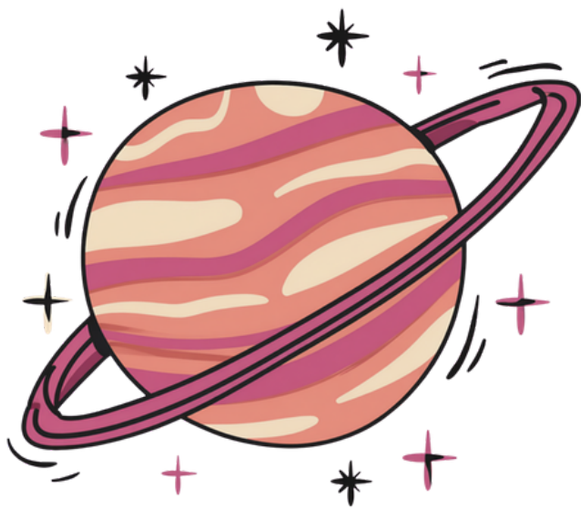

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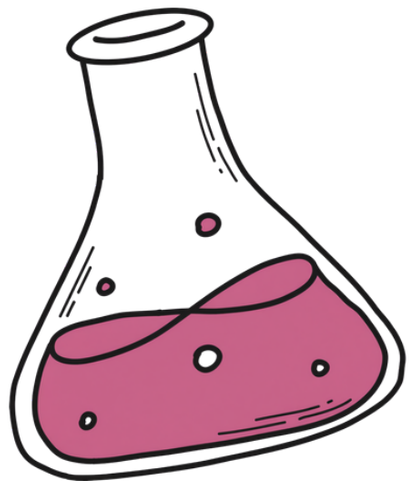

H2O

Class – 10th

NCERT Solution

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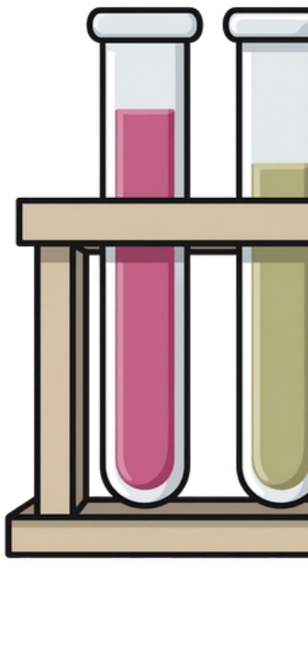

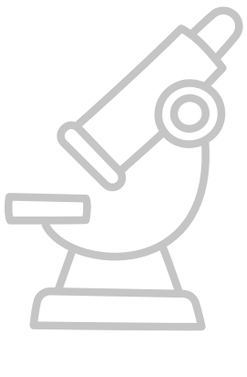

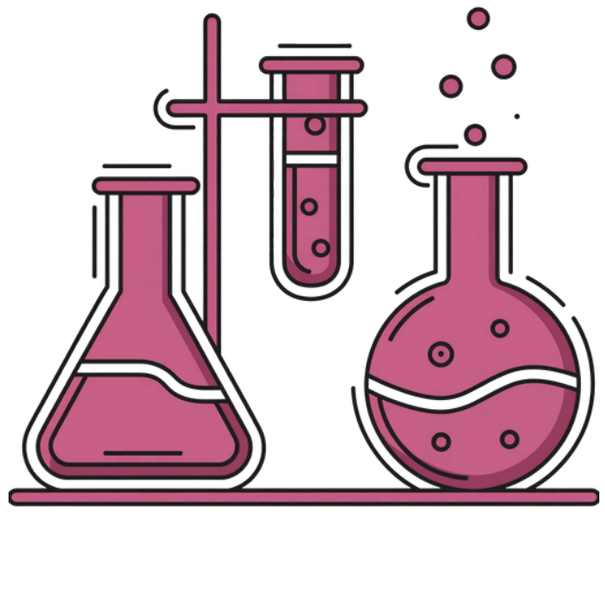

CLASS 10 SCIENCE
CHAPTER 1 CHEMICAL REACTIONS AND EQUATIONS
NCERT : DETAILED SOLUTIONS

1. Why should a magnesium ribbon be cleaned before it is burnt in air?
Answer: Magnesium is an extremely reactive metal. When stored, it reacts with oxygen to form a layer of magnesium oxide on its surface. This layer of magnesium oxide is quite stable and prevents further reaction of magnesium with oxygen. The magnesium ribbon is cleaned by sand paper for removing this layer so that the underlying metal can be exposed to air.

