

CHEMICAL REACTIONS AND CHARACTERISTICS OF CHEMICAL REACTIONS

1. What is a chemical reaction?

Ans :- The process of chemical change in which the initial substances lose their nature and identity and form new substances having different properties, is called as a chemical reaction.

2. Give some examples of chemical reactions from your daily life.

Ans :-

- Souring of milk during summer.
- Cooking of food.
- Fermentation of grapes.
- Digestion of food in our body.
- Respiration.
- Rusting of iron tawa when exposed to humid atmosphere.

3. Why should a magnesium ribbon be cleaned before burning in air?

Ans :- The surface of magnesium ribbon is generally coated with a layer of magnesium oxide, because magnesium reacts slowly with atmospheric air when exposed to atmosphere. This layer hinders proper burning. So, to remove this layer, it is cleaned so as to expose pure magnesium to air to facilitate proper burning.

4. What do you mean by characteristics of a chemical reactions?

Ans :- Characteristics of a chemical reaction means those observations which indicate that a chemical reaction has taken place.

5. What are the different characteristics of a chemical reactions ?

Ans :-

- Change in colour.
- Change in state.
- Change in temperature.
- Evolution of gas.
- Formation of precipitate.

CHEMICAL EQUATION

6. What is a chemical equation?

Ans :- The short hand representation of a true chemical reaction in terms of symbols and formula of elements and compounds is called as a chemical reaction.

7. What do you mean by balanced chemical equation ?

Ans:- Balanced chemical equation: - If the number of each kind of atoms in the reactant side is equal to the number of corresponding atoms in the product side, then that reaction is called balanced chemical equation.

Ex: - $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

8. Why a chemical equation should be balanced?

Ans :- A chemical equation should be balanced, so as to **satisfy the law of conservation of mass.**

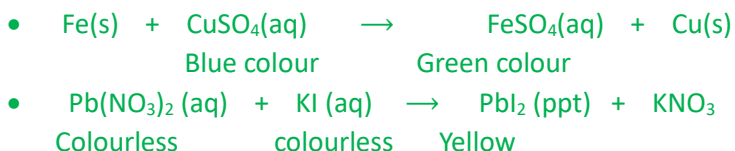
9. What are the different points that should be mentioned to make the equation more informative ?

Ans :- Physical states, Pressure, Temperature, Catalyst.

CHARACTERISTICS OF CHEMICAL REACTIONS

10. Give some examples of chemical reactions which are characterized by change in colour ?

Ans :-



11. Give some examples of chemical reactions which are characterized by change in state.

Ans :-

- Burning of Candel wax (solid) to give rise to carbon dioxide (gas) and Water vapour (Gas)
- $\text{CaCO}_3(\text{s}) \xrightarrow{\Delta} \text{CaO(s)} + \text{CO}_2(\text{g})$

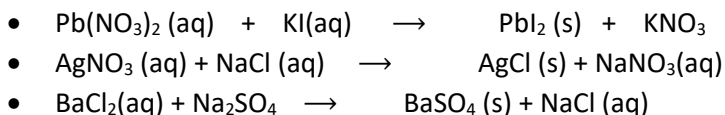
12. Give some examples of chemical reactions which are characterized by evolution of gas.

Ans :-



13. Give some examples of chemical reactions which are characterized by formation of precipitate.

Ans :-



14. Give some examples of chemical reactions which are characterized by more than one change.

Ans:-

- Change in state and change in temperature
 - Burning of candle wax
- Evolution of gas and change in temperature
 - $\text{Zn(s)} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$

TYPES OF CHEMICAL REACTIONS

15. What are the different types of chemical reactions?

Ans :-

- Combination reactions
- Decomposition reactions
- Displacement reactions
- Double displacement reactions
- Redox reactions

16. What is a combination reactions?

Ans :- The reactions in which two or more substances (elements or compounds) are combined together to form a single substance are called combination reactions.

