

ABs Paths, Kolhapur

Chemical Equations and Reactions

I. Multiple Choice Questions

1. Which of the following does not involve a chemical change?
 - (a) Leaving milk at room temperature during summer
 - (b) Leaving an iron nail left exposed to humid atmosphere
 - (c) Respiration
 - (d) Evaporation of water
2. Which of the following observation/s can be used to determine whether a chemical reaction has taken place?
 - (a) Change in colour
 - (b) Change in temperature
 - (c) Evolution of a gas
 - (d) Any one of the three
3. Which of the following does not represent the balanced chemical reaction correctly?
 - (a) $\text{Zn} (\text{s}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{NaOH} (\text{aq}) + \text{H} (\text{g})$
 - (b) $\text{BaCl}_2 (\text{aq}) + \text{Na}_2\text{SO}_4 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2 \text{NaCl} (\text{aq})$
 - (c) $\text{H}_2 (\text{g}) + \text{Cl}_2 (\text{g}) \rightarrow 2 \text{HCl} (\text{g})$
 - (d) $\text{CaO} (\text{s}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{Ca}(\text{OH})_2 (\text{aq})$
4. On white washing the walls of a room, after drying, they give shining white look. This is due to the formation of
 - (a) CaCl_2
 - (b) $\text{Ca}(\text{OH})_2$
 - (c) CaCO_3
 - (d) CaO
5. Which of the following is not a combination reaction?
 - (a) $\text{CaO} (\text{s}) + \text{H}_2\text{O} (\text{l}) \rightarrow \text{Ca}(\text{OH})_2 (\text{aq})$
 - (b) $\text{C} (\text{s}) + \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g})$
 - (c) $\text{CH}_4 (\text{g}) + 2 \text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + 2 \text{H}_2\text{O} (\text{g})$
 - (d) $2 \text{H}_2 (\text{g}) + \text{O}_2 (\text{g}) \rightarrow 2 \text{H}_2\text{O} (\text{l})$

6. The reactions in which heat is evolved are called
(a) Thermal reactions
(b) Exothermic reactions
(c) Endothermic reactions
(d) Photochemical reactions

7. Which of the following reaction is an endothermic reaction?
(a) Burning of coal
(b) Decomposition of vegetable matter into compost
(c) Process of respiration
(d) Decomposition of calcium carbonate to form quick lime and carbon dioxide

8. When crystals of ferrous sulphate are heated, they decompose to form
(a) FeO (s) and SO_2 (g)
(b) FeO (s) and SO_3 (g)
(c) Fe_2O_3 (s), SO_2 (g), and SO_3 (g)
(d) Fe_2O_3 (s), SO_2 (g), and SO_3 (g)

9. When crystals of lead nitrate are heated, they decompose to form
(a) Pb (s) and NO_2 (g)
(b) PbO (s), NO_2 (g), and O_2 (g)
(c) Pb (s), NO_2 (g), and O_2 (g)
(d) PbO (s), NO (g), and NO_2 (g)

10. Which of the following is not a necessary condition for a decomposition reaction?
(a) There is only one reactant
(b) There are two or more than two products
(c) Heating is always required
(d) All the above conditions are necessary

11. Which of the following is not a thermal decomposition reaction?
(a) CaCO_3 (s) \rightarrow CaO (s) + CO_2 (g)
(b) 2AgCl (s) \rightarrow 2Ag (s) + Cl_2 (g)
(c) 2KClO_3 (s) \rightarrow 2KCl (s) + 3O_2 (g)
(d) 2NaHCO_3 (s) \rightarrow Na_2CO_3 (s) + CO_2 (g) + H_2O (l)

12. The following examples of decomposition reactions:
 2AgBr (s) \rightarrow 2Ag (s) + Br_2 (g)
 $2 \text{H}_2\text{O}$ (l) \rightarrow 2H_2 (g) + O_2 (g)
represent respectively:
(a) Thermal decomposition, electrolytic decomposition
(b) Thermal decomposition, thermal decomposition
(c) Photodecomposition, electrolytic decomposition

(d) Photodecomposition, thermal decomposition

13. On electrolytic decomposition of water, the ratio of H₂ and O₂ gases collected is
(a) 1 : 1
(b) 1 : 2
(c) 2 : 1
(d) Depends on amount of H₂O taken

