Chapter 08

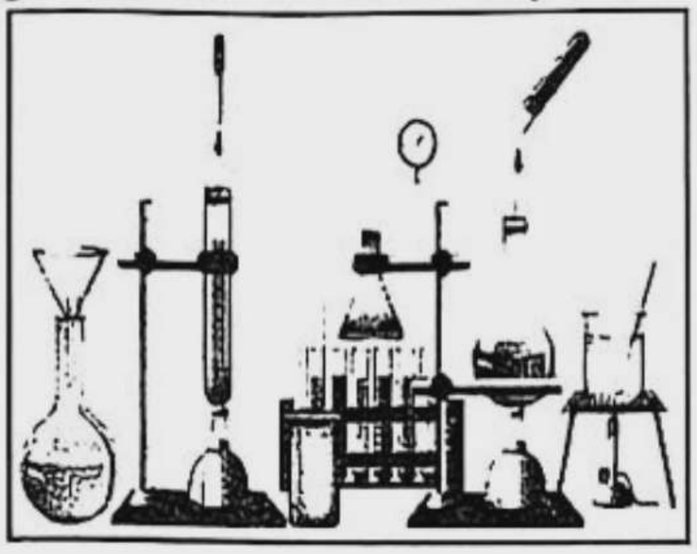
Chemical Reaction

Contents for Discussion

• Symbol, formula and valency • Chemical equation • Chemical reaction addition • Combustion reaction • Substitution or displacement reaction • Transformation of energy through chemical reaction • Dry cells.

Learning Outcomes : After studying this chapter I will be able to–

- explain different types of chemical reactions;
- explain different types of energy transformations through chemical reactions;
- explain the transformations of energy in dry cells;
- explain electrolysis;
- use properly the chemicals and different instruments in chemical experiments.
- appreciate the contributions of chemical reactions in our life;



Practice

Multiple Choice, Short & Creative Q/A following 100% accurate format for best prep.

Dear learners, the Q/A of this chapter have been divided into exercise, multiple choice, short, creative & exercise-based activities in light of the learning outcomes. Practice the questions well to ensure the best preparation in the exam.

Textual Q/A — Let's learn the textbook Q/A

Fill in the Blanks

a. —— are created by chemical reaction.
b. The chemical reaction between calcium oxide and carbon dioxide forming calcium carbonate is a —— reaction.
c. By combustion reaction —— energy is produced.
d. In a dry cell the cylinder of zinc act as ——.
e. Hydrochloric acid is electric —— substance.

Ans. a. New materials; b. addition; c. heat and light; d. anode; e. charging.

Short Answer Questions

Question 1. What do you understand by combustion reaction? Give examples.

Ans. When a substance is burnt in presence of air or oxygen to produce a different compound, the process in called combustion reaction.

Example :

$$2Mg + O_2 \longrightarrow 2MgO$$

Magnesium Oxygen Magnesium oxide

Question 2. Explain what is meant by neutralizing reaction?

Ans. The reaction in which two compounds of opposite properties (acid and base) react each other to form salt and water is called a neutralization reaction.

For example, lemon juice is an acid and baking soda is a base. When they react each other, they form sodium citrate, carbon dioxide and water. The bubble we see during the reaction is CO_2 gas.

$C_6H_8O_7 + NaHCO_3 \rightarrow Na_3C_6H_5O_7 + CO_2 + H_2O.$

Citric acid Baking soda Sodium citrate carbon dioxide water

Question 3. Explain what happens when water is added to lime?

Ans. Calcium hydroxide is produced when water is added to lime.

$CaO + H_2O \rightarrow Ca(OH)_2$

Line water calcium hydroxide

$Ca(OH)_2$ is commonly known as quick lime. The reaction produces profuse heat as a result of which water boils.

Question 4. Describe briefly the construction of a dry cell.

Ans. Dry cells are portable source of electrical energy. We use dry cells in torch light, remote controller, toy cars and in many electric machines. A brief structure of a dry cell is as follows :

To make such a dry cell first of all, ammonium chloride (NH_4Cl), charcoal powder and manganese dioxide (MnO_2) to be mixed thoroughly with little water added to make a paste.

This mixture is taken in a cylindrical shaped zinc container. A carbon rod is introduced at the centre of the container in such a way that it does not touch the zinc container. At the lop of the carbon rod there is a metal cup.

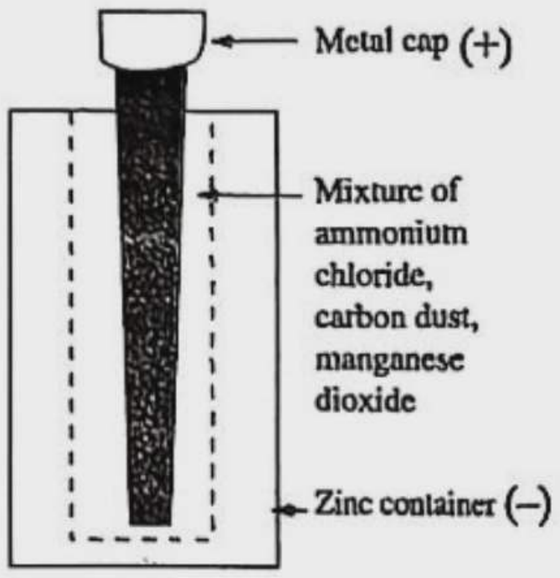


Figure : Structure of dry cell

The upper part of the cell is covered by a layer of pitch. The surface of the zinc cylinder acts as the negative electrode or as the anode. The carbon rod with the metal cap acts as the positive electrode or cathode.

Question 5. Explain the main difference between electrolyte and non-electrolyte substances with examples.

Ans. Electrolyte substances: The solute that carries electricity in dissolved state and produces different solutes by chemical reaction due to electricity is called electrolyte.

Non electrolyte substances: The materials which don't allow electric current to pass through in their dissolved state or in the melted form, are called non electrolyte.

The key difference between electrolytic and non electrolyte materials is that electrolytic materials conduct electricity but non electrolyte materials do not conduct electricity even when dissolved or melted. For example, sodium chloride, acidic water is an electrolytic substance. They transport electricity. But sugar, glucose etc. are non electrolyte substances which do not conduct electricity even when dissolved or melted.

MCQs with Answers

1. Which one is slaked lime?

ⓐ CaO ⓑ $CaCO_3$

ⓓ ⓒ $CaCl_2$ ⓓ $Ca(OH)_2$

▸▸ **Explanation :** Calcium hydroxide is called slaked lime. Formula of slaked lime: $Ca(OH)_2$. A saturated solution of $Ca(OH)_2$ in water is also called lime water. On the other hand, CaO is dry lime, $CaCO_3$ is limestone and $CaCl_2$ is calcium chloride.

2. From which of the decomposition reactions given below does a diver gets his oxygen.

ⓒ ⓐ $CaCO_3$ ⓑ $CuCO_3$ ⓒ $KClO_3$ ⓓ NH_4Cl

▸▸ **Explanation :** Divers need oxygen (O_2) to breathe underwater. This oxygen (O_2) is obtained by thermal decomposition of potassium chlorate. For example–

$$KClO_3 \xrightarrow[\Delta]{\text{Heat}} KCl + O_2$$

Potassium chlorate Potassium chloride Oxygens

In the light of the paragraph below answer the questions no. 3 and 4 :

Shapna took some lime in a beaker in the lab. Then some vinegar is added by a dropper. After some time she touched the beaker to find out the change of temperature.

3. What type of chemical reaction will occur between the compounds?

ⓐ Combustion ⓑ Neutralizing

ⓑ ⓒ Addition ⓓ Substitution

▸▸ **Explanation :** According to the above stem, A chemical reaction has taken place between lime and vinegar in the beaker.

Here's the formula for lime: CaO, which is an alkali

And the formula of vinegar: CH_3COOH, which is an organic acid.

$$CaO + CH_3COOH \longrightarrow (CH_3COO)_2\,Ca + H_2O$$

Base Acid Salt water

The base and acid react with each other to produce salt and water. So it is a neutralizing reaction.

4. The reaction between the compounds will produce —.

i. calcium acetate

ii. calcium carbonate

iii. water

Which one of the following is correct?

ⓑ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

▸▸ **Explanation :** The reaction in the stem :

$$CaO + CH_3COOH \longrightarrow (CH_2COO)_2\,Ca + H_2O$$

Calcium Oxide Acitic acid calcium acitate water

Creative Questions with Answers

Ques. 01 Fahad and Farhan carried out some chemical reactions, which are as follows :

i. Carbon + Oxygen $\xrightarrow{\text{heat}}$

ii. Lime stone $\xrightarrow{\text{heat}}$

iii. Hydrogen + Oxygen →

iv. Zinc + Sulphuric acid →

a. What is the symbol of baking powder? 1
b. What is the type of number ii. reaction, explain?2
c. Explain the generation of gas of elements in the above stimulation reactions. 3
d. Although the reactions i. and ii. are additive, there is some difference between them, Explain. 4

Answer to Question No. 01 :

a The formula of baking powder is $NaHCO_3$.

b Reaction-ii is a decomposition reaction. In presence of heat, lime stone decomposes to two compounds — calcium oxide and carbon dioxide.

Symbolically, $CaCO_3 \xrightarrow{Heat} CaO + CO_2$.

c Completing the reactions given by the stem, we get,

i.Carbon + Oxygen $\xrightarrow{Heat}$ Carbon Dioxide

Limestone $\xrightarrow{Heat}$ Calcium Oxide + Carbon Dioxide

Hydrogen + Oxygen + Water

Zinc + Sulfuric Acid ⟶ Zinc Sulphate + Hydrogen + Gas

As shown in the reactions given in reaction (iv),gas of elements are produced. Because we know from the definition of elemental gas, two or more atoms of the same element join together to produce a gas that is an elemental gas. Since two atoms of hydrogen are bonded together, it is an elemental gas.

d A chemical reaction in which more than one substance is combined to form different chemical substances is called an addition reaction. Again, the process of burning an element or compound in the presence of oxygen in the air and turning its elements into oxides is called combustion reaction.

Reaction No.(i) : Carbon+ Oxygen $\xrightarrow{Heat}$ Carbon dioxide

Reaction No. (iii) : Hydrogen + Oxygen → Water

In the above two reactions, the reactants combine with each other to produce only one product. Hence (i) and (iii) both reactions are addition reactions. In reaction (i), carbon is burnt in presence of oxygen. So this is a combustion reaction too. But reaction (iii) is not a combustion reaction. This is the difference between two reactions.

Ques. 02 Rita was watching the dance of her doll by connecting the battery of her doll. At this moment the electricity went off and her younger sister Oishori brought a lighted candle.

a. What is the neutralization reaction? 1
b. What is meant by lime water? 2
c. Explain the construction of Rita's battery. 3
d. Explain how the energy of battery of the doll and the candle transforms. 4

Answer to Question No. 02 :

a The reaction in which two compounds of different features (acid and base) react each other to form salt and water is called a neutralization reaction.

b The saturated solution of $[Ca(OH)_2]$ is called lime water. As a result of adding water to lime Calcium hydroxide is produced from the chemical reaction between lime and water.

