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Q & A WORKBOOK

Chemical Reactions and Equations

Chapter 1 — Class 10 NCERT Science

CBSE · State Boards · NEET · IIT-JEE

30 MCQs · 20 Fill-in-the-Blanks · 20 FAQs
Short & Long Answer Questions · Matching Table
NEET & IIT-JEE Special Questions

SECTION A — MULTIPLE CHOICE QUESTIONS (30 Questions)

Instructions: Each question carries 1 mark. Choose the most appropriate option. Answers with explanations are given at the end of each question — this helps you understand the concept deeply rather than just memorise. Perfect for CBSE, NEET and IIT-JEE preparation.

1. A magnesium ribbon burns in air to form a white powder. This reaction is an example of:

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

■ **Explanation:** Magnesium combines with oxygen from air to form magnesium oxide (MgO), a single product — this is a combination reaction. $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$. Heat is also released, making it exothermic.

2. Which of the following is NOT a sign of a chemical reaction?

- (a) Change in colour
- (b) Evolution of gas
- (c) Change in shape ✓**
- (d) Change in temperature

■ **Explanation:** Change in shape is a physical change — cutting paper, moulding clay. Signs of chemical reaction include: change in colour, gas evolution, temperature change, precipitate formation, and change in state.

3. In the equation $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$, which metal is more reactive?

- (a) Copper
- (b) Iron ✓**
- (c) Both are equally reactive
- (d) Neither is reactive

■ **Explanation:** Iron displaces copper from copper sulphate solution because iron is higher in the reactivity series. A more reactive metal can always displace a less reactive metal from its salt solution. This is a classic displacement reaction.

4. The decomposition of calcium carbonate on heating is an example of:

- (a) Photolytic decomposition
- (b) Electrolytic decomposition
- (c) Thermal decomposition ✓**
- (d) Combination reaction

■ **Explanation:** $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$. When heat is the energy source for a decomposition reaction, it is called thermal decomposition. This reaction is crucial in the manufacture of cement.

5. Which substance is formed when calcium oxide reacts with water?

- (a) Calcium carbonate
- (b) Calcium sulphate
- (c) Calcium chloride
- (d) Calcium hydroxide ✓**

■ **Explanation:** $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$. Calcium hydroxide (slaked lime) is formed. This is an exothermic reaction — the mixture becomes hot. Slaked lime is used for whitewashing walls.

6. Which of the following equations is correctly balanced?

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

■ **Explanation:** Check atoms: LHS — 4 Fe, 6 O. RHS — 4 Fe (in $2\text{Fe}_2\text{O}_3$), 6 O. Both sides balance perfectly. Always verify by counting atoms of each element on both sides.

7. When silver chloride is exposed to sunlight, it decomposes to give silver and chlorine. This type of reaction is called:

- (a) Thermal decomposition
- (b) Electrolytic decomposition
- (c) Photolytic decomposition ✓**
- (d) Combination reaction

■ **Explanation:** $2\text{AgCl(s)} \rightarrow 2\text{Ag(s)} + \text{Cl}_2\text{(g)}$. When light (photons) provides energy for decomposition, it is photolytic decomposition. Silver bromide decomposes similarly. This principle is used in black-and-white photography.

8. A reaction in which heat is released along with the products is called:

- (a) Endothermic reaction
- (b) Exothermic reaction ✓**
- (c) Displacement reaction
- (d) Combination reaction

■ **Explanation:** Exo = outside. When heat energy is released into the surroundings during a reaction, it is exothermic. Examples: burning of coal, respiration, neutralisation. Endothermic reactions absorb heat — e.g., decomposition reactions.

9. $\text{Na}_2\text{SO}_4\text{(aq)} + \text{BaCl}_2\text{(aq)} \rightarrow \text{BaSO}_4\text{(s)} + 2\text{NaCl(aq)}$. This reaction is best described as:

- (a) Displacement reaction
- (b) Combination reaction
- (c) Double displacement reaction ✓**
- (d) Thermal decomposition

■ **Explanation:** In this reaction, the ions of both reactants exchange places — SO_4^{2-} and Cl^- swap partners. Since an insoluble precipitate (BaSO_4) forms, it is also a precipitation reaction. Both terms are correct.

