**In-text questions set 1** **Page number – 6**

**1. Why should a magnesium ribbon be cleaned before burning in air?**
**Solution:**
Magnesium rubber should be cleaned before burning in air because Magnesium metal reacts with the atmospheric oxygen and forms Magnesium Oxide (MgO) layer which is a very stable compound. In order to prevent further reactions with Oxygen, it is therefore necessary to clean the ribbon by to remove the layer of MgO.

**2. Write a balanced equations for the following chemical reactions.**

**i) Hydrogen + Chloride —-> Hydrogen chloride**

**ii) Barium chloride + Aluminium sulphate —-> Barium sulphate + Aluminium chloride**

**iii) Sodium + Water —-> Sodium hydroxide + Hydrogen**

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

**3. Write a balanced chemical equation with state symbols for the following reactions**

**i) Solutions of Barium chloride and Sodium sulphate in water react to give insoluble Barium sulphate and solution of Sodium chloride.**

**ii) Sodium hydroxide solution in water reacts with hydrochloric acid solution to produce Sodium chloride solution and water.**

**Solution:**
i) $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$
ii) $NaOH + HCl \rightarrow NaCl + H_2O$

**Intext questions set 2** **Page number - 10**

**1. A solution of a substance 'X' is used for whitewashing.**
**(i) Name the substance 'X' and write its formula.**
**(ii) Write the reaction of the substance 'X' named in (i) above with water.**
**Solution:**
i)The substance 'X' which is used in whitewashing is quick lime or **Calcium Oxide** and its formula is **CaO**.
ii)
$CaO + H_2O \rightarrow Ca(OH)_2$

**2. Why is the amount of gas collected in one of the test tubes in Activity 1.7 double of the amount collected in the other? Name this gas**
**Solution:**

In activity 1.7, gas collected in one of the test tubes is double of the amount collected in the other because water gets hydrolysed to release H2 and O2 gas. Here, after electrolysis two molecules of Hydrogen and one molecule of oxygen gas is released, hence the amount of Hydrogen collected would be double than that of oxygen.

**In-text questions set 3** **Page number – 13**

**1. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?**
**Solution:**
When an iron nail dipped in the copper sulphate solution, iron displaces copper from the copper sulphate because iron is more reactive than copper. Therefore the colour of the copper sulphate solution changes. The reaction is:
$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

**2. Give an example of a double displacement reaction other than the one given in Activity 1.10.**
**Solution:**
Reaction Between silver nitrate ($AgNO_3$) and Sodium chloride (NaCl) is an example of double displacement reaction. Here Silver donates its ion to Sodium chloride ion and pick up nitare ion to form silver chloride and sodium Nitrate
$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

**3. Identify the substances that are oxidized and that are reduced in the following equation.**
**i)** $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$
**ii)** $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$
**Solution:**
The Sodium (Na) in the first equation is getting oxidized with the addition of Oxygen ($O_2$) and the Copper (Cu) in the second equation is reduced due to the addition of Hydrogen ($H_2$)

**Exercise Questions** **Page number - 14-16**

**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**
**Solution:**
(i) (a) and (b)
Explanation: (a) because Oxygen is being removed and (b) because the removed oxygen from Lead is

added to the elemental Carbon.

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

1. **Combination reaction.**
2. **Double displacement reaction.**
3. **Decomposition reaction.**
4. **Displacement reaction.**

**Solution:**
Answer is 4. Displacement reaction.
Explanation: The Oxygen from the Ferrous oxide is getting displaced to the Aluminium metal to form Aluminium Oxide. In this reaction Aluminum is more reactive metal than Fe. Therefore Al will displace Fe from its oxide. This type of chemical reactions in which one of the elements displace another is called displacement reaction. Here less reactive metal is displaced by more reactive metal. Since one-time displacement is occurring, therefore, it is called a single displacement reaction.

**3. What happens when dilute hydrochloric acid is added to iron fillings? Tick the correct answer.**

1. **Hydrogen gas and Iron chloride are produced.**
2. **Chlorine gas and Iron hydroxide are produced.**
3. **No reaction takes place.**
4. **Iron salt and water are produced.**

**Solution:**

1. Hydrogen gas and Iron chloride are produced.

Explanation: The Chlorine from Hydrogen chloride is displaced by the Iron fillings to undergo the following reaction.
$2HCl + Fe \rightarrow FeCl_2 + H_2$

**4. What is a balanced chemical equation? Why should a chemical equation be balanced?**
**Solution:**
A balanced equation is the one in which number of different atoms on both the reactant and product sides are equal. Balancing chemical equation is necessary for the reaction should obey The Law of Conservation of energy. Balancing the chemical equation has no defined method and is purely a trial and error attempt.