$CaO + H_2O \longrightarrow Ca(OH)_2 + Ca(OH)$

$Ca(OH)_2$ is produced by the reaction of calcium hydroxide, better known as quick lime.

c Rita used a drycell battery. Its formulation is given below.

Dry cells are portable source of electrical energy. We use dry cells in torch light, remote controller, toy cars and in many electric machines. We will discuss how this cell is made and how it works..

To make such a dry cell first of all, ammonium chloride (NH_4Cl), charcoal powder and manganese dioxide (MnO_2) to be mixed thoroughly with little water added to make a paste.

This mixture is taken in a cylindrical shaped zinc container. A carbon rod is introduced at the centre of the container in such a way that it does not touch the zinc container. At the lop of the carbon rod there is a metal cup.

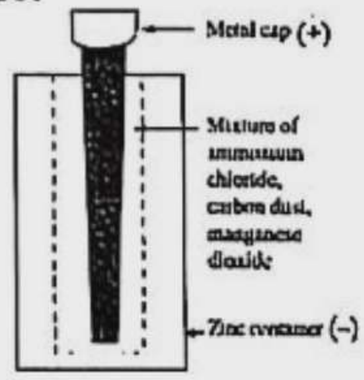


Figure : Structure of dry cell

The upper part of the cell is covered by a layer of pitch. The surface of the zinc cylinder acts as the negative electrode or as the anode. The carbon rod with the metal cap acts as the positive electrode or cathode.

d All chemical reactions involve energy transformation. Energy transoms in the doll and candle are explained below–

Energy transformation in doll : Batteries used in dolls are called drycells or dry cells. The source of battery energy is the chemicals used in the battery ie zinc, ammonium chloride, coal powder and manganese dioxide. The stored energy of all materials in the battery is converted into mechanical energy when the battery is connected to the doll. As a result the doll started dancing. That is, chemical energy is converted into mechanical energy

Energy transformation in candle : And when the candle is burnt, the wax reacts with the oxygen in the air to generate heat. Again, light energy is generated by burning the wax. As a result, it can be seen around it even in the dark. In this case, it can be said that when the wax burns, the chemical energy stored in it is changed into thermal energy and light energy.

Multiple Choice Q/A Designed as per topic

Lesson 1-2 : Symbol, formula and valency

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1. Which molecule has more than one valency? *(Knowledge)* *[CB'19]*
ⓐ Calcium ⓑ Silver
a ⓒ Florins ⓓ Led

2. What is the valency of phosphate? *(Knowledge)* *[SB'19]*
ⓐ 1 ⓑ 2
c ⓒ 3 ⓓ 4

3. What is the valency of ammonium in $(NH_4)_2 SO_4$? *(Knowledge)* *[SB'19]*
ⓐ 1 ⓑ 2
a ⓒ 3 ⓓ 4

4. Which one is positive compound? *(Knowledge)* *[DjB.-'19]*
ⓐ Sulphate ⓑ Carbonate
d ⓒ Phosphate ⓓ Ammonium

5. What is the valency of Aluminium? *(Knowledge)* *[DjB '19]*
ⓐ 1 ⓑ 2
c ⓒ 3 ⓓ 4

6. What is the valency of the ammonium radical? *(Knowledge)* *[SB '18]*
a ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

7. Which is the velency of carbon? *(Knowledge)* *[CB '17]*
c ⓐ 1, 2 ⓑ 2, 3 ⓒ 2, 4 ⓓ 3, 4

8. How many atoms are there in one molecule of sulphuric acid? *(Knowledge)* *[CtgB '17]*
d ⓐ 3 ⓑ 5 ⓒ 6 ⓓ 7

9. Which one is radical? *(Knowledge)* *[BB '17]*
ⓐ Aluminium ⓑ Magnesium
d ⓒ Calcium ⓓ Ammonium

10. Which is a symbol? *(Knowledge)* *[BB '18]*
c ⓐ 2H ⓑ O^- ⓒ K ⓓ Na^+

11. What is the valency of Zn? *(Knowledge)* *[DjB '18]*
b ⓐ One ⓑ Two ⓒ Three ⓓ Four

Lesson 3-4 : Chemical equation

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Observe the reaction b« low and answer to the questions no. 12 and 13 :
$NaOH + A \longrightarrow Na_2SO_4 + H_2O$ *[DB'19]*

12. How many atoms are there in the first reactant compound of the reaction? *(Comprehension)*
ⓐ 1 ⓑ 2
c ⓒ 3 ⓓ 4

13. The compound 'A' is used— *(Higher Ability)*
i. to digest food
ii. in fertilizer industry
iii. in producing rayon
Which one is correct?
c ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

14. $KClO_3 \xrightarrow{heat} KCl + 'A'$ *(Comprehension)*
What is the atoms number of the gas signed 'A'? *[RB '18]*
d ⓐ 2 ⓑ 3 ⓒ 5 ⓓ 6

15. $H_2 + N_2 \longrightarrow NH_3$;
Which one is correct balance for this equation? *(Application)* *[DjB '16]*
a ⓐ 3, 1, 2 ⓑ 3, 2, 1 ⓒ 1, 2, 3 ⓓ 1, 3, 2

Lesson 5 : Chemical reaction: addition

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16. In the reaction $NH_3 + X \rightarrow NH_4Cl$, 'X' is used in which of the following? *(Comprehension)* *[CtgB '18]*
ⓐ Explosives and rayon
ⓑ To digest the food
ⓒ To collect compound from the mine
b ⓓ Preparation of paints

17. $CaCO_3 + \boxed{X} \rightarrow CaCl_2 + H_2O + CO_2$. **In the reaction what is the name of 'X' compound?** *(Comprehension)* *[BB '18]*
ⓐ Calcium hydroxide ⓑ Hydrocloric acid
b ⓒ Calcium oxide ⓓ Acetic acid

18. What is the formula of the produced compound from the reaction of sulphur with iron? *(Comprehension)* *[CtgB '17]*
c ⓐ ZnS ⓑ $ZnSO_4$ ⓒ FeS ⓓ $FeSO_4$

19. Hydrogen + Oxygen ⟶ Water. *(Higher Ability)* *[JB'19]*
i. Addition reaction
ii. Combustion reaction
iii. Substitution reaction
Which one is correct?
a ⓐ i ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Lesson 6 -7 : Combustion reaction

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20. Compounds used in making medicine for healing heartburn —. *(Higher Ability)*
i. $Mg(OH)_2$ ii. $Al(OH)_3$
iii. $Ca(OH)_2$
Which one of the following is correct?
a ⓐ i & ii ⓑ ii & iii ⓒ i & iii ⓓ i, ii & iii

Answer the questions number 21 and 22 from the following stem :
(i) $CaCO_3 \xrightarrow{Heat} 'X' + CO_2$
(ii) $'X' + H_2O \longrightarrow 'Y'$ *[RB'19]*

21. Which is the characteristics of 'X' compound? *(Comprehension)*
ⓐ Gives H^+ ion in water solution
ⓑ It feels slippery when touched
ⓒ Neutral substance
d ⓓ Does not dissolve in water

Science

22. According to the reaction (ii)— *(Higher Ability)*
i. 'Y' dissolves in water very slightly
ii. 'Y' is a Salt
iii. huge heat energy is produced in the reaction
Which one is correct?
ⓑ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Look at the stem carefully and answer the questions no. 23 and 24 :

$CuCO_3 \xrightarrow{heat} A + CO_2$ *[JB'19]*

23. In the 'A' marked position of the equation, there is— *(Comprehension)*
ⓐ Cu ⓑ O_2
ⓓ ⓒ Cu_2O ⓓ CuO

24. What type of stem's reaction is? *(Comprehension)*
ⓐ Addition ⓑ Decomposition
ⓑ ⓒ Substitution ⓓ Combustion

Read the following stem and answer the questions no, 25 and 26 :

$S + O_2 \xrightarrow{heat} X$ *[CB'19]*

25. Of what type is the reaction shown in the stem? *(Comprehension)*
ⓐ Decomposition reaction
ⓑ Combustion reaction
ⓒ Neutralization reaction
ⓑ ⓓ Substitution reaction

26. The X compound mentioned in the stem is— *(Higher Ability)*
i. liquid
ii. having pungent fragrance
iii. produced by direct contact of sulphur and oxygen
Which one is correct?
ⓒ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

Answer the questions no. 27 and 28 in the light of the stem below :

$CaCO_3 \xrightarrow{Heat} CaO + Z$ *[BB'19]*

27. 'Z' compound— *(Application)*
i. helps to stop firing
ii. helps to occur photosynthesis
iii. creats die lime water opaque
Which one is correct?
ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

28. How many atoms are in 'Z' compound? *(Comprehension)* *[BB'19]*
ⓐ 2 ⓑ 3
ⓑ ⓒ 4 ⓓ 5

Look at the following question and answer the question No. 29 and 30 :

$CaCO_3 \xrightarrow{Heat} CaO + X$ *[CtgB '18]*

29. What will be on the X marked place in the above equation? *(Comprehension)*
ⓐ CO_2 ⓑ CO
ⓐ ⓒ O_2 ⓓ C

30. What kind of reaction is it? *(Comprehension)*
ⓐ Substitution ⓑ Decomposition
ⓑ ⓒ Addition ⓓ Neutralization

31. $Mg + O \rightarrow MgO$ — What kind of reaction is this? *(Comprehension)* *[BB '18]*
ⓐ addition reaction
ⓑ combustion reaction
ⓒ neutralization reaction
ⓑ ⓓ displacement reaction

32. When potassium chlorate is heated, it produces— *(Comprehension)* *[RB '17]*
i. Potassium chloride
ii. Oxygen
iii. Water
Which one is correct?
ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

33. How does the flame produced by the burning of Sulphur look? *(Knowledge)* *[CtgB '16]*
ⓐ ⓐ Blue ⓑ Red ⓒ Green ⓓ Violet

Lesson 8-9 : Substitution or displacement reaction

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34. Which compound is called blue Vitriol? *(Knowledge)*
ⓐ NH_4Cl ⓑ $Fe_2(SO_4)_3$
ⓒ ⓒ $CuSO_4$ ⓓ $Fe(NO_3)_2$

35. Which one of the following is a fruit enripening agent? *(Knowledge)*
ⓐ $CuSO_4$ ⓑ $FeSO_4$
ⓐ ⓒ $Al_2(SO_4)_3$ ⓓ Ag_2SO_4