2. Write the balanced equation for the following chemical reactions.
(i) Hydrogen + Chlorine → Hydrogen chloride
(ii) Barium chloride + Aluminium sulphate → Barium sulphate + Aluminium chloride
(iii) Sodium + Water → Sodium hydroxide + Hydrogen
Answer: (i) $H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$
(ii) $3BaCl_2(aq) + Al_2(SO_4)_3(aq) \rightarrow 3BaSO_4(s) + 2AlCl_3(aq)$
(iii) $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

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 the solution of sodium chloride.
(ii) Sodium hydroxide solution (in water) reacts with hydrochloric acid solution (in water) to produce sodium chloride solution and water.
Answer:(i) $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
(ii) $NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$

4. A solution of a substance 'X' is used for white washing.
(i) Name the substance 'X' and write its formula.
(ii) Write the reaction of the substance 'X' with water.
Answer: (i) The substance 'X' is calcium oxide. Its chemical formula is CaO (Also known as quick lime).
(ii) Calcium oxide reacts vigorously with water to form calcium hydroxide (slaked lime).

5. Why is the amount of gas collected in one of the test tubes in Active Chemistry 7 double the amount collected in the other? Name this gas.
Answer: Water (H_2O) contains two parts of hydrogen and one part of oxygen. Therefore, the amount of hydrogen and oxygen produced during the electrolysis of water is in a ratio of 2:1. During electrolysis, since hydrogen goes to one test tube ....

..and oxygen goes to another, the amount of gas collected in one of the test tubes is double the amount collected in the other.
The reaction is: $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$
The amount of hydrogen gas (H_2) collected would be double that of oxygen gas (O_2).

6. Why does the color of copper sulfate solution change when an iron nail is dipped in it?
Answer: When an iron nail is placed in a copper sulfate solution, iron displaces copper from the copper sulfate solution, forming iron sulfate, which is green in color.
The reaction is: $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
Therefore, the blue color of the copper sulfate solution fades, and a green color appears.

7. Give an example of a double displacement reaction other than the one given in Active Chemistry 11.
Answer: Sodium carbonate reacts with calcium chloride to form calcium carbonate and sodium chloride.
The reaction is: $Na_2CO_3(aq) + CaCl_2(aq) \rightarrow CaCO_3(s) + 2NaCl(aq)$
In this reaction, sodium carbonate and calcium chloride exchange their ions mutually to form two new compounds. Hence, it is a double displacement reaction.

8. Identify the substances that are oxidized and the substances that are reduced in the following reactions:
(i) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$
(ii) $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(l)$
Answer:
(i) Sodium (Na) is oxidized as it gains oxygen, and oxygen (O_2) is reduced.
(ii) Copper oxide (CuO) is reduced to copper (Cu), while hydrogen (H_2) is oxidized to water (H_2O).

9. Which of the statements about the reaction below are incorrect?
$2PbO(s) + C(s) \rightarrow 2Pb(s) + CO_2(g)$
(1) Lead is getting reduced.
(2) Carbon dioxide is getting oxidized.
(3) Carbon is getting oxidized.
(4) Lead oxide is getting reduced.
(a) (1) and (2)
(b) (1) and (3)
(c) (1), (2), and (3)
(d) All of these

Answer: (a) (1) and (2)
Carbon is getting oxidized into CO_2, while PbO is getting reduced into Pb.