14. Which of the following displacement reaction will not take place?
(a) Cu (s) + FeSO₄ (aq) → CuSO₄ (aq) + Fe (s)
(b) Zn (s) + FeSO₄ (aq) → ZnSO₄ (aq) + Fe (s)
(c) Cu (s) + 2 AgNO₃ (aq) → Cu(NO₃)₂ (aq) + 2 Ag (s)
(d) Fe (s) + CuSO₄ (aq) → FeSO₄ (aq) + Cu (s)

15. Which one of the following is an example of a double decomposition reaction as well as precipitation reaction?
(a) NaOH + HCl → NaCl + H₂O
(b) FeS + H₂SO₄ → FeSO₄ + H₂S
(c) BaCl₂ + Na₂SO₄ → BaSO₄ + 2 NaCl
(d) 2 NaOH + H₂SO₄ → Na₂SO₄ + 2 H₂O

16. Calcium oxide reacts vigorously with water to produce slaked lime
 $\text{CaO (s)} + \text{H}_2\text{O (l)} \rightarrow \text{Ca(OH)}_2 \text{ (aq)}$
This reaction can be classified as
(A) Combination reaction
(B) Exothermic reaction
(C) Endothermic reaction
(D) Oxidation reaction

17. When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained. The reaction is an example of
(a) Combination reaction
(b) Displacement reaction
(c) Decomposition reaction
(d) Double displacement reaction

18. In a double displacement reaction such as between sodium sulphate and barium chloride solution:
(A) Exchange of atoms takes place
(B) Exchange of ions takes place
(C) A precipitate is produced
(D) An insoluble salt is produced

19. Which one of the following statements is not correct?

- (a) Oxidation involves gain of oxygen or loss of hydrogen
- (b) Reduction involves loss of oxygen or gain of hydrogen
- (c) Oxidizing agent is a substance which can lose hydrogen
- (d) Reducing agent is a substance which can gain oxygen

20. The chemical formula of rust is

- (a) $\text{FeO} \cdot \text{Fe}_2\text{O}_3$
- (b) $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$
- (c) $\text{FeO} \cdot \text{H}_2\text{O}$
- (d) Any one of these

21. Rancidity involves

- (a) Oxidation of food
- (b) Reduction of food
- (c) Oxidation or reduction of food
- (d) Fermentation of food

22. Which of the following reaction will take place?

- (a) Ag in CuSO_4 solution
- (b) Cu in FeSO_4 solution
- (c) Fe in $\text{Al}_2(\text{SO}_4)_3$ solution
- (d) Fe in CuSO_4 solution

23. For the reaction chosen above, what will be the colour of the solution?

- (a) Blue
- (b) Light green
- (c) Colourless
- (d) Pale yellow

24. On the basis of your study, what is the correct order of activity of metals?

- (a) Ag > Cu > Fe > Al
- (b) Al > Fe > Cu > Ag
- (c) Al > Cu > Fe > Ag
- (d) Cu > Fe > Al > Ag

25. When copper strip is dipped in silver nitrate solution which of the following is/are correct?

- (i) Colour of silver nitrate solution turns blue
- (ii) It is a redox reaction
- (iii) It is a double displacement reaction
- (iv) No reaction will take place

26. Which of the following represents a balanced chemical equation correctly?

- (a) $\text{Mg}_3\text{N}_2 + 6 \text{H}_2\text{O} \rightarrow 3 \text{Mg}(\text{OH})_2 + \text{N}_2 + 3 \text{H}_2$

(b) $\text{Na}_2\text{CO}_3 + 2 \text{HCl} \rightarrow \text{Na}_2\text{Cl}_2 + \text{H}_2\text{O} + \text{CO}_2$
(c) $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + 2 \text{H}$
(d) $2 \text{KClO}_3 \rightarrow 2 \text{KCl} + 3 \text{O}_2$

27. When steam is passed over heated iron, the products formed are magnetic oxide of iron and hydrogen gas. The coefficients of Fe and H_2O in the balanced equation are respectively:

(a) 4, 3
(b) 3, 4
(c) 2, 3
(d) 1, 1

28. Which of the following represents an endothermic reaction?

(a) $\text{N}_2 + \text{O}_2 \rightarrow 2 \text{NO}$
(b) Respiration
(c) Burning of coke
(d) $\text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3$