36. Decomposition reaction is of—. *(Knowledge)*
ⓐ a single type ⓑ two types
ⓑ ⓒ three types ⓓ four types

37. What turns blue vitriol greenish? *(Knowledge)*
ⓐ Zinc dust ⓑ copper dust
ⓒ ⓒ iron dust ⓓ sulphur dust

38. Which of the following compounds is light green? *(Knowledge)*
ⓑ ⓐ $CuSO_4$ ⓑ $FeSO_4$ ⓒ $ZnSO_4$ ⓓ $CaSO_4$

39. Which of the following solution is light blue? *(Knowledge)*
ⓐ ⓐ $CuSO_4$ ⓑ $FeSO_4$ ⓒ $ZnSO_4$ ⓓ K_2SO_4

40. Which one of the following compounds is an artificial source of oxygen? *(Higher Ability)*
ⓐ $KClO_3$ ⓑ $CuCO_3$
ⓐ ⓒ $Al(NO_3)_3$ ⓓ $AgNO_3$

41. Which is the formula of quicklime? *(Knowledge)* *[CtgB'19]*
ⓐ $Mg(OH)_2$ ⓑ $Al(OH)_3$
ⓒ ⓒ $Ca(OH)_2$ ⓓ KOH

42. What is the formula of limestone? *(Knowledge)* *[SB'19]*
ⓐ $MgCO_3$ ⓑ $CuCO_3$
ⓒ ⓒ $CaCO_3$ ⓓ $FeCO_3$

43. What is the symbol of quick lime? *(Knowledge)* *[DB '18]*
ⓐ $Mg(OH)_2$ ⓑ $Al(OH)_2$
ⓒ ⓒ $Ca(OH)_2$ ⓓ Na(OH)

Read the following stem carefully and answer to the questions No. 44 and 45 :

Roni took copper sulphate (tute) in 1st jar and edible soda in second jar. He entered a iron bar in first jar and the colour of solution is changed into light green. After adding vinegar in second jar bubbles are formed. *[RB '18]*

44. What type of reaction in first jar? *(Comprehension)*

ⓐ Addition ⓑ Replacement
ⓑ ⓒ Decomposition ⓓ Combustion

45. The gas produced in second jar —. *(Higher Ability)*

i. opaque of lime water
ii. takes part in photosynthesis
iii. compound substance

Which one of the following is correct?

ⓓ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

46. Which one is combustion reaction? *(Comprehension) [RB '18]*

ⓐ $CaCO_3 \xrightarrow{heat} CaO + CO_2$
ⓑ $Zn + S \rightarrow ZnS$
ⓒ $2Mg + O_2 \xrightarrow{heat} 2MgO$
ⓒ ⓓ $Fe + CuSO_4 \rightarrow FeSO_4 + Cu$

47. Which one is the formula of limestone? *(Knowledge) [DB '17; CtgB '17]*

ⓐ ⓐ $CaCO_3$ ⓑ $Ca(OH)_2$ ⓒ CaO ⓓ $CuSO_4$

48. Which one is the formula of lime? *[RB '17]*

ⓒ ⓐ NaOH ⓑ KOH ⓒ CaO ⓓ $Ca(OH)_2$

49. Iron + Coper sulphate → "A" + Copper - In this reaction what is Compound "A"? *(Comprehension) [CB '17]*

ⓒ ⓐ CuS ⓑ $CuSO_4$ ⓒ $FeSO_4$ ⓓ $CaSO_4$

50. Which of the following compound produce O_2 by the decomposition reaction? *(Comprehension) [SB '16]*

ⓑ ⓐ $CaCO_3$ ⓑ $KClO_3$ ⓒ $CuCO_3$ ⓓ $MgCO_3$

51. Which one is the formula of lime? *(Knowledge) [RB '17]*

ⓒ ⓐ NaOH ⓑ KOH ⓒ CaO ⓓ $Ca(OH)_2$

Look at the equation and answer question No. 52 & 53 :

$Fe + CuSO_4 = \square + Cu.$

52. What will be in the ☐ in equation? *(Comprehension) [JB '17]*

ⓑ ⓐ $CaSO_4$ ⓑ $FeSO_4$ ⓒ H_2SO_4 ⓓ NH_4Cl

53. What type of reaction is this? *(Comprehension) [JB '17]*

ⓐ Combustion ⓑ Addition
ⓓ ⓒ Decomposition ⓓ Substitution

Read the following passage and answer the question numbers 54 and 55 :

Teacher told Kamal and Jamal to take two substances to make an experiment of substitution reaction. They successfully made the experiment.

54. What were the two substances?

ⓐ Zinc and sulphuric acid
ⓑ Zinc oxide and copper sulphate
ⓒ Silver nitrate and sodium chloride
ⓐ ⓓ Silver nitrate and hydrochloric acid

55. Substitution also eventuates in case of —.

i. neutralization reaction
ii. decomposition reaction
iii. double decomposition reaction

Which one of the following is correct?

ⓒ ⓐ i & ii ⓑ ii & iii ⓒ i & iii ⓓ i, ii & iii

Lesson 10-11 : Transformation of energy through chemical reaction ▸ Textbook Page 86

56. Which of the following compounds is edible? *(Knowledge)*

ⓐ ⓐ $NaHCO_3$ ⓑ H_2SO_4 ⓒ NH_4Cl ⓓ MnO_2

57. What does a lemon contain? *(Knowledge)*

ⓒ ⓐ MgO ⓑ $Al(OH)_3$ ⓒ $C_6H_8O_7$ ⓓ $ZnSO_4$

58. In the burning of candle, what type of energy is transformed? *(Comprehension) [JB'19]*

ⓐ Electric energy ⓑ Light energy
ⓓ ⓒ Heat energy ⓓ Chemical energy

59. $CaO + 2HCl \longrightarrow \boxed{X} + H_2O$

What is the compound X in the reaction? *(Comprehension) [CB'19]*

ⓐ Base ⓑ Acid
ⓓ ⓒ Alkali ⓓ Salt

Answer the question no. 60 and 61 in the light of two reactions below :

(1) $Ca + O_2 \rightarrow Y$
(2) $Y + CH_3COOH \rightarrow Z + H_2O$ *[SB'19]*

60. What type of reaction the no. (1) reaction is? *(Comprehension)*

ⓐ Combustion ⓑ Decomposition
ⓐ ⓒ Addition ⓓ Substitution

61. 'Z' compound— *(Higher Ability) [SB'19]*

i. is a neutral substance
ii. does not change the colour of litmus Paper
iii. produces in stomach

Which one is correct?

ⓐ ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

62. The main element of soap is— *(Knowledge) [DjB '19]*

ⓐ acid ⓑ alkali
ⓑ ⓒ salt ⓓ glycerin

Lesson 12-14 : Dry cells ▸ Textbook Page 88

63. **Which is electrolyte material?** *(Knowledge) [DB'19]*

ⓐ Sugar ⓑ Oil
ⓒ Salt ⓓ Glucose

64. **In a drycell which of the following acts as a cathode?** *(Knowledge) [RB'19]*

ⓐ Manganese dioxide
ⓑ Carbon rod
ⓒ Zinc container
ⓓ Metal cap

65. **Which of the following is non-electrolyte?** *[CtgB '19]*

ⓐ Sugar ⓑ Tabic salt
ⓒ Tunte ⓓ Citric acid

In the light of the paragraph below answer the questions No. 66 and 67 :
Lima took some chemicals in the lab to made an electric circuit using a dry cell. *[DjB '18]*

66. **Lima used to make a dry cell —.** *(Higher Ability)*
i. charcoal powder and manganese dioxide
ii. ammonium chloride
iii. sodium chloride
Which one of the following is correct?
ⓐ i & ii ⓑ i & iii
ⓒ ii & iii ⓓ i, ii & iii

67. **Which is the act as the cathode?** *(Knowledge)*
ⓐ Zn ⓑ Cu ⓒ NH_4Cl ⓓ MNO_2
**[NB : Correct Answer : Carbon rod.]*

68. **Which of the following does not dissolve in water?** *(Comprehension) [DjB '17]*
ⓐ NaOH ⓑ $Ca(OH)_2$
ⓒ $Al(OH)_3$ ⓓ NH_4OH

Short Q/A Designed as per topic

Lesson 1-2 : Symbol, formula and valency ▸ Textbook Page 79

Question 1. What is the symbol of an element? Explain with examples.
Ans. There are 118 known elements on Earth. Generally, instead of writing the full name of an element, it is represented by one or two letters of its English or Latin name. This short form of the element's full name is called its symbol. For example, H (hydrogen), O (oxygen), and Ca (calcium) are symbols.

Question 2. Explain the difference between a symbol and a formula.
Ans. A symbol is a short form of an element. For example, the symbol for hydrogen is H, and the symbol for oxygen is O. On the other hand, a formula represents the chemical composition of a compound. Formulas use element symbols and numbers. For example, the formula for water is H_2O, where H is the symbol for hydrogen, O is the symbol for oxygen, and 2 indicates that there are two hydrogen atoms.

Question 3. Why is it necessary to know the valency of elements to write formulas?
Ans. It is essential to know the valency of elements to write formulas because valency determines how many atoms of one element will combine with another element. Using valency, we can determine the number of atoms of different elements in a compound. For example, the valency of O is 2, and the valency of H is 1. Therefore, one oxygen atom can combine with two hydrogen atoms, resulting in the formula for water being H_2O.

Question 4. Why is hydrogen present in different amounts in ammonia and methane compounds?
Ans. The reason hydrogen is present in different amounts in ammonia (NH_3) and methane (CH_4) compounds is due to the different valencies of nitrogen and carbon. The valency of nitrogen is generally 3, and the valency of carbon is 4. This means that nitrogen can combine with three hydrogen atoms, and carbon can combine with four hydrogen atoms. That's why hydrogen is present in amounts of 3 and 4 in ammonia and methane compounds, respectively.

Question 5. Why does P form compounds like PCl_3 and PCl_5 with Cl?
Ans. Phosphorus (P) is an element with variable valency. As a result, the valency of phosphorus can be 3 or 5. The valency of chlorine is 1, so phosphorus can combine with 3 chlorine atoms to form PCl_3 and with 5 chlorine atoms to form PCl_5. In other words, due to its variable valency, phosphorus can form two different compounds with chlorine.

Question 6. Write two characteristics of a radical.
Ans. Two characteristics of a radical are:
1. Radicals are groups of atoms that do not exist independently.
2. They participate in the formation of compounds like elements.

Question 7. Mention two rules for writing the molecular formula of a compound.

Ans. Two rules for writing the molecular formula of a compound are :

1. If the valencies of both elements or radicals in a compound are the same, then it is not necessary to write the valencies in the formula; just writing the elements or radicals next to each other is sufficient.
2. If the valencies of both elements or radicals are multiples of a certain number, then the valencies should be divided by that number and exchanged before writing them in the formula.

Lesson 3-4 : Chemical equation

▸ Textbook Page 81

Question 8. Explain the two parts of a chemical reaction.

Ans. A chemical reaction can be divided into two parts. One part contains the reactants, and the other part contains the new products formed as a result of the reaction. Reactants are the substances present before the chemical reaction, and products are the substances formed after the chemical reaction.