17. What are the three types of combination reactions? Give two examples from each.

Ans :-

- Combination of elements with elements:-
 - $\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{Heat energy}$

- $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{Heat energy}$
- Combination of compounds with compounds:-
 - $\text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca}(\text{OH})_2(\text{aq})$
 - $\text{NH}_3(\text{g}) + \text{HCl}(\text{g}) \rightarrow \text{NH}_4\text{Cl}(\text{s})$
- Combination of elements with compounds:-
 - $2\text{CO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$
 - $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$

18. What are exothermic reactions? Give some examples of exothermic reactions.

Ans :- Those reactions in which heat energy is released are called exothermic reactions.

Examples:-

- Burning of natural gas:- $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) + \text{Heat energy}$
- Decomposition of vegetable matter
- Respiration:- $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq}) + 6\text{O}_2(\text{g}) \rightarrow 6\text{CO}_2(\text{aq}) + 6\text{H}_2\text{O}(\text{l}) + \text{Energy}$
(Glucose)

19. Why is respiration regarded as an exothermic reactions?

Ans :- In respiration, the simplified food substances like glucose($\text{C}_6\text{H}_{12}\text{O}_6$) is oxidized inside living cells to produce carbon dioxide (CO_2) water(H_2O) and energy. Since, in this reaction, energy is released , so, respiration is rightly called as an exothermic reaction.



20. What are decomposition reactions?

Ans :- Those reactions in which a single substance breaks down to form two or more substances are called decomposition reactions.

21. What are the different types of decomposition reactions?

Ans :- There are three types of decomposition reactions depending upon the agent which cause it.

- Thermal decomposition reaction
- Electrolytic decomposition reaction
- Photolytic decomposition reaction

22. What is a thermal decomposition reaction ? Give some examples.

Ans :- When a single substance breaks down to form two or more substances in the presence of heat, then that is called a thermal decomposition reaction.

- $\text{FeSO}_4 \xrightarrow{\Delta} \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$
- $\text{Pb}(\text{NO}_3)_2 \xrightarrow{\Delta} \text{PbO} + \text{NO}_2 + \text{O}_2$
- $\text{CaCO}_3(\text{s}) \xrightarrow{\Delta} \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$

23. What happens when lead nitrate $\text{Pb}(\text{NO}_3)_2$ is heated?

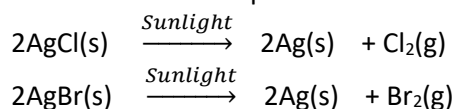
Ans :- When lead nitrate is heated it gives lead oxide(PbO), brown fumes of nitrogen dioxide(NO_2)and oxygen gas(O_2).



N.B:- Quick lime (CaO) is used in the manufacture of cement.

24. What is a photochemical decomposition reaction ?

Ans :- When a single substance breaks down to form two or more substances in the presence of light energy, then that is called a photochemical decomposition reaction.



N.B:-The above two reactions are used in black and white photography.

25. What is a double displacement reaction?

Ans :- Those reactions in which there is an exchange of ions when aqueous solutions of two ionic compounds react, are called double displacement reactions.

Examples:-

- $\text{BaCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{BaSO}_4(\text{ppt}) + \text{NaCl}(\text{aq})$
- $\text{AgNO}_3(\text{aq}) + \text{NaCl}(\text{aq}) \rightarrow \text{AgCl}(\text{ppt}) + \text{NaNO}_3(\text{aq})$
- $\text{NaOH}(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{NaCl}(\text{aq}) + \text{H}_2\text{O}$

N.B;- All Precipitation reactions are double displacement reactions but all double displacement reactions are not precipitation reactions.

26. What is an oxidation reaction?

Ans :- Oxidation reaction means addition of oxygen or removal of hydrogen.

Example:-

- $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ [Addition of Oxygen]
- $\text{H}_2\text{S} + \text{Cl}_2 \rightarrow \text{S} + 2\text{HCl}$ [Removal of Hydrogen]

27. What is a redox reaction?

Ans :- The reactions in which one substance undergoes oxidation and the other substance undergoes reduction simultaneously, are called redox reactions.