10. $Fe_2O_3 + 2Al \rightarrow Al_2O_3 + 2Fe$
The above reaction is an example of a:
(a) combination reaction.
(b) double displacement reaction.
(c) decomposition reaction.
(d) displacement reaction.
Answer: (d) The given reaction is an example of a displacement reaction.

11. What happens when dilute hydrochloric acid is added to iron filings? 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.
Answer: (a) Hydrogen gas and iron chloride are produced. The reaction is: $Fe(s) + 2HCl(aq) \rightarrow FeCl_2(aq) + H_2\uparrow$

12. What is a balanced chemical equation? Why should chemical equations be balanced?
Answer: A reaction which has an equal number of atoms of each element on both sides of the chemical equation is called a balanced chemical equation. The law of conservation of mass states that mass can neither be created nor destroyed. Hence, in a chemical reaction, the total mass of reactants should be equal to the total mass of the products. It means that the total number of atoms of each element should be equal on both sides of a chemical equation. Hence, it is for this reason that chemical equations should be balanced.

13. Translate the following statements into chemical equations and then balance them.
(a) Hydrogen gas combines with nitrogen to form ammonia.
(b) Hydrogen sulfide gas burns in air to give water and sulfur dioxide.
(c) Barium chloride reacts with aluminum sulfate to give aluminum chloride and a precipitate of barium sulfate.
(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.
Answer:
(a) $3H_2(g) + N_2(g) \rightarrow 2NH_3(g)$
(b) $2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(l) + 2SO_2(g)$
(c) $3BaCl_2(aq) + Al_2(SO_4)_3(aq) \rightarrow 2AlCl_3(aq) + 3BaSO_4(s)$
(d) $2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$

14. Balance the following chemical equations.

(a) $HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + H_2O$

(b) $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + HCl$

Answer:

(a) $2HNO_3 + Ca(OH)_2 \rightarrow Ca(NO_3)_2 + 2H_2O$

(b) $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

(c) $NaCl + AgNO_3 \rightarrow AgCl + NaNO_3$

(d) $BaCl_2 + H_2SO_4 \rightarrow BaSO_4 + 2HCl$

15. 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) Aluminum + Copper chloride → Aluminum chloride + Copper

(d) Barium chloride + Potassium sulfate → Barium sulfate + Potassium chloride

Answer:

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

16. 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)

Answer:

(a) $2KBr(aq) + BaI_2(aq) \rightarrow 2KI(aq) + BaBr_2(s)$; Double displacement reaction

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

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

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

17. What does one mean by exothermic and endothermic reactions? Give examples.

Answer:

Chemical reactions that release energy in the form of heat are called exothermic reactions.

Example: $Na(s) + ½Cl_2(s) \rightarrow NaCl(s)$ + 411 kJ of energy

Reactions that absorb energy or require energy in order to proceed are called...

endothermic reactions.
Example: $6CO_2(g) + 6H_2O(l) \rightarrow (Sunlight)\ C_6H_{12}O_6(aq) + 6O_2(g)$

18. Why is respiration considered an exothermic reaction? Explain.
Answer: Energy is released during respiration, a process where glucose combines with oxygen in cells to produce carbon dioxide, water, and energy.
The reaction is: $C_6H_{12}O_6(aq) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l) + Energy$

19. Why are decomposition reactions called the opposite of combination reactions? Write equations for these reactions.
Answer: Decomposition reactions break down a compound into simpler substances using energy, while combination reactions combine substances to form a new compound, releasing energy.
Decomposition: AB + Energy → A + B (e.g., $2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$)
Combination: A + B → AB + Energy (e.g., $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$)

20. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light, or electricity.
Answer:
(a) Thermal decomposition: $2FeSO_4(s) \rightarrow Fe_2O_3(s) + SO_2(g) + SO_3(g)$
(b) Decomposition by light: $2AgCl(s) \rightarrow 2Ag(s) + Cl_2(g)$
(c) Decomposition by electricity: $2Al_2O_3(aq) \rightarrow 4Al(s) + 3O_2(g)$