Question 9. Mention the characteristics of a chemical reaction.

Ans. In any chemical reaction, atoms are neither created nor destroyed; only the arrangement of atoms changes. Therefore, the number of atoms in the reactants before the reaction is equal to the number of atoms in the products after the reaction. As a result, there is a balance in the number of atoms between the reactants and products.

Question 10. What is a chemical equation? Explain with an example.

Ans. A chemical equation is a shorthand representation of a chemical reaction using symbols, formulas, and signs (+, =). For example:

$$\underset{\text{Zinc}}{Zn} + \underset{\text{Sulfuric acid}}{H_2SO_4} \longrightarrow \underset{\text{Zinc sulfate}}{ZnSO_4} + \underset{\text{Hydrogen}}{H_2}$$

Question 11. How are the reactants and products represented in a chemical equation?

Ans. In a chemical equation, the reactants are written on the left side of the arrow (→), and the products are written on the right side of the arrow (→). If there are multiple reactants or products, their formulas are separated by plus signs (+). This is how reactants and products are represented in a chemical equation.

Question 12. How is a chemical equation balanced?

Ans. The number of atoms of each element in the reactants before the reaction must be equal to the number of atoms of each element in the products after the reaction. To achieve this balance in the number of atoms on both sides of the equation, symbols and formulas are multiplied by appropriate numbers, which is called balancing the chemical equation.

Lesson 5 : Chemical reaction: addition

▸ Textbook Page 83

Question 13. Explain addition reactions with examples.

Ans. An addition reaction is a type of chemical reaction where two or more substances combine to form a new substance. Simply put, it is the process of combining different elements to create a new substance. For example, carbon and oxygen react to produce carbon dioxide gas.

Reaction : $C + O_2 = CO_2$

This reaction is called an addition reaction.

Question 14. What type of reaction is Zn + S = ZnS? Explain.

Ans. The chemical equation Zn + S = ZnS represents an addition reaction. Here, two elements, zinc (Zn) and sulfur (S), react with each other to form a new compound called zinc sulfide (ZnS). Since this reaction involves two substances combining to form a new substance, it is an addition reaction.

Lesson 6-9 : Combustion reaction, substitution or Displacement reaction

▸ Textbook Page 83

Question 15. What is meant by combustion reaction?

Ans. A combustion reaction is a type of chemical reaction in which a substance reacts with oxygen to produce heat and light. This process also forms new substances. For example, when a magnesium ribbon is burned, it produces heat and light. This reaction is called a combustion reaction.

Reaction : Mg + O = MgO

Question 16. Explain the type of reaction $S + O_2 = SO_2$.

Ans. The chemical equation $S + O_2 = SO_2$ represents a combustion reaction. Here, the element sulfur (S) combines with oxygen (O_2) to produce sulfur dioxide (SO_2) gas. This reaction generates heat and light. Since sulfur burns in this reaction by combining with oxygen and produces heat and light, it is a combustion reaction.

Question 17. Explain displacement reactions with examples.

Ans. A displacement reaction is a chemical reaction in which one element or radical replaces another element or radical from a compound to form a new compound. For example, when iron is added to a copper sulfate solution, iron displaces copper to form iron sulfate, and copper is released.

Reaction : $Fe + CuSO_4 = FeSO_4 + Cu$

Question 18. Explain the type of reaction $Mg + CuSO_4 = MgSO_4 + Cu$.

Ans. The chemical equation $Mg + CuSO_4 = MgSO_4 + Cu$ represents a displacement reaction. Here, when magnesium (Mg) is added to a copper sulfate ($CuSO_4$) solution, magnesium displaces copper to form magnesium sulfate ($MgSO_4$), and copper (Cu) is released. Since one element has replaced another element from its compound in this reaction, it is a displacement reaction.

Question 19. What is a decomposition reaction? Present it with an equation.

Ans. A decomposition reaction is a type of chemical reaction in which a compound breaks down into multiple elements or compounds. For example, when electricity is passed through water (H_2O), it splits into hydrogen (H_2) and oxygen (O_2) gases. This reaction is called a decomposition reaction.

Reaction : $H_2O \xrightarrow{\text{Electrolysis}} H_2 + O_2$

Question 20. Explain why $CaCO_3 = CaO + CO_2$ is a decomposition reaction.

Ans. In the reaction $CaCO_3 = CaO + CO_2$, the reactant calcium carbonate ($CaCO_3$) is heated to decompose into calcium oxide (CaO) and carbon dioxide (CO_2) gas. In other words, a compound ($CaCO_3$) has decomposed into its constituent substances (CaO and CO_2). Since a compound is breaking down into its components in this case, it is a decomposition reaction.

Question 21. Explain why decomposition reactions are essentially the opposite of addition reactions.

Ans. Decomposition reactions and addition reactions are opposite processes because, in addition reactions, two or more substances combine to form a new substance. On the other hand, in decomposition reactions, a compound breaks down into its constituent elements. For example, carbon and oxygen combine to form carbon dioxide (addition reaction). Conversely, when calcium carbonate is heated, it decomposes into calcium oxide and carbon dioxide (decomposition reaction).

Lesson 10-11 : Transformation of energy through chemical reaction

Textbook Page 88

Question 22. What is meant by energy change in a chemical reaction?

Ans. Wax is a chemical substance. When it is burned, the chemical energy stored in it is transformed into heat energy and light energy. Similarly, when gas is burned in a gas stove, the chemical energy stored in the gas is transformed into a large amount of heat energy and light energy. We use this generated heat energy for cooking.

Question 23. Explain how heat is generated in a chemical reaction.

Ans. A chemical reaction is a process in which one or more substances react with each other to form new substances. In many reactions, heat is generated during this transformation. This is called an exothermic reaction. For example, when coal is burned, carbon and oxygen react to produce carbon dioxide gas and heat.

Reaction : $C + O_2 \rightarrow CO_2 + \text{Heat}$

Question 24. Explain how heat is absorbed in a chemical reaction.

Ans. In some chemical reactions, heat is absorbed, meaning that heat needs to be supplied from outside for the reaction to occur. This is called an endothermic reaction. For example, when baking soda and lemon juice (citric acid) react in a test tube, the test tube becomes cold. This reaction absorbs heat energy.

Question 25. What is meant by neutralization reaction?

Ans. A neutralization reaction is a type of chemical reaction in which an acid and a base react with each other to produce a neutral salt and water. For example, when hydrochloric acid and potassium hydroxide react, they produce potassium chloride salt and water, making it a neutralization reaction.

Reaction : $HCl + KOH \rightarrow KCl + H_2O$

Acid + Base Salt + Water

Question 26. What type of reaction is $NaOH + HCl = NaCl + H_2O$?

Ans. The reaction $NaOH + HCl = NaCl + H_2O$ is a clear example of a neutralizing reaction. Here, NaOH is a base, and HCl is an acid. These two compounds react with each other to produce NaCl salt (sodium chloride) and H_2O. In this reaction, the acidity of HCl and the basicity of NaOH decrease, and the solution becomes neutral. This type of reaction is a neutralizing reaction.

Question 27. Explain why a suspension is formed in the reaction between lime and water.

Ans. When lime or calcium oxide is added to water, intense heat is generated, and calcium hydroxide is formed. Here, a portion of the calcium hydroxide dissolves in water to form lime water. However, the remaining portion does not dissolve in water and remains suspended as fine particles. These insoluble particles settle over time, forming a suspension.

Reaction : $CaO + H_2O = Ca(OH)_2 \downarrow$
Lime water

Question 28. How is a dry cell formed?

Ans. To prepare a dry cell, first, a paste of ammonium chloride (NH_4Cl), coal powder, and manganese dioxide (MnO_2) is made. A zinc container is taken as the anode and filled with this prepared paste. Then, a carbon rod is taken as the cathode and inserted into the paste without touching the zinc container. This is how a dry cell is formed.

Question 29. How is chemical energy converted into electrical energy in a dry cell?

Ans. Chemical reactions occur inside a dry cell, which release electrons. These electrons tend to flow through an electrical conductor. When the cell is connected to a circuit, these electrons flow in a specific path, generating electricity. In this way, the chemical energy stored in the dry cell is converted into electrical energy.

Question 30. Describe the electrolysis process of NaCl solution.

Ans. When electricity is passed through a solution of NaCl dissolved in water, it breaks down into its constituent ions, Na^+ and Cl^-. Sodium ions (Na^+) go to the cathode, accept electrons, and become Na metal, while Cl^- ions go to the anode, donate electrons, and become Cl gas. This process is the electrolysis of NaCl.

Question 31. Explain the main difference between electrolytes and non-electrolytes.

Ans. The main difference between electrolytes and non-electrolytes is their ability to conduct electricity. Electrolytes are substances that dissociate into ions in a molten state and can conduct electricity. For example, NaCl, HCl, and NaOH are electrolytes. On the other hand, non-electrolytes are substances that do not dissociate into ions in a molten state and cannot conduct electricity. For example, glucose and urea are non-electrolytes.

Question 32. How is caustic soda produced in the electrolysis of NaCl?

Ans. Sodium chloride (NaCl) dissociates in solution to produce Na^+ and Cl^- ions. Similarly, water in the solution dissociates to produce H^+ and OH^- ions. When electricity is passed through the solution, Cl^- ions and H^+ ions go to the cathode and, through chemical reactions, produce chlorine and hydrogen gas, which escape from the solution. On the other hand, the remaining sodium ions (Na^+) and hydroxyl ions (OH^-) in the solution combine to form sodium hydroxide (NaOH).

Science

Creative Q/A Designed as per learning outcomes

Ques. 01 (i) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
(ii) $2K + Cl_2 \rightarrow 2KCl$
(iii) $NH_4Cl \xrightarrow{Heat} NH_3 + HCl$

a. What is called valency? 1
b. Why gas burner is to burn for cooking? 2
c. Explain the reaction (i) in the above stem. 3
d. Analyze (it) and (iii) are different of type with each other. 4

• *Rajshahi Board 2019*

Answer to Question No. 01 :

a The valency of the element means the number of atom attached to that element. Such as valency of hydrogen is 1.

b For cooking food, heat energy is necessary. When gas burner is burned, the chemical energy stored in it transforms into heat energy. We use this heat energy for cooking.

c The reaction (i) in the stem is a chemical reaction. When zinc and copper sulphate is chemically mixed, a chemical reaction takes place between them resulting zinc sulphate and copper. In the reaction, zinc occupies the position of Cu displacing or replacing it from $CuSO_4$. So, this type of reaction is called displacement or substitution reaction.

d The two reactions (ii) and (iii) shown in the stem are of different types.
In the reaction (ii), potassium (K) chemically reacts with chlorine (Cl) and produce potassium chloride (KCl). This is addition reaction.
In which chemical reaction more than one element combined to produce a new kind of chemical substance is called addition reaction.