Examples:-

- $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ [Here H_2 undergoes oxidation and CuO undergoes reduction]
- $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$ [Here carbon undergoes oxidation and ZnO undergoes reduction]

28. Give an example of an oxidizing agent and reducing agent .

Ans :- $\text{MnO}_2 + \text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + \text{H}_2\text{O}$

Here MnO_2 is reduced to MnCl_2 , So it is an oxidizing agent. Similarly, HCl is oxidized to Cl_2 . So, it is a reducing agent.

OXIDATION REACTIONS IN DAILY LIFE (CORROSION AND RANCIDITY)

29. What is corrosion?

Ans :- The slow and gradual eating up of a metal on its surface by the action of air, moisture, acids, bases etc is called corrosion.

30. What is rusting? Write the formula of rust.

Ans :- The slow and gradual eating up of iron metal on its surface by the action of air and moisture is called rusting. The formula of rust is $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$. It is chemically Hydrated iron(III) Oxide and its colour is brown. Here x is a variable number.

31. What is rancidity?

Ans :- The unpleasant smell and taste produced in foods due to aerial oxidation of oils and fats contained in the oily food, is called rancidity.

32. How rancidity can be prevented?

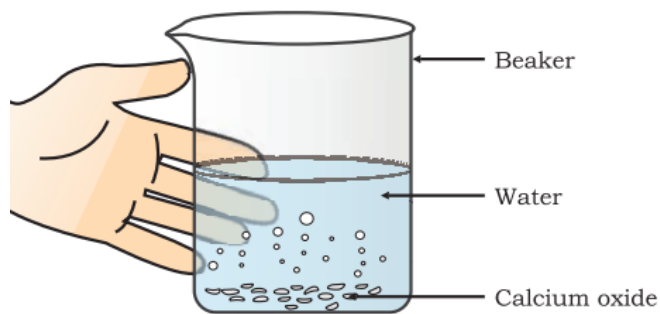
Ans :- Rancidity can be prevented by the following methods:-

- By keeping the oily food in air tight container.
- By packaging the oily food in an inert atmosphere like Nitrogen gas.
- By keeping the food in refrigerator.
- By adding anti-oxidants like BHA (Butylated Hydroxy Anisole) and BHT(Butylated Hydroxy Toluene) to the oily food.

PART-B
NCERT ACTIVITIES - [11]

ACTIVITY 1.4:- [CHARACTERISTICS OF CHEMICAL REACTIONS - Some reactions are exothermic]

Aim of activity:- Reaction of quick lime (CaO) With water.



Formation of slaked lime by the reaction of calcium oxide with water

Procedure :

- A small amount of calcium oxide or quick lime is taken in a beaker.
- Slowly add water is slowly added to this.

Observation :

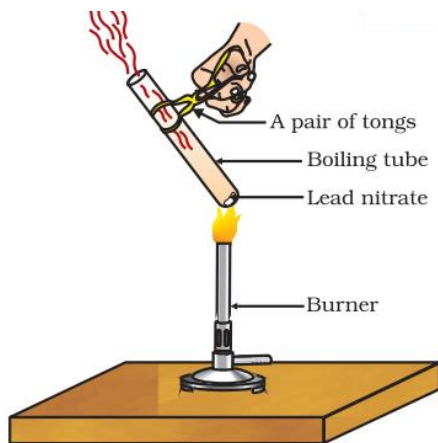
- When the beaker is touched, it feels hot.

Conclusion :

- When calcium oxide reacts with water, it produces heat. So, temperature is raised.

ACTIVITY 1.6:- [THERMAL DECOMPOSITION REACTION-2]

Aim of activity:- Decomposition of lead nitrate



*Figure 1.5
Heating of lead nitrate and
emission of nitrogen dioxide*

Procedure :

- About 2 g lead nitrate powder is taken in a boiling tube.
- The boiling tube is held with a pair of tongs and is heated over a flame.

