

PRACTICE PAPER 01 (2026-27)
CHAPTER 01: CHEMICAL REACTIONS AND EQUATIONS
(STEP-BY-STEP SOLUTIONS)

SUBJECT: SCIENCE

MAX. MARKS : 40

CLASS : X

DURATION : 1½ hrs

General Instructions:

- (i) All questions are compulsory.
- (ii) This question paper contains **20** questions divided into five Sections A, B, C, D and E.
- (iii) **Section A** comprises 10 MCQs and Assertion-Reason questions of **1 mark** each. **Section B** comprises 4 Very Short Answer questions of **2 marks** each. **Section C** comprises 3 Short Answer questions of **3 marks** each. **Section D** comprises 1 Long Answer question of **5 marks**. **Section E** comprises 2 Case Study Based questions of **4 marks** each.
- (iv) There is no overall choice. Internal choice is provided in Section E.
- (v) Use of calculators is not permitted.

SECTION - A

Questions 1 to 10 carry 1 mark each.

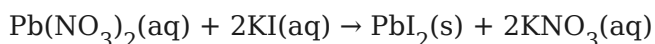
1. A student mixes lead nitrate solution with potassium iodide solution in a test tube. Which of the following correctly describes the precipitate formed?

- (a) White, PbI_2
- (b) Yellow, PbI_2
- (c) Yellow, KNO_3
- (d) Black, $\text{Pb}(\text{NO}_3)_2$

Solution:

Ans: (b) Yellow, PbI_2

- Ions are exchanged: Pb^{2+} pairs with I^- , and K^+ pairs with NO_3^- .
- Lead iodide is insoluble and settles as a **yellow** precipitate; potassium nitrate stays dissolved.



2. Aluminium reacts with oxygen to form aluminium oxide. Which of the following is the correctly balanced equation?

- (a) $2\text{Al} + 3\text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
- (b) $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
- (c) $4\text{Al} + \text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
- (d) $2\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$

Solution:

Ans: (b) $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$

- Count atoms in (b): LHS has Al = 4, O = $3 \times 2 = 6$; RHS has Al = $2 \times 2 = 4$, O = $2 \times 3 = 6$.
- Both elements are equal on both sides, so (b) is balanced. All other options fail the O or Al count.

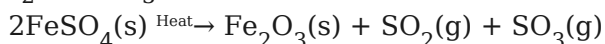
3. When ferrous sulphate crystals are heated strongly in a dry boiling tube, the colour of the crystals changes

- (a) from blue to white
- (b) from green to reddish-brown
- (c) from white to grey
- (d) from white to yellow

Solution:

Ans: (b) from green to reddish-brown

- Green $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ first loses water, then decomposes to reddish-brown ferric oxide (Fe_2O_3), releasing SO_2 and SO_3 (smell of burning sulphur).



4. Which one of the following is an endothermic process?

- (a) Respiration (b) Burning of natural gas
(c) Decomposition of calcium carbonate on heating (d) Decomposition of vegetable matter into compost

Solution:

Ans: (c) Decomposition of calcium carbonate on heating

- Heat must be supplied continuously to break CaCO_3 into CaO and CO_2 , so energy is absorbed.
- Respiration, burning of natural gas and composting all release heat (exothermic).

5. In the reaction $\text{CuO} + \text{H}_2 \xrightarrow{\text{Heat}} \text{Cu} + \text{H}_2\text{O}$, the substance that gets oxidised is

- (a) CuO (b) H_2
(c) Cu (d) H_2O

Solution:

Ans: (b) H_2

- Hydrogen gains oxygen to become H_2O , so it is oxidised. CuO loses oxygen and is reduced to Cu .

6. Manufacturers fill packets of potato chips with a gas to keep the chips fresh. The gas used is

- (a) Oxygen (b) Chlorine
(c) Nitrogen (d) Hydrogen

Solution:

Ans: (c) Nitrogen

- Nitrogen is unreactive; it pushes out oxygen and so prevents oxidation of the oil and fat in chips (rancidity).