In the reaction (iii), it is seen that ammonia gas (NH_3) and hydrochloric acid (HCl) are produced by heating ammonium chloride (NH_4Cl).
When ammonium chloride (NH_4Cl) is heated, it decomposes into ammonia and hydrochloric acid.
This type of reaction which causes the decomposition of a compound to from more than one compound is called decomposition reaction.

Ques. 02 (i) $Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$
(ii) $2Mg + O_2 \longrightarrow 2MgO$
(iii) $CuCO_3 \xrightarrow{heat} CuO + CO_2$

a. What is lime water? 1
b. Why is a litmus paper called indicator? 2
c. Explain the reaction no *(ii)*. 3
d. Are the reactions no, *(i)* and *(iii)* of same type? Explain with logic. 4

Cumilla Board 2019

Answer to Question No. 02 :

a Quick lime or $Ca(OH)_2$ dissolves in water very slightly. The saturated solution of $Ca(OH)_2$ in water is called lime water.

b Materials or substances with identify whether a substance is an acid or a base or none of these are called indicators. Litmus paper can be used to identify whether an unknown material is an acid or a base or neutral. Thats why litmus paper is called an indicator.

c The chemical reaction shown in the (ii) is known as combustion reaction. In such a reaction, if a metal is burnt in the air, a metallic oxide of the metal is produced. Here Mg is burnt in air to produce MgO and at the time of burring with the oxygen of the air, a bright flame is shown until all the magnesium is burnt out.

d No, the two reactions no. (i) and (iii) are not the same type. No. (1) reaction is a displacement reaction.
$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$
Here, Fe is removing hydrogen from sulphuric acid and occupying place to from ferrus Sulphate ($FeSO_4$) and hydrogen gas (H_2). This type of chemical reaction, where an element replace another element from a compound and occupies its place producing a new compound is called displacement reaction.
In the reaction (iii) it is shown that copper carbonate ($CuCO_3$) is heated, when copper carbonate is heated, it breaks and produces cupper oxide and carbon dioxide (CO_2) gas.

$$CuCO_3 \xrightarrow{Heat} CuO + CO_2$$

This type of reaction which causes the decomposition of a compound to form more than one compound is called decomposition reaction.

Ques. 03 (i) $NaClO_3 \xrightarrow{Heat} NaCl + O_2$
$Zn + O_2 \longrightarrow ZnO$

a. What is lime water? 1
b. $Cu(OH)_2$ is only base, its not alkali.—Explain. 2
c. Before and after the reaction no. (1), the atom numbers will be equal.—Prove it. 3
d. Give a comparative discussion between the reaction no. (1) and (2). 4

Barishal Board 2019

Answer to Question No. 03 :

a Calcium hydroxide $Ca(OH)_2$ is called limewater.

b A base is a metal oxide or hydroxide. There are some bases which dissolve in water. These are called alkali. Thus alkali is a special kind of base. $Cu(OH)_2$ does not dissolve in water and that is why it is a base but not an alkali.

c (i) $NaClO_3 \xrightarrow{Heat} NaCl + O_2$
To balance the equation (1), we get
$2NaClO_3 = 2\,NaCl + 3O_2$
From the above equation, the total number of sodium, chlorine and oxygen atoms before and after of the reaction can be calculated.

$2NaClO_3 = 2\,NaCl + 3O_2$
$2(1 + 1 + 3) = 2(1 + 1) + 3 \times 2$
or, $2 \times 5 = 2 \times 2 + 3 \times 2$
or, $10 = 4 + 6$
$\therefore\ 10 = 10$

The number of atoms before and after the reaction is equal.

d No. (i) reaction of the stem is as follows–

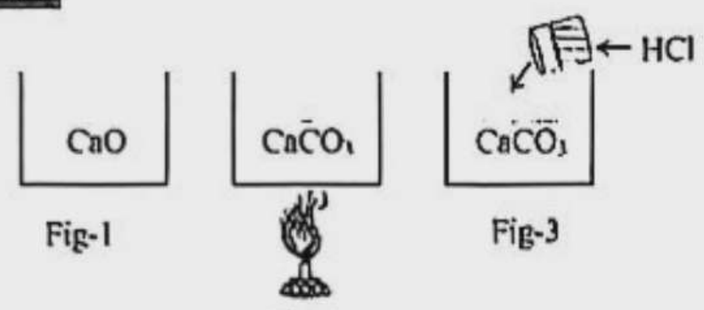
$2\,KClO_3 \xrightarrow{Heat} 2\,KCl + 3O_2$
Potassium Chlorate → Potassium Chloride + Oxygen

The reaction shows that, potassium Chloride (KCl) and oxygen gas is produced by heating potassium chlorate ($KClO_3$).
When potassium chlorate is heated, it decomposes into potassium chloride and oxygen gas.

This type of reaction which causes the decomposition of a compound to form more than one compound is called decomposition reaction.

On the other hand, the equation (ii) $Zn + O_2 \rightarrow ZnO$ refers to a combustion reaction. In such a reactions, if a metal is burnt in the air, a metal Oxide is produced. Here Zn (Zinc) is burnt in air to produce ZnO.

Ques. 04



a. What is called electrolysis? 1
b. Why $Ca(OH)_2$ is a base? 2
c. What type of reaction will be happened when water is poured in the figure 01? — Explain. 3
d. Are the reactions same that happened in the figures 2 and 3?– Give opinion with logic. 4

● *Jashore Board 2018*

Answer to Question No. 04 :

a The formation of ions due to current flow through a solution is called electrolysis.

b $Ca(OH)_2$ is a base because it produces hydroxide OH^- in water.

$$Ca(OH)_2 \xrightarrow{H_2O} Ca^{2+} + 2OH^-.$$

c CaO reacts with water (H_2O) and produces $Ca(OH)_2$

$$\underset{\text{Calcium oxide}}{CaO} + \underset{\text{water}}{H_2O} \longrightarrow \underset{\text{Calcium hydroxide}}{Ca(OH)_2}$$

Two compounds together forming a new is addition reaction.

d Reaction happens in presence of O_2.

$$\underset{\text{Calcium carbonate}}{CaCO_3} \xrightarrow{\text{Heat}} \underset{\text{Calcium oxide}}{CaO} + \underset{\text{Carbon oxide}}{CO_2}$$

Again, reaction happens in presence of O_3,

$$\underset{\text{Calcium carbonate}}{CaCO_3} + \underset{\text{hydroxide acid}}{HCl} \longrightarrow \underset{\text{Calcium chlorid}}{CaCl_2} + \underset{\text{water}}{H_2O} + \underset{\text{Carbon oxide}}{CO_2}$$

The reactions are not same that happened in the figure 1 and 3.

The reaction happened in figure 2 is called decomposition reaction.

Again, the reaction happened in figure 3 is displacement reaction. In this reaction Ca is removing H_2 from HCl acid and occupying its place to form $CaCl_2$, H_2O, CO_2. This type of chemical reaction where an element replaces another element from a compound band and occupies its place producing a new compound is called displacement reaction.

Ques. 05 (i) $Zn + H_2SO_4 = ZnSO_4 + H_2$

(ii) $C + O_2 \xrightarrow{\text{Heat}} CO_2$

(iii) $CuCO_3 \xrightarrow{\text{Heat}} CuO + CO_2$

a. What is called drycell? 1
b. Why NaCl is called electrolyte? 2
c. Marked No. (i) reaction is which type of reaction— Explain. 3
d. Are the reactions (ii) and (iii) same? Give your opinion with logic. 4

● *Cumilla Board 2018*

Answer to Question No. 05 :

a Dry cells are portable source of electrical energy.

b Those materials which in the dissolved state or melted state allow electricity to pass through it are called electrolyte. NaCl materials which in dissolved state allow electricity to pass through it. For this reason it is called electrolyte.

c Reaction (i) is a displacement reaction.

$$\underset{\text{Zinc}}{Zn} + \underset{\text{Sulfuric acid}}{H_2SO_4} = \underset{\text{Zinc Sulphate}}{ZnSO_4} + \underset{\text{Hydrogen gas}}{H_2}$$

Here, Zn is removing hydrogen from sulfuric acid and occupying place to from zinc sulphate and hydrogen gas.

This type of chemical reaction, where an element replace another element from a compound basd occupies its place producing a new conpound is called displacement reaction.

d Two reactions (ii) & (iii) shown in the stem are not same type.

Equation no. (ii) of the stem is a combustion reaction. In such a reaction C is barnt in air to produce CO_2 gas.

$$\underset{\text{carbon oxide}}{C} + O_2 \xrightarrow{\text{Heat}} \underset{\text{carbon dioxide}}{CO_2}$$

In the reaction (iii) it is shown that copper carbonate ($CuCO_3$) is heated, when copper carbonate is heated, it breaks and produces cupperoxide and carbon dioxide (CO_2) gas.

$$\underset{\text{Copper carbonate}}{CuCO_3} \xrightarrow{\text{Heat}} \underset{\text{Copper oxide}}{CuO} + CO_2$$

This type of reaction which causes the decomposition of a compound to form more than one compound is called decomposition.

Ques. 06 (i) $MgO + CH_3COOH \longrightarrow$.

(ii) $KClO_3 \xrightarrow{\text{Heat}}$

a. What is chemical equation? 1
b. The formula of carbon di-oxide is 'CO_2" — What does it mean? 2
c. Complete the equation number (i). What type of reaction is this? Explain it. 3
d. Explain the electrolysis process of the aqueous solution of the produced product of the equation no. (ii) 4

● *Sylhet Board 2018*

Answer to Question No. 06 :

a The process by which one or two element combine to form a new compound is called chemical reaction.

b The short expression of molecule of compound is called formula. The formula of carbon dioxide is CO_2. it means 1 molecule of carbon dioxide. Contains 3 atoms of two types of different elements carbon and oxygen.

Science

c According to the stem, the equation is given below:

$MgO + CH_3COOH \longrightarrow (CH_3COO)_2 Mg + H_2O$

Here, MgO is alkaline substance and CH_3COOH is acidic substance.

This type of reaction where substances of opposite characteristics react with each other and produce neutral substance are called neutralization reaction.

