, copper metal with water are formed:



In this reaction, hydrogen is gaining oxygen to form water, so hydrogen is getting oxidized to water.

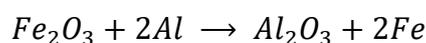
b) Reduction is loss of oxygen by a substance in a reaction.

- i) When zinc oxide is heated with carbon, then zinc metal and carbon monoxide are formed:



In this reaction, Zinc oxide (ZnO) is losing oxygen to form zinc metal (Zn), therefore, zinc oxide is reduced to zinc.

- ii) When iron (III) oxide is heated with aluminum powder, then aluminum oxide and iron metal are formed:



In this reaction, iron (III) oxide (Fe_2O_3) is losing oxygen to form iron metal (Fe), therefore, iron (III) oxide is reduced to iron.

Q17. A shiny brown colored element X on heating in air becomes black in color. Name the element X and the black colored compound formed.

Answer:

- i) The brown element X is copper metal (Cu).
ii) When copper metal is heated in air, it forms a black compound copper oxide or copper (II) oxide, CuO .

Q18. Why do we apply paint on iron articles?

Answer:

Paint is applied on iron articles to prevent their rusting as air and moisture cannot come in contact with the iron metal of the article.

Q19. Oil and fat containing food items are flushed with nitrogen. Why?

Answer:

The plastic bags containing oil and fat containing food item are flushed with an unreactive gas nitrogen so as to prevent them from getting oxidized and turn rancid, because in the presence of oxygen of air, the fats and oils present in food item get oxidizing forming products having unpleasant smell and taste which turn the foods rancid. When air containing oxygen is replaced by unreactive nitrogen gas, the packed food item do not gets spoiled. They remain fresh for a much longer time.

Q20. Explain the following terms with one example each:

- a) Corrosion**
- b) Rancidity**

Answer:

- a) Corrosion is the process in which metals are eaten up gradually by the action of air, moisture or a chemical on their surface. For example: Rusting of iron. Rusting involves unwanted oxidation of iron metal which occurs in nature on its own. When an iron object is exposed to damp air, it gets covered into red-brown substance called 'rust'. The corrosion of iron is a continuous process which, if not prevented in time, eats up the whole iron object.
- b) Rancidity: oxidation has damaging effect on foods containing fats and oils. When the food materials prepared in fats and oil are kept for a long time, they give unpleasant smell and taste is called rancidity. Rancidity spoils the food materials prepared in fats and oil which makes them unfit for eating. Example: if potatoes chips prepared in oil are kept exposed to air for a long time, they start giving unpleasant smell and taste due to the oxidation of oil present in them. The potato chips turn rancid and become unfit for eating.