Observation :

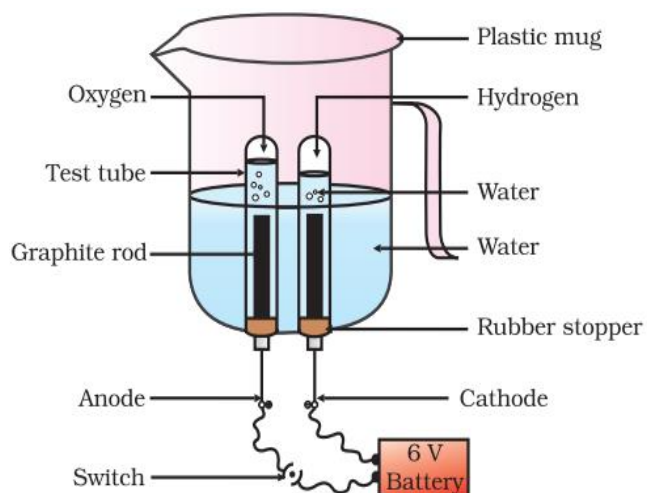
- It is observed that brown fumes are emitted.

Conclusion :

- Lead nitrate undergoes decomposition in the presence of heat giving rise to the formation of brown fumes of NO_2 and a yellow residue of Lead oxide.

ACTIVITY 1.7:- [ELECTROLYTIC DECOMPOSITION REACTION]

Aim of activity:- Electrolytic Decomposition of water by passing electric current

**Procedure :**

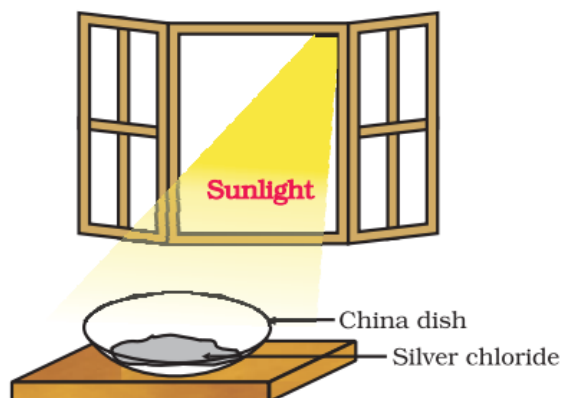
- A plastic mug having two holes at its base is taken and rubber stoppers are fitted in these holes.
- carbon electrodes are inserted in these rubber stoppers and these electrodes are connected to a 6 volt battery.
- The mug is filled with water having few drops of dilute sulphuric acid added to it such that the electrodes are immersed.
- Two test tubes filled with water are taken and are inverted over the two carbon electrodes.
- The current is then switched on and the apparatus is left undisturbed for some time.

Observation :

- Bubbles are formed at both the electrodes which displace water in the test tubes.
- The volume of the gas collected over cathode in one tube is double than that formed over anode in other.
- The gas with double volume burns with a pop sound indicating that it is hydrogen.
- The other gas supports burning which indicates that it is oxygen.
- Once the test tubes are filled with the respective gases, they are removed carefully and are tested one by one by bringing a burning candle close to the mouth of the test tubes.

Conclusion :

- Acidified water undergoes decomposition in the presence of electricity to produce hydrogen and oxygen in the ratio of 2:1 by volume.

ACTIVITY 1.8: - [PHOTOLYTIC DECOMPOSITION REACTION]**Aim of activity:- Decomposition reaction of AgBr****Procedure :**

- About 2 g silver chloride is taken in a china dish and its colour is noted.
- This china dish is then placed in sunlight for some time.

Observation :

- It is observed that the white colour crystals of silver chloride turns into grey colour in the presence of sunlight.

Conclusion :

- Silver chloride undergoes decomposition to give grey coloured silver along with liberation of chlorine gas.