The above mentioned reaction is neutralization reaction.

d When potassium chlorate is heated it decomposes into potassium chloride and oxygen gas.

$$\underset{\text{Potassium chlorate}}{2KClO_3} \xrightarrow{\text{Heat}} \underset{\text{Potassium chloride}}{2KCl} + \underset{\text{Oxygen}}{3O_2}$$

The electrolysis process of KCl is given below : the carbon rod which is connected to the positive pole is covered with gas bubbles and the rod which is the negative pole of the battery is covered with a gray layer. Why is this? The reason is that due to flow of current through the dissolved salt chloride ions (Cl") reaching the anode produce chlorine gas (Cl_2) and we find bubbles of gas on the anode. On the other hand, the Potassium ion (K^+) goes to the cathode due to the flow of electricity and through chemical reaction produce metallic Potassium (K). This is why we find gray layer on the cathode. The produced sodium reacts with water and sodium hydroxide and hydrogen are generated.

$$\underset{\text{Potassium ion}}{k^+} + \underset{\text{Electron}}{e} \longrightarrow \underset{\text{Matallic Potassium}}{K}$$

$$\underset{\text{Potassium}}{k} + \underset{\text{Water}}{H_2O} \longrightarrow \underset{\text{Potassium hydroxide}}{KOH} + \underset{\text{Hydrogen}}{H_2}$$

$$\underset{\text{Chlorine ion}}{Cl^-} - \underset{\text{Electron}}{e} \longrightarrow \underset{\text{Chlorine atom}}{Cl}$$

$$\underset{\text{Chlorine atom}}{Cl} + \underset{\text{Chlorine atom}}{Cl} \longrightarrow \underset{\text{Chlorine gas}}{Cl_2}$$

Ques. 07 (i) $2Mg + O_2 \longrightarrow$

(ii) $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$

a. What is called valency? 1

b. Write the two difference between formula and symbol. 2

c. Explain the reaction by the balance in the No. (i) reaction. 3

d. What kind of reaction is No. (ii) explain by the mentioned. 4

● *Dhaka Board 2017*

Answer to Question No. 07 :

a The valency of the element means the number of atom attached to that element. Such as valency of hydrogen is 1.

b The two differences between formula and symbol are given below :

Formula	Symbol
1. The short expression of molecules of a compound is called formula.	1. The sign used for denoting a particular thing or event is known as symbol of that thing or event.
2. Example : Formula of hydrogen molecule is H_2 and oxygen molecule is O_2.	2. Example : Symbol of hydrogen is H and oxygen is O.

c The reaction by the balance in the no. (i) reaction is explained below :

$$2Mg + O_2 = 2MgO$$

From the above equation, the total number of oxygen and magnesium atoms before and after the reaction can be calculated :

$2Mg + O_2 = 2MgO$

$(2 \times 1) + (1 \times 2) = 2 \times (1 + 1)$

or, $2 + 2 = 2 \times 2$

or, $4 = 4$

Therefore, the number of atoms before and after the reaction is equal. Thus the reaction is balanced.

d In the reaction (ii) —

A chemical reaction has taken place, as a result iron sulphate and copper have been formed. The colour of iron sulphate is light green which turns the blue colour of the solution into light green.

$$\underset{\text{Iron}}{Fe} + \underset{\text{Copper sulphate}}{CuSO_4} \longrightarrow \underset{\text{Iron sulphate}}{FeSO_4} + \underset{\text{Copper}}{Cu}$$

In this reaction Iron is removing copper from copper sulphate and occuping is place to form Iron sulphate and pure copper.

This type of chemical reaction, where an element replaces another element from a compound band occupies its place producing a new compound is called displacement reaction.

Ques. 08 (i) $2KClO_3 \xrightarrow{Heat} 2KCl + 3O_2$

(ii) $NaOH + HCl \longrightarrow NaCl + H_2O$

a. How many atoms are in the compound $3Al_2(SO_4)_3$? 1
b. What do you mean by chemical equation? 2
c. What type of reaction is No. (i)? Explain it. 3
d. Are the two reactors of the reaction No. (ii) same? Give your opinion with comparative details. 4

● *Jessore Board 2017*

Answer to Question No. 08 :

a The compound is 3 $Al_2(SO_4)_3$.
Here, the number of aluminium (al) atoms = 2
the number of sulphur (s) atoms = 3
the number of oxygen (o) atom = 3×4
= 12
∴ The total number of atom in this compound is
$= 3(2 + 3 + 12) = 3 \times 17 = 51$

b A chemical equation is a shortened expression of a chemical reaction. It uses some symbols, formulas and some mathematical signs to denote the reactants and the products. For example :

$Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$
(Zinc) (Sulphuric acid) (Zinc sulphate) (Hydrogen)

In a chemical equation the formula or symbols of the reacting substances or reactants are written on the left of the sign of equality (=) and the symbols or formulas of the products are written on the right of it.

c Reaction (i) of the stem is as follows :

$2KClO_3 \xrightarrow{Heat} 2KCl + 3O_2$
Potassium Chlorate → Potassium Chloride + Oxygen

The reaction shows that potassium Chloride (KCl) and oxygen gas are produced by heating potassium chlorate ($KClO_3$).
When potassium chlorate is heated, it decomposes into potassium chloride and oxygen gas.
This type of reaction which causes the decomposition of a compound to form more than one compound is called decomposition reaction.

d In chemical reaction (ii), we have two reactants namely sodium hydroxide (NaOH) and hydrochloric acid. These two reactants are not the same. Here NaOH is a base and HCl is an acid. The chemical properties of the two compounds are quite different. For example, NaOH turns red litmus paper blue and HCl turns blue litmus paper red. Besides, pH of NaOH is greater than 7 while pH of HCl is less than 7. When an aquous solution NaOH and HCl is mixed together, salt and water is produced. Both salt and water are neutral substances.
So, it is evident that the reactant compounds in the reaction (ii) are not of the same nature.

Ques. 09 Take a notice at the following chemical elements and answer the question :

$\overset{b}{K}ClO_3 \xrightarrow{heat}$

a. How is the proton number of sodium? 1
b. What do you mean by symbol? 2
c. Complete the equation and explain which kind of reaction it. 3
d. Show that the number of atoms is equal before the reaction and after the reaction 4

● *Cumilla Board 2017*

Answer to Question No. 09 :

a The atomic number of sodium is 11. Since the atomic number is equal to the number of protons in the atom of the element, the proton number of sodium is 11.

b The short expression of the element is called symbol. Generally, symbols are expressed by the first one or two letters of the English or Latin name of the elements. For example : O is the symbol of oxygen, H is the symbol of hydrogen etc.

c A chemical reaction is shown in the stem in which it is seen that $KClO_3$ (potassium chlorate) is heated. When potassium chlorate is heated it decomposes into potassium chloride and oxygen gas. The equation of the reaction is as follows–

$2KClO_3 \xrightarrow{heat} 2KCl + 3O_2$
potassium chlorate → potassium chloride + oxygen.

This type of reaction which causes the decomposition of a compound to form more than one compound is called decomposition reaction.

d In the reaction of the stem, potassium chlorate decomposes into potassium chloride and oxygen gas. So, the formula of potassium chlorate is to be written on the left of the equals sign and the formula of the product will be written on the right.
The reaction may be expressed as follows :

$KClO_3 \xrightarrow{heat} KCl + O_2$

In potassium chlorate, three types of elements are present : potassium (K), chlorine (Cl) and oxygen (O). The number of K, Cl and O atoms before the reaction and their numbers after the reaction should be same. To make the number equal, it will have to multiplied on the left and right sides by 2 and 3 respectively. The equation now stands as :

$2\,KClO_3 \xrightarrow{heat} 2KCl + 3O_2$

Science

From the above equation the total number of potassium (K), chlorine (Cl) and oxygen (O) atoms before and after of the reaction can be calculated :

$2KClO_3 = 2KCl + 3O_2$

$2 \times (1 + 1 + 3) = 2 (1 + 1) + 3 (1 \times 2)$

or, $2 \times 5 = 2 \times 2 + 3 \times 2$

or, $10 = 4 + 6$

or, $10 = 10$.

Therefore, the number of atoms before and after the reaction is equal.

Ques. 10 (i) $Mg + O_2 \xrightarrow{Heat} MgO$;

(ii) $CaO + H_2O \longrightarrow Ca(OH)_2$

a. What is called symbol? 1
b. What is meant by lime water? 2
c. What is the type of number (i) reaction, in the stem– explain. 3
d. Do you think the two reactions mentioned in the above stem are same? Give logic in favour of your answer. 4

● *Dhaka, Jessore Board 2016*

Answer to Question No. 10 :

a The sign used for denoting a particular thing or event is known as symbol of that thing or event namely O' is the symbol of oxygen, H is the symbol of hydrogen, etc.

b The chemical reaction between lime and water is shown below :

$CaO + H_2O \longrightarrow Ca(OH)_2$
Lime Water Calcium hydroxide

Quick lime or $Ca(OH)_2$ dissolves in water very slightly. The saturated solution of $Ca(OH)_2$ in water is called lime water.

c The chemical reaction shown in the stem is known as combustion reaction. In such a reaction, if a metal is burnt in air, a metallic oxide of the metal is produced. Here Mg is burnt in air to produce MgO and at the time of burring with the oxygen of the air, a bright flame is shown until all the whole amount of magnesium is burnt out.

d The two reactions shown in the stem are of different types. Reaction (i) is combustion reaction whereas reaction (ii) is synthesizing reaction.
In combustion reaction, when a chemical substance is burnt with fire in the air. As a result of chemical reaction of the substance under discussion and oxygen in the air, a new substance is produced. On the other hand, in the case of synthesizing reaction, a chemical substance is added to another and a new chemical substance is produced due to chemical reaction between the two substances.
From the above, discussion it is clear that the given chemical reactions are not same.

Ques. 11 (i) $Mg + O_2 \longrightarrow$?

(ii) $CaCO_3 \xrightarrow{Heat}$? (Solid) + ? (Gas)

a. What is chemical equation? 1
b. What do you mean by formula? 2
c. Complete the equation (i) of the stem with balance. 3
d. What type of reactions are the equations (i) and (ii) of the stem? Give your comment with logic. 4

● *Rajshahi Board 2017*

Answer to Question No. 11 :

a A chemical equation is a shortened expression of a chemical reaction where some symbols, formulas and some mathematical signs are used to denote the reactants and the products.

b The short expression of molecule of compound is called formula. For example : formula of hydrogen molecule H_2, Oxygen molecule O_2, Hydrogen chloride molecule HCl etc. To write the formula of compound, we need to know the valency of the element. According to the number of valency of the element, elements form compounds by chemical bondage.

c In equation (i), magnesium reacts with oxygen. So, the formula of magnesium and oxygen is to be written on the left of the equal (=) sign and the formula of the product will be written on the right. The reaction can be expressed in the following way :

$Mg + O_2 \longrightarrow MgO$

The number of Mg and O atoms before the reaction and their numbers after the reaction should be same. To make the number equal, it will have to be multiplied on the right side by 2. The equation stands as :

$2 Mg + O_2 = 2MgO$

From the above equation, the total number of oxygen and magnesium atoms before and after the reaction can be calculated :

$2 Mg + O_2 = 2 MgO$
$(2 \times 1) + (1 \times 2) = 2 \times (1 + 1)$
Or, $2 + 2 = 2 \times 2$
Or, $4 = 4$

Therefore, the number of atoms before and after the reaction is equal.

d Two reactions are shown in the stem. The chemical reaction shown in the equation– (i) of the stem is a combustion reaction. In such a reaction, if a metal is burnt in the air, a metallic oxide of the metal is produced. Here Mg is burnt in air to produce Mgo and at the time of burning with the oxygen of the air, a bright flame is shown until all the magnesium is burnt out.