29. In the preparation of O_2 gas by heating potassium chlorate (KClO_3), the catalyst used is

(a) Fe_2O_3
(b) MnO_2
(c) Ni
(d) Fe

30. Which of the following statement/s is/are correct?

(i) When CO_2 is passed through lime water, it first turns milky and then becomes colourless
(ii) There is no action of water on magnesium nitride (Mg_3N_2)
(iii) When Cl_2 is passed through KBr solution, the solution acquires light brown colour
(iv) When dilute sulphuric acid is poured over FeS crystals, a pungent smelling gas is produced

(a) (i), (ii), (iii)
(b) (i), (iii), (iv)
(c) (ii), (iii), (iv)
(d) (i), (ii), (iii), (iv)

31. When $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ crystals are strongly heated, the end products are:

(a) CuSO_4 and H_2O
(b) CuO , SO_2
(c) CuO , SO_2 , O_2
(d) CuO , SO_2 , SO_3 and O_2

32. Which of the following is not a photodecomposition reaction?

(a) $\text{NaCl} \rightarrow 2 \text{Na} + \text{Cl}_2$

- (b) $2 \text{AgBr} \rightarrow 2 \text{Ag} + \text{Br}_2$
- (c) $2 \text{HI} \rightarrow \text{H}_2 + \text{I}_2$
- (d) $2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$

33. Which of the following is a double displacement reaction but not a precipitation reaction?

- (a) $2 \text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2 \text{H}_2\text{O}$
- (b) $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
- (c) $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 + 2 \text{HCl}$
- (d) $\text{Pb} + \text{CuCl}_2 \rightarrow \text{PbCl}_2 + \text{Cu}$

34. Oxidation reaction involves

- (a) Gain of oxygen
- (b) Loss of hydrogen
- (c) Loss of electrons
- (d) Any one of these

35. Which of the following are combination reactions?

- (i) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
- (ii) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$
- (iii) $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
- (iv) $2 \text{NO} + \text{O}_2 \rightarrow 2 \text{NO}_2$

- (a) (i) and (ii)
- (b) (ii) and (iii)
- (c) (ii) and (iv)
- (d) (ii), (iii) and (iv)

36. In the reaction $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$, the substance that acts as an oxidizing agent is

- (a) CuO
- (b) H₂
- (c) Cu
- (d) H₂O

37. In the reaction $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$, the substance that acts as a reducing agent is

- (a) ZnO
- (b) C
- (c) Zn
- (d) CO

38. In the reaction $2 \text{H}_2\text{S} + \text{SO}_2 \rightarrow 3 \text{S} + 2 \text{H}_2\text{O}$, the substance oxidized and reduced respectively are

- (a) H₂S and SO₂
- (b) SO₂ and H₂S
- (c) SO₂ and S

(d) H_2S and S

39. In the reaction $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$, the substance oxidized and reduced are respectively

- (a) Zn and Cu
- (b) Cu and Zn
- (c) Zn, Cu^{2+}
- (d) Cu^{2+} , Zn

40. Which of the following statement/s correctly represents an oxidizing agent?

- (i) A substance that gains oxygen acts as an oxidizing agent
- (ii) A substance which undergoes reduction acts as an oxidizing agent
- (iii) A substance that loses hydrogen acts as an oxidizing agent
- (iv) A substance that gains electrons in a reaction acts as an oxidizing agent

- (a) (i) and (ii)
- (b) (ii) and (iii)
- (c) (ii) and (iv)
- (d) (i) and (iv)

41. A student while burning a magnesium ribbon in air, collected the products in a wet watch glass. The new product obtained was:

- (a) Magnesium oxide
- (b) Magnesium carbonate
- (c) Magnesium hydroxide
- (d) Magnesium chloride

42. When lead nitrate powder is heated in a boiling tube, we observe:

- (a) Brown fumes of nitrogen dioxide
- (b) Brown fumes of lead oxide
- (c) Yellow fumes of nitrogen dioxide
- (d) Brown fumes of nitric oxide

43. A student took sodium sulphate solution in a test tube and added barium chloride solution to it. He observed that an insoluble substance has formed. The colour and molecular formula of the insoluble substance is:

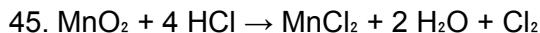
- (a) Grey, Ba_2SO_4
- (b) Yellow, $\text{Ba}(\text{SO}_4)_2$
- (c) White, BaSO_4
- (d) Pink, BaSO_4

44. $\text{C}_6\text{H}_{12}\text{O}_6 \text{ (aq)} + 6 \text{ O}_2 \text{ (aq)} \rightarrow 6 \text{ CO}_2 \text{ (aq)} + 6 \text{ H}_2\text{O} \text{ (l)}$

The above reaction is a/an:

- (a) Displacement reaction
- (b) Endothermic reaction

- (c) Exothermic reaction
- (d) Neutralisation reaction



Which of the following are correct?