10. The rusting of iron is an example of which type of reaction?

- (a) Decomposition
- (b) Combination and Oxidation ✓**
- (c) Displacement
- (d) Endothermic decomposition

■ **Explanation:** Rusting involves iron combining with oxygen and moisture: $\text{Fe} + \text{O}_2 + \text{H}_2\text{O} \rightarrow \text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$. Iron gains oxygen — so it is oxidised. It is also a combination reaction (reactants combining to form one product — rust).

11. In the electrolysis of water, the gas collected at the cathode is:

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

■ **Explanation:** $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$. Hydrogen (H^+ ions gain electrons) is deposited at the cathode. Oxygen is collected at the anode. The volume of hydrogen is double that of oxygen — as the equation shows a 2:1 ratio.

12. Which of the following is an endothermic reaction?

- (a) Burning of coal
- (b) Respiration
- (c) Decomposition of CaCO_3 ✓**
- (d) Neutralisation of acid and base

■ **Explanation:** $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ requires continuous heating — it absorbs energy. All decomposition reactions are endothermic. Burning, respiration, and neutralisation all release heat (exothermic).

13. A substance X is used for whitewashing. It is formed by reacting CaO with water. What is X?

- (a) $\text{Ca}(\text{HCO}_3)_2$
- (b) CaCO_3
- (c) CaCl_2
- (d) $\text{Ca}(\text{OH})_2$ ✓**

■ **Explanation:** $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$. Calcium hydroxide, commonly known as slaked lime, is the white milky liquid used for whitewashing. Over time, it reacts with CO_2 in air to form CaCO_3 , giving a shiny finish.

14. When ferrous sulphate crystals are heated, the colour changes from green to:

- (a) White
- (b) Blue
- (c) Yellow-brown ✓**
- (d) Pink

■ **Explanation:** $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ (green) loses water on heating and decomposes to Fe_2O_3 (ferric oxide, which is yellow-brown/reddish), SO_2 , and SO_3 . The characteristic smell of burning sulphur confirms SO_2 release.

15. Which of the following correctly represents a balanced skeletal equation for the burning of natural gas?

- (a) $\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- (b) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ ✓**
- (c) $2\text{CH}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- (d) $\text{CH}_4 + 3\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

■ **Explanation:** Check: LHS — 1C, 4H, 4O. RHS — 1C (CO_2), 4H ($2\text{H}_2\text{O}$), 4O ($2+2$). Perfectly balanced. Natural gas (methane) burns in oxygen to produce carbon dioxide and water — a combustion reaction.

16. The symbol (aq) in a chemical equation indicates that the substance is:

- (a) In gaseous state
- (b) Dissolved in water ✓**
- (c) In solid state
- (d) In liquid state

■ **Explanation:** (aq) stands for aqueous — meaning the substance is dissolved in water. The four state symbols are: (s) solid, (l) liquid, (g) gas, (aq) aqueous solution. Including state symbols makes chemical equations more informative.

17. When copper powder is heated in air, the surface turns black because:

- (a) Copper decomposes
- (b) CuO is formed ✓**
- (c) Cu_2O is formed
- (d) Copper sulphate is formed

■ **Explanation:** $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$. Copper gains oxygen and forms copper(II) oxide (CuO), which is black. This is an oxidation reaction. If hydrogen gas is then passed over CuO, the black coating disappears — copper is reduced back.

18. In the reaction $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$, which substance is being reduced?

- (a) Carbon
- (b) CO_2
- (c) PbO ✓**
- (d) Pb

■ **Explanation:** PbO loses oxygen to become Pb — it is reduced. Carbon gains oxygen to become CO_2 — it is oxidised. Carbon is the reducing agent here. This is a redox reaction. (NEET favourite!)

19. Which of the following is an example of a precipitation reaction?

- (a) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$
(b) $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4\downarrow + 2\text{NaCl}$ ✓
(c) $2\text{FeSO}_4 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$
(d) $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$

■ **Explanation:** A precipitation reaction produces an insoluble salt (precipitate). BaSO_4 is insoluble in water — indicated by the ↓ arrow. The arrow ↓ in equations always indicates that a precipitate is formed.