$2\,Mg + O_2 \longrightarrow 2\,Mgo.$

In the equation (ii), it is shown that, calcium carbonate ($CaCO_3$) is heated. When Calcium carbonate or limestone ($CaCO_3$) is heated, it breaks and produces calcium oxide which is a solid material and carbon dioxide (CO_2) gas.

$$CaCO_3 \xrightarrow{Heat} CaO + CO_2$$

Calcium Carbonate — Calcium Oxide — Carbon Dioxide

This type of reaction which causes the decomposition of a compound to form more than one compounds is called decomposition reaction.

Knowledge & Comprehension-based Q/A — Designed as per topic

Preparatory Knowledge-based Q/A

Question 1. What is the symbol?

Ans. The abbreviation of the English or Latin name of an element is called a symbol.

Question 2. What is the formula?

Ans. A symbol is an abbreviation of the molecular name of an element or compound.

Question 3. What is the valency?

Ans. The valency of an element is the number of hydrogen atoms an atom of that element is bonded to.

Question 4. What is compound?

Ans. If more than one atom of two or more elements joined together behaves like a single atom, it is called compound.

Question 5. What is a radical?

Ans. Those groups of atoms that participate in the formation of compounds like atoms of basic substances are called radicals.

Question 6. What is combustion reaction?

Ans. Combustion is the process of burning a substance in the presence of oxygen in the air to form its oxide.

Question 7. What is the formula of vinegar?

Ans. The formula for vinegar is CH_3COOH.

Question 8. Write the formula of milk of magnesia.

Ans. The formula for milk of magnesia is $Mg(OH)_2$

Question 9. Write formula of Ferric Oxide.

Ans. The formula of Ferric Oxide is Fe_2O_3.

Question 10. What is slack lime?

Ans. Slack lime is essentially calcium hydroxide with the chemical formula $Ca(OH)_2$

Question 11. What is lime water?

Ans. A saturated solution of calcium hydroxide ($Ca(OH)_2$) in water is called lime water.

Question 12. What are called dry cells?

Ans. Batteries used in torch lights, various remote controllers, various toys, etc. are called dry cells.

Question 13. . What is electrolysis?

Ans. Electrolysis is the chemical change that occurs when an electric current is passed through a dissolved or melted substance.

Question 14. What is called the saturated solution of quick lime?

Ans. The saturated solution of quick lime is called lime water.

Preparatory Comprehension-based Q/A

Question 1. What is meant by symbol, formula and valency ?

Ans. A symbol is an abbreviation or expression of the full name of an element. Again, the abbreviation of the molecules of an element or compound is called formula.

For example, the formula of hydrogen molecule is H_2, the formula of oxygen molecule is O_2, the formula of hydrogen chloride molecule is HCI, etc. And the number of electrons that an atom of an element can donate or accept to another atom is called the valency of that element.

Question 2. What is the difference between CO_2 and CO_3^{2-}?

Ans. CO_2 and CO_3^{2-} are different from each other. Because CO_2 is a compound called carbon dioxide. CO_2 is charge neutral. But CO_3^{2-} is a compound or group of atoms which behaves like an atom which is called carbonate. CO_3^{2-} is a negatively charged element whose charge is -2.

Question 3. Write the rules for balancing chemical equations.

Ans. The following rules are followed to balance chemical equations-

1. Write the reaction equation using correct notation of reactants and products.
2. If the reactant and product are compounds, i.e. if the signal contains atoms of more than one element, equate the reactant or product or both by multiplying different numbers.
3. Then equalize the number of basic reactants and products.
4. Equating reactions with reactants and products usually using whole numbers as multipliers.

Question 4. Explain why chemical reactions occur.

Ans. One of the reasons why chemical reactions take place is the tendency of elements to form stable structures. Each element strives to attain the stable electron configuration of the inert gas in its final energy transition. When two atoms of the same or different elements come close together, they acquire the electron configuration of an inert gas by accepting, discarding, or sharing electrons in their last energy levels. As a result, a chemical reaction takes place.

Question 5. What is neutralizing reaction? Give an example of a neutralizing reaction.

Ans. The reaction in which acids and bases react with each other to form salts of neutral substances is called neutralizing reaction.

Example: Sodium hydroxide (NaOH) reacts with alkali, hydrochloric acid (HCl) to form salt (NaCl) and water: where NaCl is a neutral substance.

$NaOH + HCl \rightarrow NaCl + H_2O$

Question 6. Write the chemical reaction of lime and vinegar with equations.

Ans. The chemical reaction of lime and vinegar is written in the form of equation below–

$CaO + 2\ CH_3COOH \rightarrow (CH_3COO)_2Ca + H_2O$

In this case acid and alkali react with each other to produce salt and water in neutralization reaction.

Question 7. Why is MnO used in dry cells?

Ans. Reason for using MnO in dry cell-

1. The surface area of the cathode is increased by using powders of carbon and MnO around the carbon rods of the cell.
2. MnO oxidizes the $H_2(g)$ produced in the cell, freeing the cell from polaron action.

MnO also acts as an energy source in dry cells. reaction

Question 8. Why NaCl is an electrolyte ?

Ans. NaCl is an electrolytic substance. Because, we know that all substances that undergo chemical reactions due to the flow of electricity are called electrolytic substances. Passing an electric current through an aqueous solution of NaCl produces NaOH, C_2, and H_2 respectively. So NaCl is an electrolytic substance.

Question 9. Why is sugar called a non-electrolytic substance?

Ans. Sugar is an nonelectrolytic substance. This is because sugar does not react chemically with the flow of electricity. Those substances which do not conduct electricity in dissolved or melted state and therefore do not undergo chemical reactions are called non electrolyte substances. So, sugar is an non-electrolytic substance.

Question 10. How can be proved that chemical reaction causes transformation of energy?

Ans. We know that the chemicals containing chemical energy used in a dry cell are Zinc, Charcoal powder, Amonium chloride and MnO_2. When an electric circuit is completed with an electric circuit and a bulb, electric light is obtained. So, it is evident that chemical energy is transformed into electrical energy in a dry cell.

Question 11. What type of transformation of energy is caused in a dry cell?

Ans. We can easily experience that we feel hot if we put our hand near a burning candle. Again we can see things around a burning candle in the dark. A candle is a chemical substance which when is ignited gives us heat and light. Thus it is proved that any chemical reaction causes transformation of energy like heat, light, etc.

Solutions to Textual Activities Along with textual reference

Solutions to Activities of Exercise

Task 01 Form a group of 4 to 5 and identify 5 chemical reactions which are closely related to our day to day life. Think whether there is transformation of energy in these reactions. If there are transformations of energy, try to find out. Make a report, what kind of transformation occure during the translformation of energy.

▸ Textbook Page 92

Solution : We formed groups of 4-5 people and identified 5 chemical reactions that are closely related to our daily lives and involve energy conversion. We have listed the types of energy conversions we observed below.

1. When we light a candle and place our hand over it, we feel the heat, and if we light a candle in a dark room, the area around it becomes illuminated. This means that when a candle burns, the chemical energy stored in it is converted into heat energy and light energy.

Fig : Burning Candle

2. We use gas stoves to cook food. This means that the chemical energy stored in the gas is converted into heat energy and light energy.

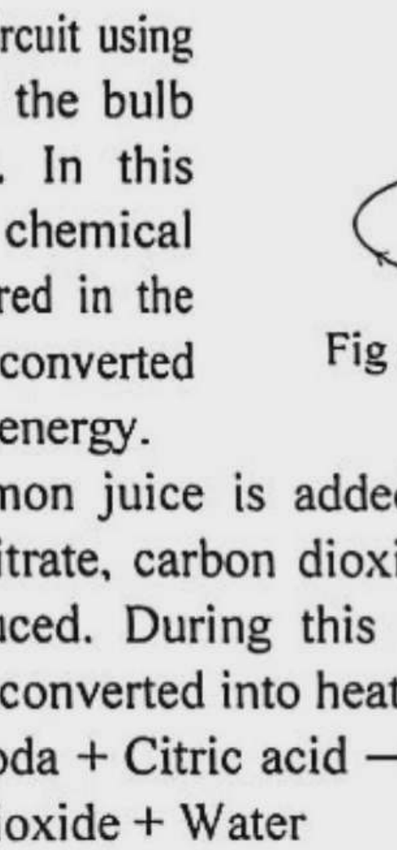


Fig : Cooking on gas stove

3. When lime is added to water, the water starts to boil. In this case, the chemical energy stored in the lime is converted into heat energy.
4. When we create an electrical circuit using a battery, the bulb lights up. In this case, the chemical energy stored in the battery is converted into light energy.

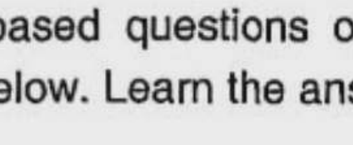


Fig : Dry cell circuit

5. When lemon juice is added to baking soda, sodium citrate, carbon dioxide gas, and water are produced. During this process, chemical energy is converted into heat energy.
Baking soda + Citric acid → Sodium citrate + Carbon dioxide + Water

Super Suggestions

Super Suggestions with 100% preparatory questions selected by the Master Trainer Panel

Dear learners, important multiple choice, short, creative, knowledge & comprehension-based questions of this chapter selected by Master Trainer Panel for Half-Yearly and Annual Exams are presented below. Learn the answers to the mentioned questions well to ensure 100% preparation.

Question Pattern	7★	5★
○ MCQs with Answers	Learn each MCQs in this chapter thoroughly.	
○ Short Q/A	2, 4, 6, 12, 14, 19, 24, 30	8, 9, 16, 17, 27, 28
○ Creative Q/A	3, 4, 8	5, 9, 11
○ Knowledge-based Q/A	2, 4, 7, 9, 12, 14	1, 5, 8
○ Comprehension-based Q/A	2, 4, 7, 10	1, 5

Exclusive Tips ▸▸ Master the solutions to all the activities in this chapter along with exercise and other Q/A to develop the creative thinking and assess your talent.

Assessment & Evaluation

A question bank presented in the form of a class test to assess the preparation

Class Test Time : 3 hours

Science

Class : Eight

Full marks : 100

Multiple Choice Questions (Each question carries 1 mark) $1 \times 30 = 30$

[N.B. : Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Question Type Examination.]

