

1. Any of the following **observations** helps us to determine whether a chemical reaction has taken place – i. Change in state, ii. Change in colour, iii. Evolution of a gas, iv. Change in temperature.

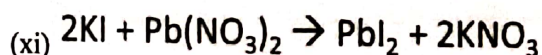
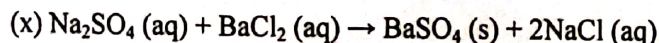
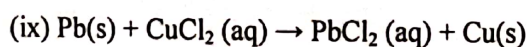
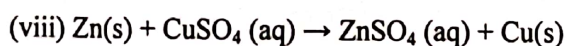
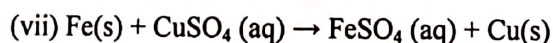
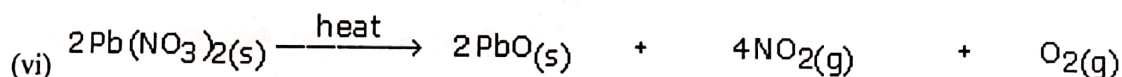
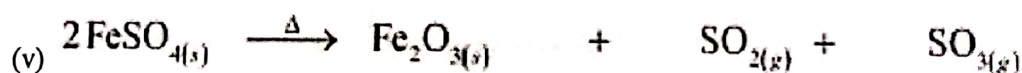
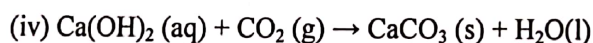
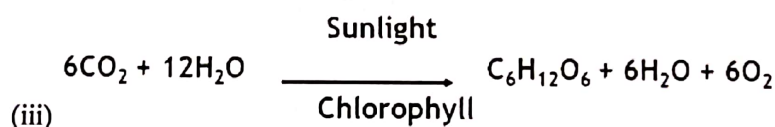
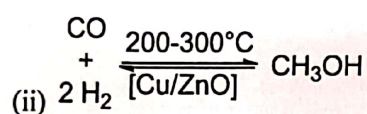
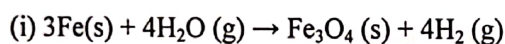
2. A complete chemical equation represents the reactants, products and their physical states symbolically.

2. A chemical equation is a skeletal chemical equation for a reaction which is unbalanced (because the mass is not the same on both sides of the equation) is called a **SKELETAL CHEMICAL EQUATION**.

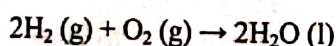
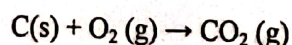
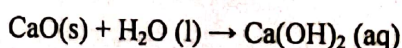
3. Mass can neither be created nor destroyed in a chemical reaction (**Law of Conservation of Mass**). That is, the total mass of the elements present in the products of a chemical reaction has to be equal to the total mass of the elements present in the reactants.

4. The number of atoms of each element should be the same, before and after a chemical reaction (Law of Conservation of Mass). Hence, **we need to balance** a skeletal chemical equation.

5. Some important chemical equations:



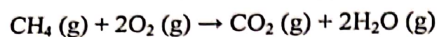
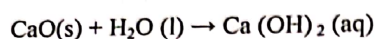
6. A reaction in which a single product is formed from two or more reactants is known as a **combination reaction**.



OR

When two or more substances (elements or compounds) combine to form a single product, the reactions are called **combination reactions**.

7. Reactions in which heat is released along with the formation of products are called **exothermic** chemical reactions.



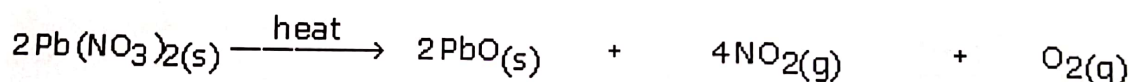
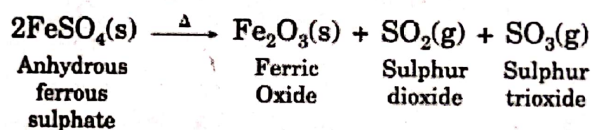
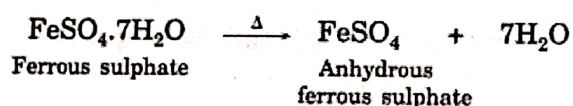
8. Respiration is an exothermic process: During digestion, food is broken down into simpler substances. For example, rice, potatoes and bread contain carbohydrates. These carbohydrates are broken down to form glucose. This glucose combines with oxygen in the cells of our body and provides energy. This reaction is called **RESPIRATION**.



NOTE: - The decomposition of vegetable matter into compost is also an example of an exothermic reaction.

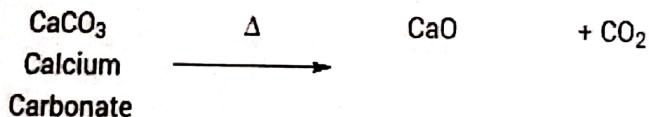
9. A reaction in which a single reactant breaks down to give simpler products is called **decomposition reaction**.

NOTE: - Ferrous sulphate crystals ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) lose water when heated and the colour of the crystals changes. It then decomposes to ferric oxide (Fe_2O_3), sulphur dioxide (SO_2) and sulphur trioxide (SO_3). Ferric oxide is a solid, while SO_2 and SO_3 are gases.