- (i) HCl is oxidized to Cl_2
- (ii) MnO_2 is reduced to MnCl_2
- (iii) MnCl_2 acts as an oxidizing agent
- (iv) HCl acts as an oxidizing agent

- (a) (ii), (iii) and (iv)
- (b) (i), (ii) and (iii)
- (c) (i) and (ii) only
- (d) (iii) and (iv) only

46. Why is it important to balance a chemical equation to satisfy the law of conservation of mass? Which of the following is **incorrect**?

- (a) Total mass of elements in reactants = total mass in products
- (b) Number of atoms of each element is the same before and after
- (c) Chemical composition remains the same before and after
- (d) Mass can neither be created nor destroyed in a chemical reaction

47. Which of the following reactions is categorised as thermal decomposition reaction?

- (a) $2 \text{ H}_2\text{O} (\text{l}) \rightarrow 2 \text{ H}_2 (\text{g}) + \text{O}_2 (\text{g})$
- (b) $2 \text{ AgBr} (\text{s}) \rightarrow 2 \text{ Ag} (\text{s}) + \text{Br}_2 (\text{g})$
- (c) $2 \text{ AgCl} (\text{s}) \rightarrow 2 \text{ Ag} (\text{s}) + \text{Cl}_2 (\text{g})$
- (d) $\text{CaCO}_3 (\text{s}) \rightarrow \text{CaO} (\text{s}) + \text{CO}_2 (\text{g})$

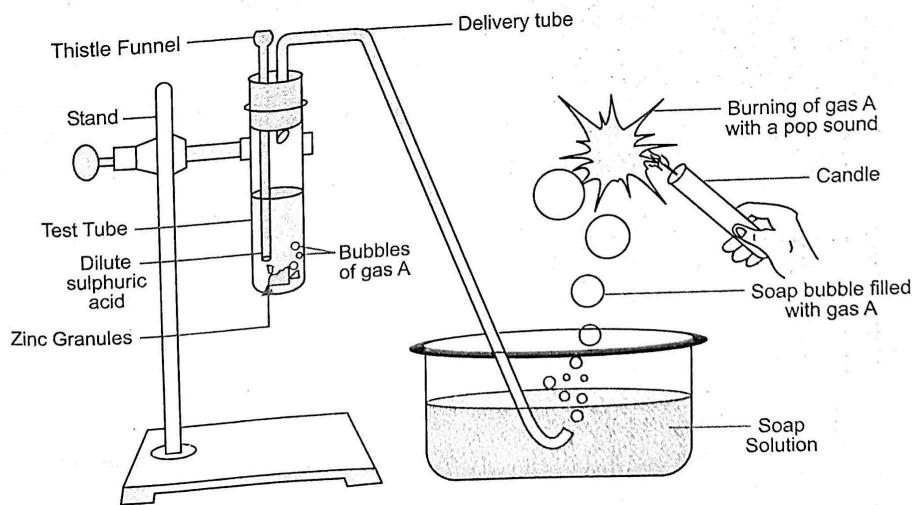
48. Reena took 5 ml of lead nitrate solution and added 4 ml of potassium iodide. What did she observe?

- (a) Solution turned red
- (b) Yellow precipitate was formed
- (c) White precipitate was formed
- (d) Mixture became hot

49. Identify gas A in the following experiment:

(Zinc granules + Dilute $\text{H}_2\text{SO}_4 \rightarrow$ bubbles collected in soap solution \rightarrow pop sound when lit)

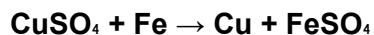
- (a) Nitrogen
- (b) Hydrogen
- (c) Oxygen
- (d) Carbon dioxide



