SpeedLabs

Science

CBSE 10th

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Chemical Reactions and Equations Exercise

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

$2PbO_{(s)} + C_{(s)} \rightarrow 2Pb_{(s)} + CO_{2(g)}$

(a) Lead is getting reduced.

(b) Carbon dioxide is getting oxidised.

(c) Carbon is getting oxidised.

(d) Lead oxide is getting reduced.

(i) (a) and (b) (ii) (a) and (c)

(iii) (a), (b) and (c) (iv) all

Ans. (i) (a) and (b)

2. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$.The above reaction is an example of a

(a) Combination Reaction. (b) Double Displacement Reaction.

(c) Decomposition Reaction. (d) Displacement Reaction.

Ans. (d) The given reaction is an example of a displacement reaction.

3. 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.

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

$Fe_{(s)} + 2HCl_{(aq)} \rightarrow FeCl_{2(aq)} + H_2 \uparrow$

4. what is balanced chemical equation? Why should chemical equations be balanced?

Ans. A reaction which has an equal number of atoms of all the elements on both sides of the chemical equation is called a balanced chemical equation.

The law of conservation of mass states that mass can neither be created nor destroyed. Hence, in a chemical reaction, the total mass of reactants should be equal to the total mass of the products. It means that the total number of atoms of each element should be equal on both sides of a chemical equation. Hence, it is for this reason that chemical equations should be balanced.

5. 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.

Ans. (a) $3H_{2(g)} + N_{2(g)} \rightarrow 2NH_{3(g)}$

(b) $2H_2S_{(g)} + 3O_{2(g)} \rightarrow 2H_2O_l + 2SO_{2(g)}$

(c) $3BaCl_{2(aq)} + Al_2(SO_4)_{3(aq)} \rightarrow 2Alcl_{3(aq)} + 3BaSO_{4(s)}$

(d) $2K_{(s)} + 2H_2O_{(l)} \rightarrow 2KOH_{(aq)} + H_{2(g)}$

6. Balance the following chemical equations**.**

(a) $KNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c) $NaCl + agNO_3 \rightarrow AgCi + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Ans. (a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

(c) $NaCl\ | + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

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

(a) Calcium hydroxide + Carbon dioxide → Calcium carbonate + Water

(b) Zinc + Silver nitrate → Zinc nitrate + Silver

(c) Aluminium + Copper chloride → Aluminium chloride + Copper

(d) Barium chloride + Potassium sulphate → Barium sulphate +Potassium chloride

Ans. (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) $BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

8. 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 $_{(g)}$

Ans. (a) $2KBr_{(aq)} + BaI_{2(aq)} \rightarrow 2KI_{(aq)} + BaBr_{2(s)}$; Double displacement reaction.

(b) $ZnCO_{3(s)} \rightarrow ZnO_{(s)} + CO_2$; Decomposition reaction

(c) $H_{2(g)} + Cl_{2(g)} \rightarrow 2HCl_{(g)}$; Combination reaction.

(d) $Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$; Displacement reaction

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

Ans. Chemical reactions that release energy in the form of heat, light, or sound are called exothermic reactions. Example. Mixture of sodium and chlorine to yield table salt

$$Na_{(s)} + \frac{1}{2}Cl_{2(s)} \rightarrow NaCl_{(s)} + 411kJ \text{ of energy}$$

In other words, combination reactions are exothermic.

Reactions that absorb energy or require energy in order to proceed are called endothermic reactions. For example. In the process of photosynthesis, plants use the energy from the sun to convert carbon dioxide and water to glucose and oxygen.

$$6CO_{2(g)} + 6H_2O_{\ell} \xrightarrow[\text{Glucose}]{\text{sunlight}} C_6H_{12}O_{6(aq)} + 6O_{2(g)}$$

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

Ans. Energy is required to support life. Energy in our body is obtained from the food we eat. During digestion, large molecules of food are broken down into simpler substances such as glucose. Glucose combines with oxygen in the cells and provides energy. The special name of this combustion reaction is respiration. Since energy is released in the whole process, it is an exothermic process.