1. What is the valency of ammonium in $(NH_4)_2 SO_4$?
ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

2. In the reaction $NH_3 + X \rightarrow NH_4Cl$, 'X' is used in which of the following?
ⓐ Explosives and rayon
ⓑ To digest the food
ⓒ To collect compound from the mine
ⓓ Preparation of paints

3. Compounds used in making medicine for healing heartburn —.
i. $Mg(OH)_2$
ii. $Al(OH)_3$
iii. $Ca(OH)_2$
Which one of the following is correct?
ⓐ i & ii ⓑ ii & iii ⓒ i & iii ⓓ i, ii & iii

4. What is the valency of Zn?
ⓐ One ⓑ Two ⓒ Three ⓓ Four

5. Which compound is called blue Vitriol?
ⓐ NH_4Cl ⓑ $Fe_2(SO_4)_3$
ⓒ $CuSO_4$ ⓓ $Fe(NO_3)_2$

6. Which of the following solution is light blue?
ⓐ $CuSO_4$ ⓑ $FeSO_4$ ⓒ $ZnSO_4$ ⓓ K_2SO_4

7. Which one of the following compounds is an artificial source of oxygen?
ⓐ $KClO_3$ ⓑ $CuCO_3$
ⓒ $Al(NO_3)_3$ ⓓ $AgNO_3$

8. Which of the following compounds is edible?
ⓐ $NaHCO_3$ ⓑ H_2SO_4 ⓒ NH_4Cl ⓓ MnO_2

9. Which is electrolyte material?
ⓐ Sugar ⓑ Oil ⓒ Salt ⓓ Glucose

10. Which of the following is non-electrolyte?
ⓐ Sugar ⓑ Tabic salt
ⓒ Tunte ⓓ Citric acid

Observe the reaction b« low and answer to the questions no. 11 and 12 :
$NaOH + A \longrightarrow Na_2SO_4 + H_2O$

11. How many atoms are there in the first reactant compound of the reaction?
ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

12. The compound 'A' is used—
i. to digest food
ii. in fertilizer industry
iii. in producing rayon
Which one is correct?
ⓐ i & ii ⓑ i & iii ⓒ ii & iii ⓓ i, ii & iii

13. Which molecule has more than one valency?
ⓐ Calcium ⓑ Silver
ⓒ Florins ⓓ Led

14. $KClO_3 \xrightarrow{heat} KCl + 'A'$
What is the atoms number of the gas signed 'A'?
ⓐ 2 ⓑ 3 ⓒ 5 ⓓ 6

15. What is the valency of the ammonium radical?
ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

16. $H_2 + N_2 \longrightarrow NH_3$;
Which one is correct balance for this equation?
ⓐ 3, 1, 2 ⓑ 3, 2, 1 ⓒ 1, 2, 3 ⓓ 1, 3, 2

17. How many atoms are there in one molecule of sulphuric acid?
ⓐ 3 ⓑ 5 ⓒ 6 ⓓ 7

18. Which is a symbol?
ⓐ 2H ⓑ O^- ⓒ K ⓓ Na^+

19. Decomposition reaction is of —.
ⓐ a single type ⓑ two types
ⓒ three types ⓓ four types

20. What is the formula of limestone?
ⓐ $MgCO_3$ ⓑ $CuCO_3$
ⓒ $CaCO_3$ ⓓ $FeCO_3$

21. What is the valency of phosphate?
ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

22. What is the formula of the produced compound from the reaction of sulphur with iron?
ⓐ ZnS ⓑ $ZnSO_4$ ⓒ FeS ⓓ $FeSO_4$

23. Which one is radical?
ⓐ Aluminium ⓑ Magnesium
ⓒ Calcium ⓓ Ammonium

24. Which one is positive compound?
ⓐ Sulphate ⓑ Carbonate
ⓒ Phosphate ⓓ Ammonium

25. How does the flame produced by the burning of Sulphur look?
ⓐ Blue ⓑ Red ⓒ Green ⓓ Violet

26. Which of the following compounds is light green?
ⓐ $CuSO_4$ ⓑ $FeSO_4$ ⓒ $ZnSO_4$ ⓓ $CaSO_4$

Look at the following question and answer the question No. 27 and 28 :
$CaCO_3 \xrightarrow{Heat} CaO + X$

27. What will be on the X marked place in the above equation?
ⓐ CO_2 ⓑ CO ⓒ O_2 ⓓ C

28. What kind of reaction is it?
ⓐ Substitution ⓑ Decomposition
ⓒ Addition ⓓ Neutralization

29. Iron + Coper sulphate → "A" + Copper - In this reaction what is Compound "A"?
ⓐ CuS ⓑ $CuSO_4$ ⓒ $FeSO_4$ ⓓ $CaSO_4$

30. Which of the following compound produce O_2 by the decomposition reaction?
ⓐ $CaCO_3$ ⓑ $KClO_3$ ⓒ $CuCO_3$ ⓓ $MgCO_3$

Answer Sheet ▸ Multiple Choice Questions

1	ⓐ	2	ⓑ	3	ⓐ	4	ⓑ	5	ⓒ	6	ⓐ	7	ⓐ	8	ⓐ	9	ⓒ	10	ⓐ	11	ⓒ	12	ⓒ	13	ⓐ	14	ⓓ	15	ⓐ
16	ⓐ	17	ⓓ	18	ⓒ	19	ⓑ	20	ⓒ	21	ⓒ	22	ⓒ	23	ⓓ	24	ⓓ	25	ⓐ	26	ⓑ	27	ⓐ	28	ⓑ	29	ⓒ	30	ⓑ

Short-Answer Question (Each question carries 2 marks)

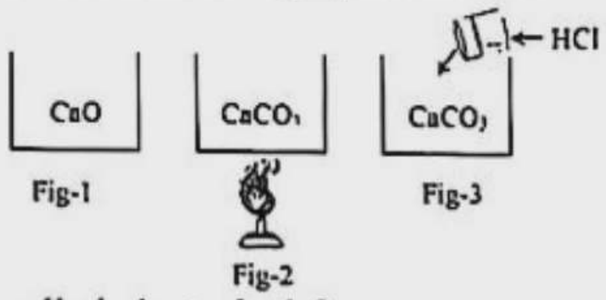
Answer any 10 of the following questions : 2 × 10 = 20

1. Explain the difference between a symbol and a formula.
2. Why is hydrogen present in different amounts in ammonia and methane compounds?
3. Why does P form compounds like PCl_3 and PCl_5 with Cl?
4. Mention two rules for writing the molecular formula of a compound.
5. Mention the characteristics of a chemical reaction.
6. How are the reactants and products represented in a chemical equation?
7. What type of reaction is Zn + S = ZnS? Explain.
8. Explain the type of reaction $S + O_2 = SO_2$.
9. Explain the type of reaction $Mg + CuSO_4 = MgSO_4 + Cu$.
10. Explain why $CaCO_3 = CaO + CO_2$ is a decomposition reaction.
11. Explain why decomposition reactions are essentially the opposite of addition reactions.
12. Explain how heat is generated in a chemical reaction.
13. What type of reaction is $NaOH + HCl = NaCl + H_2O$?
14. How is a dry cell formed?
15. Explain the main difference between electrolytes and non-electrolytes.

Creative Question (Each question carries 10 marks)

Answer any 5 of the following questions : 10 × 5 = 50

1.



a. What is called electrolysis? 1
b. Why $Ca(OH)_2$ is a base? 2
c. What type of reaction will be happened when water is poured in the figure 01? — Explain. 3
d. Are the reactions same that happened in the figures and 3?– Give opinion with logic. 4

2. (i) $MgO + CH_3COOH \longrightarrow$.
(ii) $KClO_3 \xrightarrow{Heat}$
a. What is chemical equation? 1
b. The formula of carbon di-oxide is 'CO_2" — What does it mean? 2
c. Complete the equation number (i). What type of reaction is this? Explain it. 3
d. Explain the electrolysis process of the aqueous solution of the produced product of the equation no. (ii) 4

3. (i) $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
(ii) $2K + Cl_2 \rightarrow 2KCl$
(iii) $NH_4Cl \xrightarrow{Heat} NH_3 + HCl$
a. What is called valency? 1
b. Why gas burner is to burn for cooking? 2
c. Explain the reaction (i) in the above stem. 3
d. Analyze (it) and (iii) are different of type with each other. 4

4. (i) $NaClO_3 \xrightarrow{Heat} NaCl + O_2$
$Zn + O_2 \longrightarrow ZnO$
a. What is lime water? 1
b. $Cu(OH)_2$ is only base, its not alkali.—Explain. 2
c. Before and after the reaction no. (1), the atom numbers will be equal.—Prove it. 3
d. Give a comparative discussion between the reaction no. (1) and (2). 4

5. (i) $Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$
(ii) $2Mg + O_2 \longrightarrow 2MgO$
(iii) $CuCO_3 \xrightarrow{heat} CuO + CO_2$
a. What is lime water? 1
b. Why is a litmus paper called indicator? 2
c. Explain the reaction no *(ii)*. 3
d. Are the reactions no. *(i)* and *(iii)* of same type? Explain with logic. 4

6. Take a notice at the following chemical elements and answer the question :
$KClO_3 \xrightarrow{heat}$
a. How is the proton number of sodium? 1
b. What do you mean by symbol? 2
c. Complete the equation and explain which kind of reaction it. 3
d. Show that the number of atoms is equal before the reaction and after the reaction 4

7. (i) $2KClO_3 \xrightarrow{Heat} 2KCl + 3O_2$
(ii) $NaOH + HCl \longrightarrow NaCl + H_2O$
a. How many atoms are in the compound $3Al_2(SO_4)_3$? 1
b. What do you mean by chemical equation? 2
c. What type of reaction is No. (i)? Explain it. 3
d. Are the two reactors of the reaction No. (ii) same? Give your opinion with comparative details. 4

8. (i) $2Mg + O_2 \longrightarrow$
(ii) $Fe + CuSO_4 \longrightarrow FeSO_4 + Cu$
a. What is called valency? 1
b. Write the two difference between formula and symbol. 2
c. Explain the reaction by the balance in the No. (i) reaction. 3
d. What kind of reaction is No. (ii) explain by the mentioned. 4

Science

☑ Answering Reference ▸ Short-Answer Questions

1 ▸ See this Chapter, Ques. 02	5 ▸ See this Chapter, Ques. 09	9 ▸ See this Chapter, Ques. 18	13 ▸ See this Chapter, Ques. 26
2 ▸ See this Chapter, Ques. 04	6 ▸ See this Chapter, Ques. 11	10 ▸ See this Chapter, Ques. 20	14 ▸ See this Chapter, Ques. 28
3 ▸ See this Chapter, Ques. 05	7 ▸ See this Chapter, Ques. 14	11 ▸ See this Chapter, Ques. 21	15 ▸ See this Chapter, Ques. 31
4 ▸ See this Chapter, Ques. 07	8 ▸ See this Chapter, Ques. 16	12 ▸ See this Chapter, Ques. 23	

☑ Answering Reference ▸ Creative Questions

1 ▸ See this Chapter, Ques. 04	3 ▸ See this Chapter, Ques. 01	5 ▸ See this Chapter, Ques. 02	7 ▸ See this Chapter, Ques. 08
2 ▸ See this Chapter, Ques. 06	4 ▸ See this Chapter, Ques. 03	6 ▸ See this Chapter, Ques. 09	8 ▸ See this Chapter, Ques. 07