50. Which of the following correctly represents a balanced chemical equation?

- (a) $\text{Fe} (\text{s}) + 4 \text{H}_2\text{O} (\text{g}) \rightarrow \text{Fe}_3\text{O}_4 (\text{s}) + 4 \text{H}_2 (\text{g})$
- (b) $3 \text{Fe} (\text{s}) + 4 \text{H}_2\text{O} (\text{g}) \rightarrow \text{Fe}_3\text{O}_4 (\text{s}) + 4 \text{H}_2 (\text{g})$
- (c) $3 \text{Fe} (\text{s}) + \text{H}_2\text{O} (\text{g}) \rightarrow \text{Fe}_3\text{O}_4 (\text{s}) + \text{H}_2 (\text{g})$
- (d) $3 \text{Fe} (\text{s}) + 4 \text{H}_2\text{O} (\text{g}) \rightarrow \text{Fe}_3\text{O}_4 (\text{s}) + \text{H}_2 (\text{g})$

51. In the reaction of iron with copper sulphate solution:



Which option in the table correctly represents the **substance oxidised** and the **reducing agent**?

Option	Substance Oxidized	Reducing Agent
(a)	Fe	Fe
(b)	Fe	FeSO_4
(c)	Cu	Cu
(d)	CuSO_4	Fe

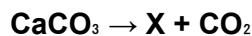
52. The chemical reaction between copper and oxygen can be categorised as:

- (a) Displacement reaction
- (b) Decomposition reaction
- (c) Combination reaction
- (d) Double displacement reaction

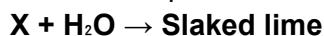
53. Why is it important to balance a skeletal chemical equation?

- (a) To verify law of conservation of energy
- (b) To verify the law of constant proportion
- (c) To verify the law of conservation of mass
- (d) To verify the law of conservation of matter

54. Limestone is heated in Step 1:



Then, in Step 2:



Choose the correct option:

	Option	Step 1	Step 2
(a)		Endothermic	Exothermic
(b)		Exothermic	Endothermic
(c)		Exothermic	Exothermic
(d)		Endothermic	Endothermic

55. Calcium oxide can be reduced to calcium by heating with sodium metal.

Which compound would act as an oxidizing agent?

- (a) Sodium
- (b) Sodium oxide
- (c) Calcium
- (d) Calcium oxide

56. In the redox reaction:

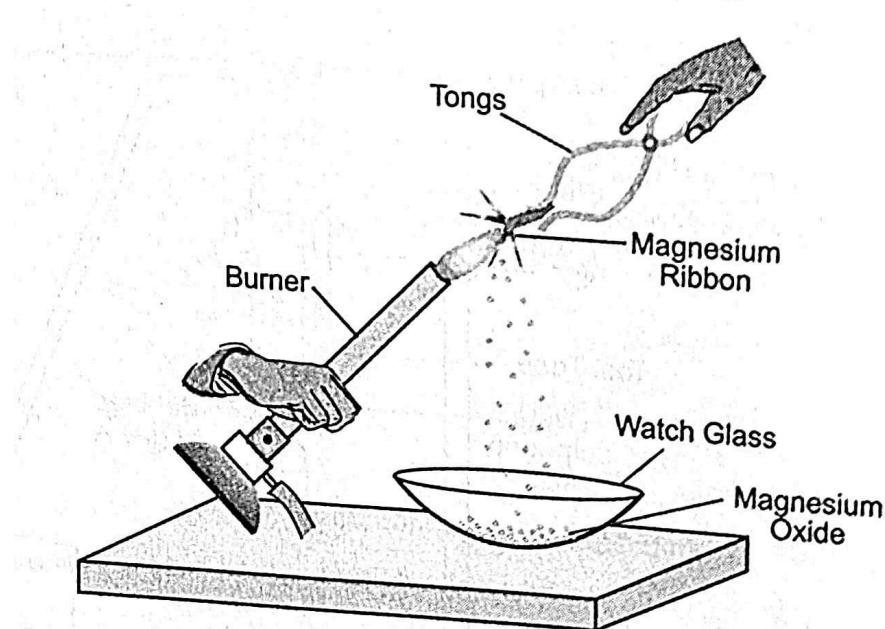


Which of the following is correct?