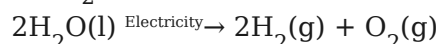
7. During the electrolysis of acidified water, the ratio of volumes of hydrogen and oxygen collected is

- (a) 1 : 2 (b) 2 : 1
(c) 1 : 1 (d) 4 : 1

Solution:

Ans: (b) 2 : 1

- Each water molecule (H_2O) has two hydrogen atoms for every oxygen atom, so 2 volumes of H_2 form for every 1 volume of O_2 .



8. An iron nail is kept dipped in copper sulphate solution for about 20 minutes. Which of the following observations are correct?

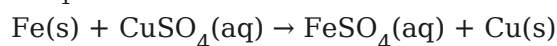
- (i) The iron nail becomes brownish in colour.
(ii) The blue colour of the solution fades.
(iii) The iron nail becomes shiny silver.
(iv) The solution becomes a deeper blue.

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

Solution:

Ans: (a) (i) and (ii)

- Iron is more reactive than copper and displaces it. Reddish-brown copper deposits on the nail, and pale green FeSO_4 forms, so the blue colour fades.



In the following questions 9 and 10, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

- (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 but (R) is false.
- (d) (A) is false but (R) is true.

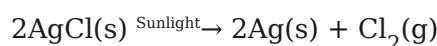
9. Assertion (A): White silver chloride kept in a china dish turns grey when left in sunlight.

Reason (R): Silver chloride decomposes into silver and chlorine in the presence of light.

Solution:

Ans: (a)

- (A) is true: the white solid turns grey. (R) is true and explains it: the grey colour is metallic silver formed by photochemical decomposition.



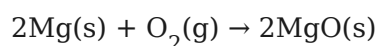
10. Assertion (A): Burning of a magnesium ribbon in air is a combination reaction.

Reason (R): Magnesium gets reduced to magnesium oxide in this reaction.

Solution:

Ans: (c)

- (A) is true: Mg and O₂ combine to form a single product, MgO.
- (R) is false: magnesium **gains** oxygen, so it is **oxidised**, not reduced.



SECTION - B

Questions 11 to 14 carry 2 marks each.

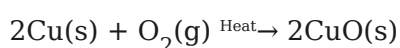
11. A china dish containing about 1 g of copper powder is heated. The brown surface of the powder turns black.

- (a) Name the black substance formed and write the balanced equation for its formation.
- (b) How can the black coating be turned brown again? Write the equation for this change.

Solution:

(a) Step 1: Heated copper combines with oxygen of air.

Step 2: The black substance is **copper(II) oxide, CuO**.



[½ mark name + ½ mark equation]

(b) Pass hydrogen gas over the heated black CuO. Oxygen is removed from CuO and brown copper is obtained.



[½ mark method + ½ mark equation]

12. Write balanced chemical equations with state symbols for the following:

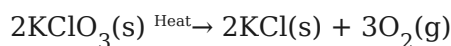
- (a) Solid potassium chlorate on heating decomposes to give solid potassium chloride and oxygen gas.
(b) Lead nitrate solution reacts with potassium iodide solution to form a precipitate of lead iodide and potassium nitrate solution.

Solution:

(a) Skeletal: $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$ (O: 3 on LHS, 2 on RHS)

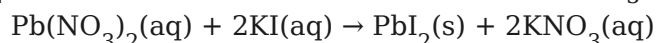
Step 1: LCM of 3 and 2 is 6 $\rightarrow$ put 2 before KClO_3 and 3 before O_2 .

Step 2: Now K = 2 on LHS, so put 2 before KCl. Check: K 2 = 2, Cl 2 = 2, O 6 = 6.



(b) Skeletal: $\text{Pb}(\text{NO}_3)_2 + \text{KI} \rightarrow \text{PbI}_2 + \text{KNO}_3$

Step 1: Two I in $\text{PbI}_2 \rightarrow$ put 2 before KI. Step 2: Now K = 2 and $\text{NO}_3 = 2 \rightarrow$ put 2 before KNO_3 .



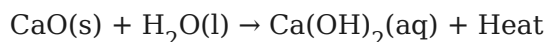
[1 mark each: $\frac{1}{2}$ for balancing + $\frac{1}{2}$ for correct state symbols]

13. A small amount of a white solid 'X' is taken in a beaker and water is added slowly. The beaker becomes very hot and a substance used for whitewashing walls is formed.