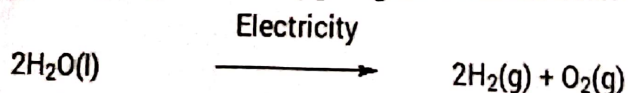


10. DECOMPOSITION-Types (Thermal, Photochemical & decomposition using electricity)

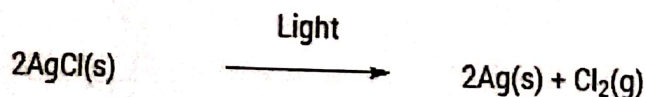
When calcium carbonate is heated, it decomposes to give calcium oxide and carbon dioxide:



When electric current is passed through acidified water, it decomposes to give hydrogen gas and oxygen gas. This reaction can be represented as:



When silver chloride is exposed to light, it decomposes to form silver metal and chlorine gas:



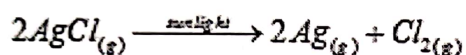
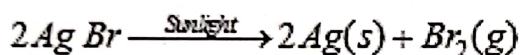
11. (i) Calcium oxide is called lime or quick lime. It has many uses – one is in the manufacture of cement.

(ii) When light green coloured crystals of ferrous sulphate are heated:

- a. it loses water of crystallisation
- b. it decomposes to ferric oxide (The colour of the crystals change from light green to brown).
- c. there is characteristic odour of burning sulphur.

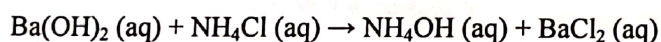
(iii) The decomposition of lead nitrate results in the emission of **brown fumes**. These fumes are of nitrogen dioxide (NO_2).

(iv) White/colourless silver chloride turns grey in sunlight. This is due to the decomposition of silver chloride into silver and chlorine by light (**PHOTOCHEMICAL DECOMPOSITION**).

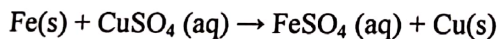


The above reactions are **used in** black and white photography.

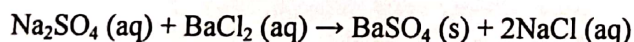
12. Reactions in which energy is absorbed are known as endothermic reactions.



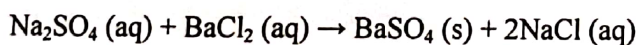
13. **Single displacement reaction** is a chemical reaction in which a more reactive element displaces a less reactive element from the aqueous solution of its compound.



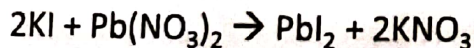
14. Reactions in which there is an exchange of ions between the reactants are called **double displacement reactions**.



15. An insoluble substance formed during a chemical reaction is called a **precipitate**.



$BaSO_4$ is a white substance (called a PRECIPITATE), which is insoluble in water.

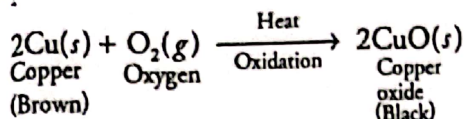


The precipitate of lead iodide has a yellow colour.

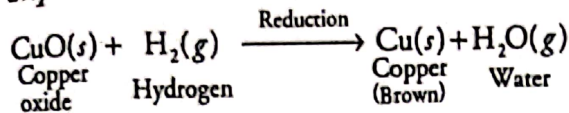
16. Precipitation reactions produce insoluble salts.

17. If a substance gains oxygen during a reaction, it is said to be oxidized. If a substance loses oxygen during a reaction, it is said to be reduced.

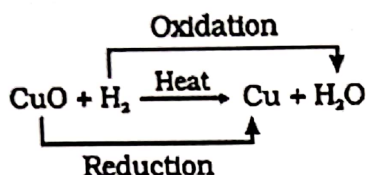
(i) **Step I. Combination reaction/oxidation reaction**



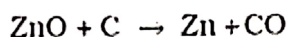
Step II Reduction reaction



18. **Redox reactions:** - In REDOX reactions, one reactant gets oxidized while the other gets reduced during a reaction.



Some other examples of redox reactions are:



In the two examples given above, carbon is oxidized to CO and ZnO is reduced to Zn in the first reaction. In the second reaction, HCl is oxidized to Cl₂ whereas MnO₂ is reduced to MnCl₂.

Note: - If a substance gains oxygen or loses hydrogen during a reaction, it is oxidized. If a substance loses oxygen or gains hydrogen during a reaction, it is reduced.

19. EFFECTS OF OXIDATION REACTIONS IN EVERYDAY LIFE

(i) Destruction of metals layer by layer in the presence of air & moisture is called **corrosion**. Examples,

Iron articles are shiny when new, but get coated with a **reddish brown powder** (RUST) when left for some time. This process is commonly known as **rusting of iron**. The *black coating on silver and the green coating on copper* are other examples of corrosion.

Corrosion causes damage to car bodies, bridges, iron railings, ships and to all objects made of metals, especially those of iron.

(ii) When fats and oils are oxidized, they become **rancid** and their smell and taste change.

Process of RANCIDITY can be slowed down by,

- adding substances which prevent oxidation (antioxidants) of foods containing fats and oil.
- keeping food in air tight containers, which helps to slow down oxidation.

Note: - Chips manufacturers usually flush bags of chips with gas such as nitrogen to prevent the chips from getting oxidized.