**5. Translate the following statements into chemical equations and 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.**
**Solution:**
(a) Unbalanced: $H_2 + N_2 \rightarrow NH_3$
Balanced: $3H_2 + N_2 \rightarrow 2NH_3$

(b) Unbalanced: $H_2S + O_2 \rightarrow H_2O + SO_2$
Balanced: $2H_2S + 3O_2 \rightarrow 2H_2O + 2SO_2$

(c) Unbalanced:
$BaCl_2 + Al_2(SO_4)_3 \rightarrow AlCl_3 + BaSO_4$
Balanced: $3BaCl_2 + Al_2(SO_4)_3 \rightarrow 2AlCl_3 + 3BaSO_4$

(d) Unbalanced: $K + H_2O \rightarrow KOH + H_2$
Balanced: $2K + 2H_2O \rightarrow 2KOH + H_2$

**6. Balance the following chemical equations.**
**(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$**
**(b) $NaOH + H_2SO_4 \rightarrow Na2SO4 + H2O$**
**(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$**
**(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$**
**Solution:**
(a) $2HNO_3 + 2Ca(OH)_2 \rightarrow 2Ca(NO_3)_2 + 2H_2O$
(b) $6NaOH + 3H_2SO_4 \rightarrow H_2SO_4 + 6H_2O$
(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$
(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

**7. Write the balanced chemical equation for the following reactions.**
**Calcium hydroxide + Carbon dioxide —-> Calcium carbonate + Water**
**Zinc + Silver nitrate —-> Zinc nitrate + Silver**
**Aluminium + Copper chloride —-> Aluminium chloride + Copper**
**Barium chloride + Potassium sulphate —-> Barium sulphate + Potassium chloride**
**Solution:**
$2Ca(OH)_2 + 2CO_2 \rightarrow 2CaCO_3 + 2H_2O$
$Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$
$2Al + 3CuCl_3 \rightarrow 2AlCl_3 + 3Cu$
$BaCl_2 + K_2SO_4 \rightarrow BaSO_4 + 2KCl$

**8) Write a balanced chemical equation for the following and identify the type of reaction of each case**
**$KBr + BaI_2 \rightarrow KI + BaBr_2$**
**$ZnCO_3 \rightarrow ZnO + CO_2$**
**$H_2 + Cl \rightarrow HCl$**
**$Mg + HCl \rightarrow MgCl_2 + H_2$**
**Solution:**
$2KBr + BaI_2 \rightarrow 2KI + BaBr_2$ (Double Displacement Reaction)
$ZnCO_3 \rightarrow ZnO + CO_2$ (Decomposition Reaction)
$H_2 + Cl \rightarrow 2HCl$ (Combination Reaction)
$Mg + 2HCl \rightarrow MgCl_2 + H2$ (Displacement Reaction)

**9) What is meant by exothermic and endothermic reactions? Give examples.**
**Solution:**

An endothermic reaction occurs when energy is absorbed from the surroundings in the form of heat.(Example: Photosynthesis, melting of ice, evaporation). Conversely, an exothermic reaction is one in which energy is released from the system into the surroundings. (Example: Explosions, concrete setting, nuclear fission and fusion).

**10. Why is respiration considered to be an exothermic reaction?**
**Solution:**
For the survival of life, we require energy. We obtain this energy from the food we eat. The food molecules, through the process of digestion, is broken down into a simpler molecule like glucose. These substances come in contact with the Oxygen present in our body cells to form Carbon dioxide and water along with a certain amount of energy (Respiration process). Since the energy is in the form of heat (that maintains our body temperature) the respiration is considered to be an exothermic reaction. The reaction taking place is:
$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + Energy$

**11. Why are decomposition reactions called the opposite of Combination reactions? Write equations for decomposition reactions.**
**Solution:**
Combination reaction is said to be the reaction between two or more molecules to form a larger molecule; whereas the decomposition reaction is defined as the splitting of larger molecules into two or more smaller molecules. This essentially explains that the decomposition reaction is the opposite of the combination reaction.
In most of the cases the decomposition reaction is endothermic since heat from the surrounding or induced heat is used to break the bonds of the larger molecule. Few examples of decomposition reactions are:
$ZnCO_3 \rightarrow ZnO + CO_2$
$CaCO_3 + Energy \rightarrow CaO + CO_2$
$2HgO \rightarrow 2Hg + O_2$