- (a) Identify 'X' and the product formed, and write the balanced equation.
(b) Classify this reaction in two different ways.

Solution:

(a) 'X' is **calcium oxide (CaO), quick lime**. The product is **calcium hydroxide, $\text{Ca}(\text{OH})_2$, slaked lime**, which is used for whitewashing.



[$\frac{1}{2}$ mark identification + $\frac{1}{2}$ mark equation]

(b) (i) **Combination reaction** – two reactants form a single product.

(ii) **Exothermic reaction** – a large amount of heat is released (the beaker becomes hot).

[$\frac{1}{2}$ mark each]

14. Packets of potato chips look 'puffed up' when bought from a shop.

- (a) Which gas is filled in such packets and why?
(b) Name the process this prevents, and suggest one way of slowing it down for oily food kept at home.

Solution:

(a) The packets are filled with **nitrogen**. Nitrogen is unreactive, so it replaces oxygen inside the packet and stops the oil in the chips from being oxidised.

[1 mark]

(b) It prevents **rancidity** – oxidation of fats and oils that spoils their smell and taste.

At home: keep food in **airtight containers** (or add antioxidants / refrigerate / keep away from light).

[$\frac{1}{2}$ mark name + $\frac{1}{2}$ mark method]

SECTION - C

Questions 15 to 17 carry 3 marks each.

15. About 2 g of lead nitrate powder is taken in a boiling tube and heated over a flame.

- (a) What would you observe? Name the gas responsible for the observation.
- (b) Write the balanced chemical equation for the reaction.
- (c) Identify the type of reaction. Is it exothermic or endothermic? Give a reason.

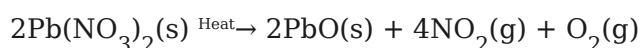
Solution:

(a) Brown fumes are seen. They are due to **nitrogen dioxide (NO₂)** gas. [1]

(b) Skeletal: $\text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbO} + \text{NO}_2 + \text{O}_2$

Step 1: N - put 2 before NO₂. Step 2: O count is then 6 on LHS and 1 + 4 + 2 = 7 on RHS - odd.

Step 3: Double everything except O₂: $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$. Check: Pb 2 = 2, N 4 = 4, O 12 = 2 + 8 + 2 = 12.



[1 mark]

(c) Thermal decomposition reaction - a single reactant breaks into simpler products on heating. It is **endothermic**, because heat must be absorbed to break down lead nitrate. [1]

16. Identify the substance oxidised and the substance reduced in each of the following reactions:

- (a) $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$
- (b) $2\text{H}_2\text{S} + \text{SO}_2 \rightarrow 3\text{S} + 2\text{H}_2\text{O}$
- (c) $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$

Solution:

Rule used: Gain of oxygen or loss of hydrogen = oxidation; loss of oxygen or gain of hydrogen = reduction.

(a) C gains oxygen (C → CO): **C is oxidised**. ZnO loses oxygen (ZnO → Zn): **ZnO is reduced**. [1]

(b) H₂S loses hydrogen (H₂S → S): **H₂S is oxidised**. SO₂ loses oxygen (SO₂ → S): **SO₂ is reduced**. [1]

(c) Al gains oxygen (Al → Al₂O₃): **Al is oxidised**. Fe₂O₃ loses oxygen (Fe₂O₃ → Fe): **Fe₂O₃ is reduced**. [1]

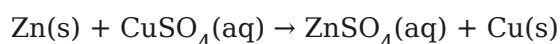
17. (a) Differentiate between a displacement reaction and a double displacement reaction. Write one balanced equation for each.

(b) A copper strip is placed in zinc sulphate solution. No change is observed even after several hours. Explain why.

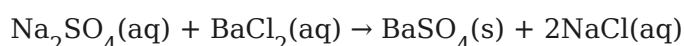
Solution:

(a)

- **Displacement:** a more reactive element removes a less reactive element from its compound. Only one element is exchanged.



- **Double displacement:** two compounds exchange their ions to form two new compounds (often a precipitate).



[1 mark difference + ½ mark each equation]

(b) Copper is **less reactive** than zinc, so it cannot displace zinc from zinc sulphate. Hence no reaction takes place. [1]

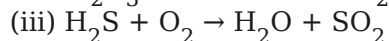
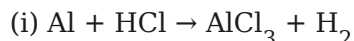
SECTION - D

Question 18 carries 5 marks.

