Chemical Reactions and Equations: Exercise Questions

Q.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 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
Sol. (i) (a) and (b)

Q.2 $2Fe_2O_3+2Al \rightarrow Al_2O_3+2Fe$
The above reaction is an example of a
(a) combination reaction.
(b) Double displacement reaction.
(c) Decomposition reaction.
(d) Displacement reaction.
Sol. (d) Displacement reaction.

Q.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.
Sol. (a) Hydrogen gas and iron chloride are produced.

Q.4 What is a balanced chemical equation? Why should chemical equations be balanced?
Sol. A balanced chemical reaction is defined as when the number of atoms present in reactants is equal to the number of atoms present in products. According to the Law of conservation of mass, total mass of the elements present in the reactants will be equal to the total mass of the elements present in products. So, chemical equation should obey the law of conservation of mass, that's why a chemical equations should be balanced always.

Q.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 sulpur 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.
Sol. (a) $3H_2 + N_2 \rightarrow 2NH_3$
(b) $2H_2S + 3O_2 \rightarrow 2H_2O+2SO_2$
(c) $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$
(d) $2K + 2H_2O \rightarrow 2KOH + H_2$

Q.6 Balance the following chemical equations:
(a) $HNO3 + Ca(OH)2 \rightarrow Ca(NO3)2 + H2O$
(b) $NaOH + H2SO4 \rightarrow Na2SO4 + H2O$
(c) $NaCl + AgNO3 \rightarrow AgCl + NaNO3$
(d) $BaCl2 + H2SO4 \rightarrow BaSO4 + HCl$

Sol. (a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H2O$
(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$
(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

Q.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

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

Q.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)

Sol. (a) $2KBr(aq) + BaCl_2 \rightarrow 2Kl(aq) + BaBr_3(s)$
Double displacement reaction.

(b) $ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$
Decomposition reaction.

(c) $H_2(g) + Cl_2 \rightarrow 2HCl(g)$
Combination reaction.

(d) $Mg(s) + 2HCl(aq) \rightarrow MgCl_2 + H_2(g)$
Displacement reaction.

Q.9 What does one mean by exothermic and endothermic reactions? Give examples.
Sol. **Exothermic reaction:** A chemical reaction in which energy is released is called the exothermic reaction. Example: Burning of fuel, nuclear fission and fusion.
Endothermic reaction: A chemical reaction in which energy in form of heat is absorbed is called endothermic reaction. Example: Photosynthesis, melting of ice.

Q.10 Why is respiration considered an exothermic reaction? Explain.
Sol. In the process of respiration, glucose is converted into carbon dioxide, water and energy. This energy is used to do our daily activities and life process. That's why it is considered as an exothermic reaction. Respiration reaction is:

$$C_6H_{12}O_6(aq) + 6O_2 \rightarrow 6CO_2(aq) + 6H_2O(I) + Energy$$

Q.11 Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.
Sol. In a combination chemical reaction two or more compounds are combined to form new compound while in the decomposition chemical reaction one compound broken down into two or more compounds. Both chemical reactions are opposite to each other. Thus, the decomposition reactions are called opposite of combination reactions.

$CaCO_3$ (s) ----------> CaO (s) + CO_2 (s): Decomposition reaction
$2HgO$---------> $2Hg + O_2$: Combination Reaction

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

Sol. Decomposition Reactions:

(a) The reaction in which energy is supplied in form of heat:

$$2KClO_3 \xrightarrow{\text{Heat}} 2KCl + 3O_2$$

(b) The reaction in which energy is supplied in form of light:

$$2AgCl\ (s) \xrightarrow{\text{Sunlight}} 2Ag\ (s) + Cl_2\ (g)$$

(C) The reaction in which energy is supplied in form of Electricity:

$$2NaCl \xrightarrow{\text{Electricity}} 2Na + Cl_2$$

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

Sol. A chemical reaction in which a more reactive element displaces a less reactive element from its salt solution, then this reaction is called displacement reaction. On the other hand, there is an exchange of ions between the compounds of reactants to form new substances, then this reaction is called double displacement reaction.

Displacement reaction:

$$Zn\ (s) + CuSO_4\ (aq.) \rightarrow ZnSO_4\ (aq.) + Cu\ (s)$$

Double displacement reaction

$$Na_2SO_4\ (aq) + BaCl_2\ (aq) \rightarrow BaSO_4\ (s) + 2NaCl\ (aq)$$

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

Sol. The reaction for the recovery of silver from silver nitrate solution involved displacement by copper metal:

$$2AgNO_3\ (aq.) + Cu\ (s) \rightarrow Cu\ (NO_3)_2 (l) + 2Ag\ (s)$$

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

Sol. ***A*** Reaction in which insoluble salts is formed are called precipitation reactions. Generally insoluble salts are settled down as precipitate.

$$Na_2SO_4\ (aq.) + BaCl_2\ (aq.) \rightarrow BaSO_4\ (s) + 2NaCl\ (aq.)$$

In this reaction, sodium sulphate reacts with barium chloride, a insoluble white precipitate of barium sulphate is formed along with the sodium chloride.

Q.16 Explain the following in terms of gain or loss of oxygen with two examples each.
(a) Oxidation (b) Reduction

Sol. Oxidation: In a chemical reaction, when a substance adds oxygen or loses hydrogen, it is that the substance is oxidized. This reaction is called oxidation.

$$Na + O_2 \text{ ----------> } Na_2O$$

In this reaction Sodium adds oxygen and hence is oxidized.

Reduction: In a chemical reaction, when a substance loses oxygen or gains hydrogen, it is that the substance is reduced. This reaction is called reduction.

$$CuO + H_2 \rightarrow Cu + H_2O$$

In this reaction copper loses oxygen, and hence called is reduced.

Q.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.

Sol. Here, X is copper (Cu) element. It is a brown coloured shiny element. On heating this in air, it becomes black in colour due to formation of copper oxide (CuO).

$$2Cu + O_2 \rightarrow 2CuO$$

Hence, black coloured compound formed is copper oxide (CuO).

Q.18 Why do we apply paint on iron articles?

Sol. Paint prevents the iron articles to come in contact with moisture present in the air. Because when iron articles come in contact with the moisture present in the air, it forms iron oxide, which is rust. Hence, paint prevents the iron to get rusted.

Q.19 Oil and fat containing food items are flushed with nitrogen. Why?

Sol. ***The*** food items containing oil and fat are flushed with nitrogen which prevents them to get oxidized and becoming rancid.

Q.20 Explain the following terms with one example each.
(a) Corrosion (b) Rancidity

Sol. **(a) Corrosion:** When metals react with oxygen and moisture present in atmosphere and form metal oxides. In due course of time, finally the whole metal is lost due to oxidation. This process is called corrosion.
Example: When iron articles are exposed to moist air for a long period of time, their surface tends to rust because of oxidation. Rust is mainly hydrated iron (III) oxide [$Fe_2O_3.xH_2O$].

$$4Fe + 3O_2 + 2x\ H_2O \text{ ----------> } 2\ Fe_2O_3.xH_2O$$

(b) Rancidity: When fats and oils containing food items are oxidised, their smell and taste change. This process is called rancidity.

Example: When packets of potato chips or namkeens are kept open for a long time, their taste and smell change. The open oily food is no longer safe to eat.