21. What is the difference between displacement and double displacement reactions? Write equations for these reactions.
Answer: Displacement: A + BX → AX + B (e.g., $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$)
Double displacement: AB + CD → AD + CB (e.g., $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$)

22. In the refining of silver, the recovery of silver from silver nitrate solution involves displacement by copper metal. write down the reaction involved.
Answer: $2AgNO_3(aq) + Cu(s) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

23. What do you mean by a precipitation reaction? Explain by giving examples.
Answer: A reaction in which an insoluble solid (precipitate) is formed is called a precipitation reaction.
Example:

24. In this reaction, calcium carbonate is obtained as a precipitate. Hence, it is a precipitation reaction.
Answer: Another example of precipitation reaction is:
..

$Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) \downarrow + 2NaCl(aq)$
Sodium sulphate + Barium chloride → Barium sulphate (precipitate) + Sodium chloride
In this reaction, barium sulphate is obtained as a precipitate.

25. Explain the following in terms of gain or loss of oxygen with two examples of each.
(a) Oxidation
(b) Reduction
Answer:
(a) Oxidation is the gain of oxygen.
For example:
Addition of oxygen - oxidation
In equation (i), H_2 is oxidized to H_2O and in equation (ii), Cu is oxidised to CuO .
(b) Reduction is the loss of oxygen.
For example,
Removal of oxygen - reduction
(ii) $CuO + H_2 \rightarrow (\Delta)\ Cu + H_2O$
Loss of oxygen - reduction
In equation (i), CO_2 is reduced to CO and in equation (ii), CuO is reduced to Cu.

26. A Shiny brown Coloured Element 'X' is copper (Cu) and the black-coloured compound formed is copper oxide (CuO). The equation of the reaction involved in heating copper is given below.
Answer: 2Cu (Shiny brown) + O_2 →(Heat) 2CuO (Black)

27. Why do we apply paint on iron articles?
Answer: Iron articles are painted because it prevents them from rusting. When painted, the contact of iron articles with moisture and air is cut off. Hence, rusting is prevented. Their presence is essential for rusting to take place.

28. Oil and fat containing food items are flushed with nitrogen. Why?
Answer: Nitrogen is an inert gas and does not easily react with these substances. On the other hand, oxygen reacts with food substances and makes them rancid. Thus, bags used in packing food items are flushed with nitrogen gas to remove oxygen inside the pack. When oxygen is not present inside the pack, rancidity of oil and fat containing food items is prevented.

29. Explain the following terms with one example of each.
(a) Corrosion
(b) Rancidity
Answer:
...

(a) **Corrosion**- Corrosion is defined as a process where materials, usually metals, deteriorate as a result of a chemical reaction with air, moisture, chemicals, etc. For example, iron, in the presence of moisture, reacts with oxygen to form hydrated iron oxide.

$4Fe + 3O_2 + nH_2O \rightarrow 2Fe_2O_3 \cdot nH_2O$

Hydrated iron oxide

This hydrated iron oxide is rust.

(b) **Rancidity -** The process of oxidation of fats and oils that can be easily noticed by the change in taste and smell is known as rancidity.

For example, the taste and smell of butter changes when kept for long. Rancidity can be avoided by

(1) Storing food in airtight containers.

(2) Storing food in refrigerators.

(3) Adding antioxidants.

(4) Storing food in an environment of nitrogen.

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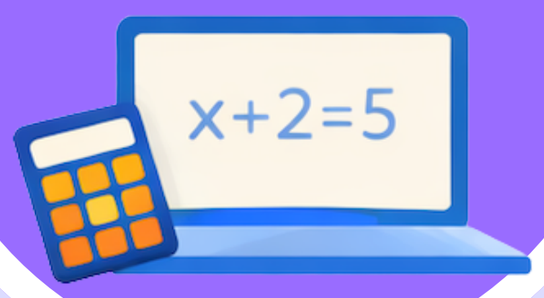

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