- 18.** (a) What is a skeletal chemical equation? Why must a skeletal equation be balanced?

Balance: $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$.

- (b) Balance the following equations, showing the steps:

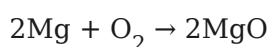


Solution:

(a) A **skeletal chemical equation** uses correct formulae of reactants and products but the number of atoms of each element is not equal on both sides.

It must be balanced because of the **law of conservation of mass**: mass can neither be created nor destroyed in a chemical reaction, so the number of atoms of each element must be the same before and after the reaction.

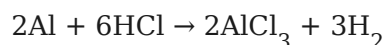
$\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$: O is 2 on LHS, 1 on RHS $\rightarrow$ put 2 before MgO; then Mg is 2 on RHS $\rightarrow$ put 2 before Mg.



[$\frac{1}{2}$ definition + $\frac{1}{2}$ reason + 1 balancing = 2 marks]

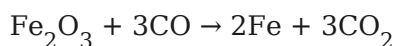
(b)(i) Cl: 1 on LHS, 3 on RHS $\rightarrow 3\text{HCl}$. H: now 3 on LHS but 2 on RHS - odd/even mismatch.

LCM of 3 and 2 is 6 $\rightarrow 6\text{HCl}$ and 3H_2 ; then Cl = 6 $\rightarrow 2\text{AlCl}_3$; then Al = 2 $\rightarrow 2\text{Al}$. Check: Al 2 = 2, H 6 = 6, Cl 6 = 6.



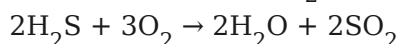
(ii) Fe: 2 on LHS $\rightarrow 2\text{Fe}$. C balances as 1 = 1 for now; O: 3 + 1 = 4 on LHS, 2 on RHS.

Each CO picks up one O from Fe_2O_3 ; Fe_2O_3 has 3 O $\rightarrow 3\text{CO}$ and 3CO_2 . Check: Fe 2 = 2, C 3 = 3, O 3 + 3 = 6 = 6.



(iii) H and S are already 2 = 2 and 1 = 1. O: 2 on LHS, 1 + 2 = 3 on RHS (odd).

Double H_2S , H_2O and SO_2 : RHS O = 2 + 4 = 6 $\rightarrow 3\text{O}_2$. Check: H 4 = 4, S 2 = 2, O 6 = 6.



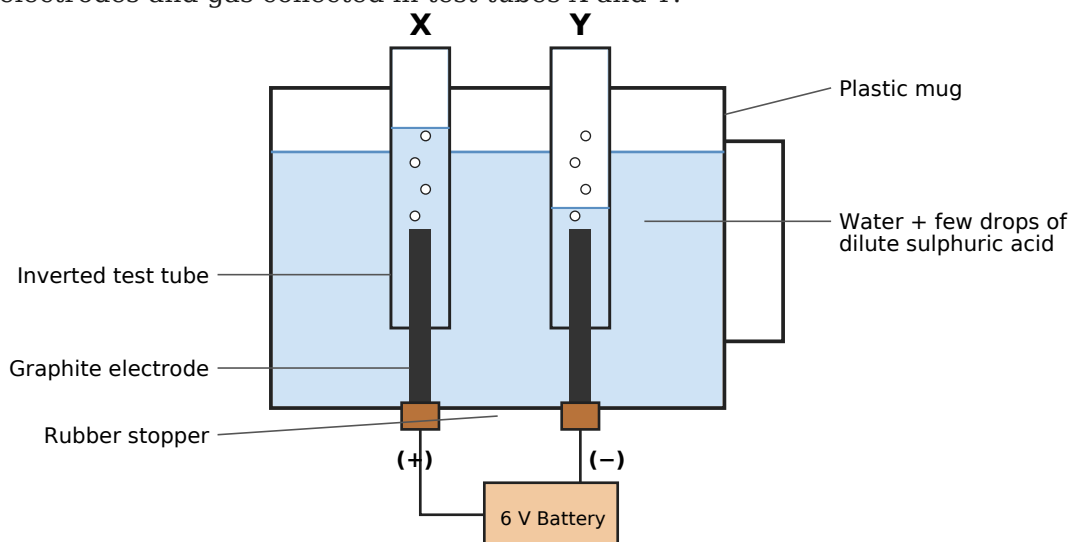
[1 mark each = 3 marks]

SECTION - E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. Read the passage and answer the questions that follow.