- (a) MnO_2 is reduced to MnCl_2 and HCl is oxidized to H_2O
- (b) MnO_2 is reduced to MnCl_2 and HCl is oxidized to Cl_2
- (c) MnO_2 is oxidized to MnCl_2 and HCl is reduced to Cl_2
- (d) MnO_2 is oxidized to MnCl_2 and HCl is reduced to H_2O

57. Which of the following is the correct observation for this setup (magnesium ribbon burned with tongs, white solid collected in a watch glass)?

- (a) Brown powder of magnesium oxide is formed
- (b) Colourless gas which turns lime water milky is evolved
- (c) Magnesium ribbon burns with brilliant white light
- (d) Reddish brown gas with a smell of burning sulphur is



III. Assertion-Reason Type Questions (58 to 72)

Instructions: For each of the following questions, choose the correct option:

- (a) Both A and R are true, and R is the correct explanation of A
- (b) Both A and R are true, but R is not the correct explanation of A
- (c) A is true, R is false
- (d) A is false, R is true

58.

Assertion (A): Ferrous sulphate crystals are green in colour but on heating, they first turn white and on further heating decompose to leave behind a reddish brown residue.

Reason (R): They turn white due to loss of water of crystallisation and the reddish brown residue is due to formation of Fe_2O_3 .

59.

Assertion (A): When copper powder is heated in air, it turns black.

Reason (R): Copper reacts with H_2S gas of the air forming black CuS .

60.

Assertion (A): Iron gets corroded in moist air but silver is not.

Reason (R): Iron is more active metal than silver.

61.

Assertion (A): After whitewashing the walls, a shiny white finish is obtained after 2 to 3 days.

Reason (R): Calcium oxide reacts with carbon dioxide to form calcium hydrogen carbonate which gives shiny white finish. (CBSE 2022)

62.

Assertion (A): Silver salts are used in black and white photography.

Reason (R): Silver salts do not decompose in the presence of light. (CBSE 2022)

63.

Assertion (A): Burning of natural gas is an endothermic reaction.

Reason (R): Methane gas combines with oxygen to produce carbon dioxide and water. (CBSE Sample Paper 2021–22)

64.

Assertion (A): Decomposition of vegetable matter into compost is an endothermic reaction.

Reason (R): Decomposition reaction involves breakdown of a single reactant into simpler products.

65.

Assertion (A): In a reaction, the substance which is oxidized is called oxidizing agent.

Reason (R): Oxidizing agent is a substance which takes up hydrogen in a chemical reaction.

66.

Assertion (A): When 1 g of graphite or 1 g of diamond is burnt in excess air, the heat evolved is the same.

Reason (R): Both graphite and diamond are allotropic forms of carbon.

67.

Assertion (A): When CO_2 gas is passed through lime water for a long time, the solution first turns milky and then becomes colourless.

Reason (R): Lime water first changes into calcium carbonate which then changes into calcium bicarbonate.

68.

Assertion (A): If a silver spoon is kept immersed in blue coloured copper nitrate solution, the blue colour disappears or fades after some time.

Reason (R): AgNO_3 solution is colourless.

69.

Assertion (A): When Cl_2 is passed through colourless KI solution, the solution acquires a violet colour.

Reason (R): Chlorine is more reactive than iodine.

70.

Assertion (A): Reaction between Na and Cl_2 to form NaCl is not a redox reaction.

Reason (R): A redox reaction must involve loss or gain of oxygen or hydrogen or electrons.

71.

Assertion (A): Silver vessels or ornaments lose their shine after some time.

Reason (R): Oxygen and moisture of the air attack silver to form a layer of silver oxide (Ag_2O) on its surface.

72.

Assertion (A): Silver bromide decomposition is used in black and white photography.

Reason (R): Light provides energy for this exothermic reaction. (CBSE Sample Paper 2022–23)

Question No.	Correct Option
1	d
2	d
3	a
4	c
5	c
6	b
7	d
8	c
9	b
10	c
11	b
12	c
13	c
14	a
15	c
16	c
17	d
18	d
19	c
20	b

21	a
22	d
23	b
24	b
25	a
26	d
27	b
28	a
29	b
30	d
31	d
32	a
33	a
34	d
35	c
36	a
37	b
38	a
39	a
40	a
41	c
42	a
43	c
44	c
45	c
46	c
47	d
48	b
49	b
50	b
51	a
52	c
53	c
54	a
55	d
56	b
57	c
58	a
59	d
60	a
61	c
62	d
63	d
64	c
65	c
66	a
67	a

68	b
69	a
70	d
71	d
72	c