**12. Write one equation each for decomposition reactions in which energy is supplied in the form of heat, light or electricity.**
**Solution:**
(a) Thermal decomposition reaction (Thermolysis)
Decomposition of potassium chlorate: When heated strongly, potassium chlorate decomposes into potassium chloride and oxygen. This reaction is used for the preparation of oxygen.
$2KClO_3 + Heat \rightarrow 2KCl + 3O_2$

(b) Electrolytic decomposition reaction (Electrolysis)
Decomposition of sodium chloride: On passing electricity through molten sodium chloride, it decomposes into sodium and chlorine.

$$2NaCl \xrightarrow{electricity} 2Na + Cl_2$$

(c) Photodecomposition reaction (Photolysis)
Decomposition of hydrogen peroxide: In the presence of light, hydrogen peroxide decomposes into

water and oxygen.

$$2H_2O_2 \xrightarrow{light} 2H_2O$$

**13. What is the difference between displacement and double displacement reactions? Write relevant equations for the above.**
**Solution:**
A displacement reaction is the one when a more reactive substance displaces a less reactive one from its salt solution whereas a double displacement reaction is the one where a mutual exchange of ions happens between two compounds.
In a displacement reaction, only a single displacement takes place whereas in the double displacement reaction, as the name suggests two displacement takes place between the molecules.
Example:
Displacement reaction
$Mg + 2HCl \rightarrow MgCl_2 + H_2$
Double displacement reaction
$2KBr + BaI_2 \rightarrow 2KI + BaBr_2$

**Q13) What is the difference between displacement and double displacement reactions? Write relevant equations for the above.**
**Solution:**
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Displacement reaction
$Mg+2HCl \rightarrow MgCl_2+H_2$

Double displacement reaction
$2KBr + BaI_2 \rightarrow 2KI + BaBr_2$

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

**15. What do you mean by a precipitation reaction? Explain by giving examples.**
**Solution:**
When two solutions containing soluble salts are combined, a double displacement reaction takes place in which the ions are exchanged between the compounds. When one of such compounds formed is in solid form (that is insoluble in aqua) then it settles down at the bottom of the container. This solid is known as the precipitate and the respective reaction is termed as the precipitation reaction. Few examples of precipitation reactions are:

$CdSO_4(aq) + K_2S(aq) \rightarrow CdS(s) + K_2SO_4(aq)$
$2NaOH(aq) + MgCl_2(aq) \rightarrow 2NaCl(aq) + Mg(OH)_2(s)$

**16. Explain the following in terms of gain of oxygen with two examples each.**
**(a) Oxidation**
**(b) Reduction**
**Solution:**
(a) In a chemical reaction, when the oxygen is added to the element to form its respective oxide it is the element being oxidised. Example:
$4Na(s) + O_2(g) \rightarrow 2Na2O(s)$
$H_2S + O_2 \rightarrow H_2O + SO_2$

(b) In a chemical reaction, when the oxygen is being removed from the compound then it is said to be reduced. Example:
$CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$
$2HgO \rightarrow 2Hg + O_2$

**17. A shiny brown coloured element 'X' on heating in the air becomes black in colour. Name the element 'X' and the black coloured compound formed.**
**Solution:**
The shiny brown coloured element is the Copper metal (Cu). When the metal is heated in air, it reacts with atmospheric oxygen to form copper oxide. Hence the black coloured compound is the copper oxide.
$2Cu(s) + O_2(g) \rightarrow 2CuO(s)$

**18) Why do we apply paint on iron articles?**
**Solution:**
Iron articles are painted to prevent them from rusting. When left unpainted, the metal surface comes in contact with the atmospheric oxygen and in the presence of moisture it from Iron(III) oxide. But if painted the surface does not come in contact with moisture and air thus preventing Rusting.

**19) Oil and Fat containing food items are flushed with Nitrogen. Why?**
**Solution:**
The main purpose of flushing Nitrogen into food packets that contain oil and fat items is to prevent Rancidity which occurs when the oil or fat reacts with the oxygen letting out an unpleasant smell and taste. Therefore by flushing Nitrogen, an unreactive surrounding is created thus preventing rancidity.

**20) Explain the following terms with one example each.**
**(a) Corrosion**
**(b) Rancidity**
**Solution:**
(a) Corrosion is a process where a refined metal is oxidised by atmospheric oxygen to form a more stable compound such as oxides. The metal gradually degrades during the corrosion process. Rusting of iron is a good example of corrosion where the iron is converted to Iron oxide. Millions of dollars are spent annually in preventing rusting from bridges and other monuments.
(b) The condition produced by the aerial oxidation of the oil and fat present in the food material that

produces an unpleasant taste and smell. The rancidity is retarded when the food is kept inside the refrigerator since the low temperature does not promote the oxidation reaction.