Chapter 1 Chemical Reactions and Equations

Question 1. Which of the following 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
Answer: (i) (a) and (b)

Question 2. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
The above reaction is an example of
(a) combination reaction.
(b) double displacement reaction.
(c) decomposition reaction.
(d) displacement reaction.
Answer: (d) displacement reaction.

Question 3. 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.
Answer: (a) Hydrogen gas and iron chloride are produced.

Question 4. What is balanced chemical equation? Why should chemical equations be balanced?
Answer: Balanced chemical equations means total number of

atoms of each element should be equal on both sides of the reaction in reactants and products. The reaction should be balanced because matter can neither be created nor be destroyed. The total mass of reactants should be equal to total mass of products i.e., mass of reactants = mass of product.

Question 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.
Answer: (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) $2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)T$

Question 6. Balance the following chemical equations.
(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$
(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$
Answer: (a) $2HNO_3(aq) + Ca(OH)_2\ (aq) \rightarrow Ca(NO_3)_2(aq) + 2H_2O(l)$
(b) $2NaOH(aq) + H_2SO_4(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$
(c) $NaCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NaNO_3(aq)$
(d) $BaCl_2(aq)\ H_2SO_4(aq) \rightarrow BaSO_4(s) + 2HCl(aq)$

Question 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
Answer: (a) $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$
(b) $Zn(s) + 2AgNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + 2Ag(s)$
(c) $2Al(s) + 3CuCl_2(aq) \rightarrow 2AlCl_3(aq) + 3Cu(s)$
(d) $BaCl_2(aq) + K2SO_4(aq) \rightarrow BaSO_4(s) + 2KCl(aq)$

Question 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)
Answer: (a) $2KBr(aq) + BaI_2(aq) \rightarrow 2KI(aq) + BaBr_2(s)$
(b) $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$
(c) $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$
(d) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

Question 9. What does one mean by exothermic and endothermic reactions? Give examples.
Answer: Exothermic: Those reactions in which heat is evolved are called exothermic reaction. Heat symbol A is shown at product side.

Example: $C(s) + O_2(g) \rightarrow CO_2(g) + \Delta$
Endothermic: Those reactions in which heat is absorbed are called endothermic reaction. Heat symbol A is shown at reactant side.

Example: $CaCO_3(s) + \Delta \rightarrow CaO(s) + CO_2(g)$

Question 10. Why is respiration considered as exothermic reaction? Explain.
Answer:

1. In respiration glucose gets oxidized to form carbon dioxide, water and heat is evolved
2. As heat energy is released during respiration it is regarded as exothermic reaction.

Question 11. Why are the decomposition reactions called the opposite of combination reactions? Write equations for these reactions.
Answer: In decomposition reaction, single compound is broken down into simpler compounds or elements.

Example: $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$
In combination reaction, two or more elements or compounds combine to form a single new compound.

Example: $CO_2(g) + CaO(s) \rightarrow CaCO_3(s)$
$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$
Hence the decomposition and combination are opposite to each other.

Question 12. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity.
Answer: In decomposition reaction, a compound is broken down into simpler compounds or elements
Example:

$$\text{Heat} \longrightarrow CaCO_3(s) \xrightarrow{\text{heat}} CaO(s) + CO_2(g)$$

$$\text{Light} \longrightarrow 2AgBr(s) \xrightarrow{\text{sunlight}} 2Ag(s) + Br_2(g)$$

$$\text{Electricity} \longrightarrow 2H_2O(l) \xrightarrow[\text{current}]{\text{electric}} 2H_2(g) + O_2(g)$$

Question 13. What is the difference between displacement and double displacement reactions? Write equations for these reactions.
Answer: In displacement reaction more reactive metal can displace a less reactive metal from its salt solution.

Example: $Zn(s) + CuCl_2(aq) \rightarrow ZnCl_2(aq) + Cu(s)$
In double displacement reaction, two different compounds exchange their ions and
form new compounds.

Example: $NaOH + HCl \rightarrow NaCl + H_2O$

Question 14. In the refining of silver, the recovery of silver from silver nitrate solution involved displacement by copper metal. Write down the reaction involved.
Answer: $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

Question 15. What do you mean by precipitation reaction? Explain it by giving examples.
Answer: Those reactions in which reactants react to form an insoluble compound, i.e. precipitate are called precipitation reactions.
Example:

$$AgNO_3(aq) + NaCl(aq) \longrightarrow \underset{\text{(white ppt.)}}{AgCl(s)} + NaNO_3(aq)$$

Question 16. Explain the following in terms of gain or loss of oxygen with two examples each.
(a) Oxidation
(b) Reduction
Answer: (a) Oxidation: It is a process in which gain of oxygen takes place or loss of hydrogen takes place.
Example:

$$2Mg(s) + O_2(g) \xrightarrow{\text{Burning}} 2MgO(s) \text{ (Mg is oxidized to MgO).}$$

$$2Cu(s) + O_2(g) \xrightarrow{\text{Heat}} 2CuO(s) \text{ (Cu is oxidised to CuO)}$$

(b) Reduction: It is a process in which loss of oxygen takes place or gain of hydrogen takes place.
Example:

$$CuO(s) + H_2(g) \xrightarrow{\text{Heat}} Cu(s) + H_2O(g) \text{ (CuO is reduced to form Cu).}$$

$$ZnO(s) + C(s) \xrightarrow{\text{Heat}} Zn(s) + CO(g) \text{ (ZnO is reduced to Zn)}$$

Question 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.
Answer: X is a copper metal, on heating in air it gets oxidized to form CuO which is black in colour.

$$2Cu(s) + O_2(g) \xrightarrow{\text{Heat}} 2CuO(s)$$

Question 18. Why do we apply paint on iron articles?
Answer: We apply paint on iron articles so as to prevent it from rusting. When the surface of iron is coated with paint, its surface does not come in contact with oxygen and moisture, therefore, rusting does not take place.

Question 19. Oil and fat containing food items are flushed with nitrogen. Why?
Answer: The food items containing oil and fat are flushed with nitrogen because oil and fat become rancid on oxidation which has the bad taste and smell. The nitrogen flushing prevents the oxidation of food so that it does not become rancid.

Note: (Food is kept in refrigerator so as to reduce the temperature which slows down the rate of oxidation and preserve the food for longer time).

Question 20. Explain the following terms with one example each.
(a) Corrosion
(b) Rancidity
Answer: (a) Corrosion: It is a process in which metal reacts with substances like moisture and gases present in atmosphere to form surface compounds. For example, iron reacts with oxygen in the presence of moisture and forms rust. Silver turns black due to formation of silver sulphide and copper turns green due to the formation of copper carbonate.

(b) Rancidity: It is a process in which food material gets spoiled when it comes in contact with oxygen. It leads to the change in taste and smell of food materials. For example, butter gets spoiled due to oxidation at room temperature if kept for a longer time, it becomes sour in taste and gives a foul smell. The product formed on oxidation of food is rancid and such a process is called rancidity.