A student set up the apparatus shown below. Two graphite electrodes fitted through rubber stoppers at the base of a plastic mug were connected to a 6 V battery. The mug was filled with water containing a few drops of dilute sulphuric acid, and two test tubes filled with the same water were inverted over the electrodes. After the current was switched on, bubbles formed at both electrodes and gas collected in test tubes X and Y.



- (a) Name the gas collected in test tube Y. Why is its volume double that in test tube X? **(1)**
(b) Why were a few drops of dilute sulphuric acid added to the water? **(1)**
(c) Write the balanced chemical equation for the reaction and name the type of reaction. How would you test the gas in each test tube? **(2)**

OR

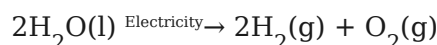
- (c) Decomposition reactions need energy in some form. Write one balanced equation each for a decomposition reaction caused by (i) heat and (ii) light. **(2)**

Solution:

(a) Test tube Y (over the negative electrode, cathode) collects **hydrogen**. Water contains 2 atoms of hydrogen for every 1 atom of oxygen, so twice as much hydrogen gas is formed as oxygen. [1]

(b) Pure water is a very poor conductor of electricity. A few drops of dilute sulphuric acid make the water **conduct electricity**, so electrolysis can take place. [1]

(c)

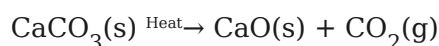


Type: **decomposition reaction** (electrolytic decomposition; it is endothermic). [1]

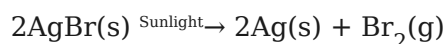
Test: bring a burning candle near each tube. In Y (hydrogen) the gas burns with a '**pop**' **sound**. In X (oxygen) the candle **burns more brightly**. [1]

OR

(c) (i) By heat:



(ii) By light:



[1 mark each; any correct example accepted]

20. Four beakers A, B, C and D were taken. 25 mL of water was put in A, B and C, and 25 mL of copper sulphate solution in D. After recording the temperature of each liquid, two spatulas of a different substance were added to each beaker and stirred. The final temperatures were recorded as shown:

Beaker	Liquid taken (25 mL)	Substance added	Initial temp. (°C)	Final temp. (°C)
A	Water	Potassium sulphate	26.0	26.0
B	Water	Ammonium nitrate	26.0	19.5
C	Water	Anhydrous copper sulphate	26.0	32.5
D	Copper sulphate solution	Fine iron filings	26.0	28.0

- (a) In which beaker is heat absorbed? How do you conclude this from the data? **(1)**
 (b) Name the beakers in which heat is released. **(1)**
 (c) For beaker D, write the balanced chemical equation, name the type of reaction, and state the colour change you would observe in the solution. **(2)**

OR

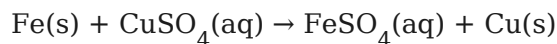
- (c) Explain why the temperature in beaker A did not change. Give one example of an endothermic reaction from this chapter with its balanced equation. **(2)**

Solution:

(a) Beaker B (ammonium nitrate). The temperature fell from 26.0 °C to 19.5 °C, a drop of 6.5 °C, which shows heat was absorbed from the surroundings – an endothermic process. [1]

(b) Beakers C and D – temperature rose by 6.5 °C in C and 2.0 °C in D, so heat was released (exothermic). [$\frac{1}{2}$ + $\frac{1}{2}$]

(c)



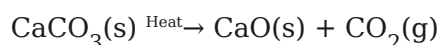
Type: **displacement reaction** – iron, being more reactive, displaces copper. [1]

Colour change: the **blue** solution turns **pale green** (FeSO_4), and a reddish-brown coating of copper appears on the iron filings. [1]

OR

(c) Potassium sulphate simply dissolves in water; no noticeable heat is absorbed or released, so the temperature stayed at 26.0 °C. [1]

Endothermic example (thermal decomposition of limestone):



[1 mark; any correct endothermic reaction with balanced equation accepted]