$C_6H_{12}O_{6(aq)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)} + Energy$

Glucose Oxygen Carbon dioxide Water

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

Ans. Decomposition reactions are those in which a compound breaks down to form two or more substances. These reactions require a source of energy to proceed. Thus, they are the exact opposite of combination reactions in which two or more substances combine to give a new substance with the release of energy. Decomposition reaction. $AB + Energy \rightarrow A + B$

$$2H_2O_l \xrightarrow{\text{Electrolysis}} 2H_{2(g)} + O_{2(g)}$$

Combination reaction A + B → AB Energy.

$$2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_l + Energy$$

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

Ans. (a) Thermal decomposition.

$$2FeSO_{4(s)} \xrightarrow{\Delta} Fe_2O_{3(s)} + SO_{2(g)} + SO_{3(g)}$$

Ferrous suplhate Ferric oxide Sulphur dioxide Sulphur trioxide

(b) Decomposition by light.

$$2AgCl_{(s)} \xrightarrow{Light} 2Ag_{(s)} + Cl_{2(g)}$$

Silver chloride Silver Chlorine

(c) Decomposition by electricity.

$$2Al_2O_{3(aq)} \xrightarrow{Electricity} 4Al_{(s)} + 3O_{2(g)}$$

Aluminium oxide Aluminium Oxygen

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

Ans. In a displacement reaction, a more reactive element replaces a less reactive element from a compound.

A + BX → $AX + B$; where A is more reactive than B

In a double displacement reaction, two atoms or a group of atoms switch places to form new compounds.

AB + CD → $AD + CB$

For example. Displacement reaction.

$CuSO_{4(aq)} + Zn_{(s)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$

Double displacement reaction. $Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)} + 2NaCl_{(aq)}$

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

Ans. $2AgNO_{3(aq)} + Cu_{(s)} \rightarrow Cu(NO_3)_{2(aq)} + 2Ag_{(s)}$

Silver nitrate Copper Copper nitrate Silver

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

Ans. A reaction in which an insoluble solid (called precipitate) is formed is called a precipitation reaction.

For example.

$$Na_2CO_{3(aq)} + CaCl_{2(aq)} \rightarrow CaCO_{3(s)} + 2NaCl_{(aq)}$$

Sodium carbonate Calcium chloride Calcium carbonate Sodium chloride

In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction.

Another example of precipitation reaction is.

$$Na_2SO_{4(aq)} + BaCl_{2(aq)} \rightarrow BaSO_{4(s)} + 2NaCl_{(aq)}$$

Sodium sulphate Barium chloride Barium sulphate Sodium chloride

In this reaction, barium sulphate is obtained as a precipitate.

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

(a) Oxidation (b) Reduction

Ans. (a) Oxidation is the gain of oxygen.

For example.

(i) $\underbrace{CO_2 + H_2 \rightarrow CO + H_2O}_{\text{Addition of oxygen}-\text{oxidation}}$

(ii) $\underbrace{2Cu + O_2 \rightarrow 2CuO}_{\text{Gain of oxygen}-\text{oxidation}}$

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

(b) Reduction is the loss of oxygen.

For example.

(i) $\underbrace{CO_2 + H_2 \rightarrow CO}_{\text{Removalofoxygen}-\text{reduction}} + H_2O$

(ii) $\underbrace{CuO + H_2 \xrightarrow{\Delta} Cu + H_2O}_{\text{loss of oxygen}-\text{reduction}}$

In equation (i), CO_2 is reduced to CO and in equation (ii), CuO is reduced to Cu.

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

Ans. 'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved on heating copper is given below.

$2Cu + O_2 \xrightarrow{\text{Heat}} 2CuO$

(Shiny brown in colour) (Black in colour)

18. Why do we apply paint on iron articles?

Ans. Iron articles are painted because it prevents them from rusting. When painted, the contact of iron articles from moisture and air is cut off. Hence, rusting is prevented. So presence of air and moisture is essential for rusting to take place.