**15th JUNE, 2020 JESUS AND MARY SCHOOL AND COLLEGE MODULE – 4**

**CLASS – 9**

**CHEMISTRY**

**CHAPTER – CHEMICAL CHANGES AND REACTIONS**

**CHARACTERISTICS OF CHEMICAL CHANGE:**

1. **Change of colour:** During a chemical change, a change in colour maybe noticed. Some examples of colour change are given in the table below:

|  |  |
| --- | --- |
| **REACTION**  | **COLOUR CHANGE** |
| * **Copper [II] Nitrate**

**2Cu(NO3)2** $\rightarrow $ **2CuO + 4NO2 + O2** | Blue – Copper [II] nitrate Black – Copper [II] oxide  |
| * **Lead [II] Nitrate**

**2Pb(NO3)2** $\rightarrow $ **2PbO + 4NO2 + O2** | White – Lead [II] nitrate Yellow – Litharge  |
| * **Copper Sulphate**

**CuSO4  + Fe** $\rightarrow $ **FeSO4 + Cu** | Blue – Copper sulphate Green – Ferrous sulphate |

1. **Evolution of a gas:** During a chemical change, gaseous products formed are escaped out. The table given below shows some reactions that involve formation of gaseous products:

|  |  |
| --- | --- |
| **REACTION OF** | **GAS EVOLVED** |
| * **Sodium sulphite with dilute sulphuric acid**

**Na2SO3 + H2SO4** $ \rightarrow $ **Na2SO4 + H2O + SO2** | **Sulphur dioxide** |
| * **Calcium carbonate with dilute hydrochloric acid**

**CaCO3 + 2HCl** $\rightarrow $ **CaCl2 + H2O + CO2** | **Carbon dioxide** |
| * **Ammonium chloride with calcium hydroxide**

**2NH4Cl + Ca(OH)2** $\rightarrow $ **CaCl2  + 2H2O + 2NH3** | **Ammonia** |

1. **Formation of precipitate:** During a chemical change, if the product formed is insoluble then it can be separated as precipitate. In a chemical reaction the insoluble compound formed as a product is shown by a downward arrow ($\downright $). The table given below are some examples in which precipitate is formed:

|  |  |
| --- | --- |
| **REACTION OF** | **PRECIPITATE FORMED** |
| * **Sodium chloride and silver nitrate**

**NaCl + AgNO3** $\rightarrow $ **NaNO3 + AgCl** $\downright $ | **Silver chloride – white precipitate** |
| * **Lead nitrate and sodium chloride**

**Pb(NO3)2 + 2NaCl** $\rightarrow $ **2NaNO3 + PbCl2** $\downright $ | **Lead Chloride – white precipitate** |
| * **Copper [II] sulphate and sodium hydroxide**

**CuSO4 + 2NaOH** $\rightarrow $ **Na2SO4  + Cu(OH)2** $\downright $ | **Copper [II] hydroxide – pale blue precipitate** |

**ENERGY CHANGES IN A CHEMICAL REACTION:**

The change in a chemical reaction is the difference between the chemical energy of the reactants and the products. A chemical change is associated with the evolution or absorption of energy which is required to break or form different bonds between the molecules of the reactants and products. This energy can be in the form of heat, light or electricity. Based on the chemical changes the chemical reactions can be of following types:

1. **Exothermic Reaction:** A chemical reaction which proceeds with the evolution of heat energy is called an exothermic reaction. This type of reaction can be sustained without supply of external energy. In a chemical reaction evolution of heat is indicated by **+**$∆$**T**. An exothermic reaction takes place when total sum of the heat content of the product is less than that of the reactants.

**EProduct** $<$ **EReactants**

**Hproduct** $<$ **HReactants**

**Where, H represents the heat content**

**Examples:**

**C + O2** $ \rightarrow $ **CO2 +** $∆$**T**

**N2 + 3H2** $\rightarrow $ **2NH3 +** $ ∆$**T**

1. **Endothermic Reaction:** A chemical reaction which proceeds with the absorption of heat energy is called an endothermic reaction. An endothermic reaction cannot be sustained without supply of external energy. In a chemical reaction absorption of heat is indicated by **-**$∆$**T**. An endothermic reaction takes place when total sum of the heat content of the product is greater than that of the reactants.

**EProduct** $>$ **EReactants**

**Hproduct** $>$ **HReactants**

**Where, H represents the heat content**

**Examples:**

**CaCO3** $→$ **CaO + CO2 –** $∆$**T**

**N2 + O2** $→$ **2NO –** $∆$**T**

1. **Photochemical Reaction:** A chemical reaction which proceeds with the absorption of light energy is called photochemical reaction. **Examples:**

**H2 + Cl2** $→$ **2HCl**

**4AgBr** $ →$ **2Ag2Br + Br2**

***(Silver salts decompose in the presence of sunlight; therefore they are kept in dark coloured bottles)***

1. **Electrochemical Reaction:** A chemical reaction which proceeds with the absorption of electrical energy is called electrochemical reaction. **Examples:**

**2H2O** $→$ **2H2 + O2**

 **(acidified)**

**2NaCl** $→$ **2Na + Cl2**

 **(fused)**

**BURNING OR COMBUSTION:**

The chemical change involving the combination of combustible substances with oxygen, leading to the formation of oxides with the evolution of large amount of energy in the form of heat and light is called burning or combustion.

**SOME TERMS RELATED TO COMBUSTION:**

1. **Combustible Substances:** The substances which can burn in air or oxygen are called combustible substances. Examples: coke, coal, wood etc.
2. **Non-combustible substances:** The substances which are unable to burn in air or oxygen are called non-combustible substances. Examples: sand, stone, chlorine etc.
3. **Supporter of Combustion:** The gaseous environment which supports the burning of a combustible substance by allowing oxidation to occur is called supporter of combustion. Examples: oxygen, chlorine, fluorine etc.
4. **Non-supporter of combustion:** The gaseous environment which does not permit the burning of a combustible substance by not allowing the oxidation to occur is called non-supporter of combustion. Examples: hydrogen, hydrogen chloride, carbon dioxide etc.
5. **Ignition Temperature:** The minimum temperature at which the combustible substance starts burning, i.e., it catches fire is called ignition temperature.

 **WORKSHEET 4**

1. **Name the gas evolved in each of the following reactions:**
2. Action of heat on calcium carbonate.
3. Ammonium dichromate is heated.
4. Ammonium chloride is reacted with calcium hydroxide.
5. Reaction of sodium sulphite with dilute sulphuric acid.
6. Reaction of calcium carbonate with dilute hydrochloric acid.
7. **Differentiate between the following with examples:**
8. Exothermic reaction and endothermic reaction
9. Photochemical reaction and electrochemical reaction
10. Synthesis reaction and decomposition reaction
11. Combustible substance and non-combustible substance
12. **Determine the colour changes or the colour of the precipitate in each of the following cases:**
13. Copper [II] nitrate is heated
14. Sodium chloride and silver nitrate are reacted together
15. Lead [II] nitrate is heated
16. Copper [II] sulphate and sodium hydroxide are reacted together
17. **Answer the following questions:**
18. Why are silver salts kept in dark coloured bottles?
19. What does **+**$∆$**T** indicates in a chemical reaction?
20. What is ignition temperature?

**NOTE: Please do all this work in your copies which will be checked when the school reopens. Please consider this important.**