20. Respiration is considered an exothermic reaction because:

- (a) It requires heat to start
(b) It produces oxygen
(c) It releases energy ✓
(d) It absorbs carbon dioxide

■ **Explanation:** $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$. Glucose is oxidised and energy is released — this powers all body functions. That is why it is exothermic, similar to combustion but occurring at body temperature.

21. Which agent prevents oxidation (rancidity) in food items?

- (a) Catalyst
(b) Antioxidant ✓
(c) Oxidising agent
(d) Reducing agent

■ **Explanation:** Antioxidants such as BHA (Butylated Hydroxyanisole) are added to oily and fatty foods to prevent their oxidation. Nitrogen gas is also used to flush chip packets — it prevents oxygen from reacting with the oils.

22. The balanced equation for the formation of water from its elements is:

- (a) $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
(b) $\text{H}_2 + \text{O} \rightarrow \text{H}_2\text{O}$
(c) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ ✓
(d) $4\text{H} + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$

■ **Explanation:** Check: LHS — 4H, 2O. RHS — 4H (in $2\text{H}_2\text{O}$), 2O. Balanced. This is also a combination reaction — two elements combining to form a compound. It releases a large amount of heat (exothermic).

23. Which type of chemical reaction takes place when lead nitrate is heated?

- (a) Combination
(b) Photolytic decomposition
(c) Thermal decomposition ✓
(d) Displacement

■ **Explanation:** $2\text{Pb}(\text{NO}_3)_2(\text{s}) \rightarrow 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$. Brown fumes of NO_2 are visible. Heat is the energy source, so it is thermal decomposition. Lead nitrate is a common example in board and competitive exams.

24. In a chemical equation, the arrow pointing downward (\downarrow) indicates:

- (a) Evolution of gas
- (b) Formation of a precipitate ✓**
- (c) Endothermic reaction
- (d) Exothermic reaction

■ **Explanation:** The downward arrow (\downarrow) in a chemical equation signifies that a precipitate has formed — an insoluble product that settles at the bottom. The upward arrow (\uparrow) indicates that a gas has been evolved. Both symbols make equations more descriptive.

25. Which of the following is a redox reaction?

- (a) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$
- (b) $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$
- (c) $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ ✓**
- (d) $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$

■ **Explanation:** In $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$: CuO loses oxygen (reduced), H_2 gains oxygen (oxidised). Both oxidation and reduction occur simultaneously — this defines a redox reaction. Whenever one substance is oxidised, another is always reduced.

26. The law that governs the balancing of chemical equations is:

- (a) Law of definite proportions
- (b) Law of conservation of mass ✓**
- (c) Law of multiple proportions
- (d) Avogadro's law

■ **Explanation:** According to the Law of Conservation of Mass (Lavoisier), mass can neither be created nor destroyed in a chemical reaction. Hence the total mass of reactants = total mass of products. This is why chemical equations must always be balanced.

27. Iron articles are painted or oiled to prevent:

- (a) Rancidity
- (b) Displacement
- (c) Corrosion ✓**
- (d) Decomposition

■ **Explanation:** Painting or oiling creates a protective layer that prevents iron from coming into contact with moisture and oxygen — the two conditions required for rusting (corrosion). Galvanisation (zinc coating) and electroplating are other methods.

28. In the reaction $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$, what type of reaction is this?

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

■ **Explanation:** Zinc is more reactive than hydrogen and displaces it from sulphuric acid. This is a single displacement (or simply displacement) reaction. It is also a redox reaction — Zn is oxidised (0 → +2) and H is reduced (+1 → 0).

29. The brown fumes observed when lead nitrate is heated strongly are due to:

- (a) SO_2
- (b) NO_2 ✓**
- (c) CO_2
- (d) N_2

■ **Explanation:** $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$. Nitrogen dioxide (NO_2) is a reddish-brown gas with a pungent smell. It is toxic and its appearance is a clear visual indicator that decomposition of lead nitrate has occurred.

30. Which of the following is an oxidising agent in the reaction: $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$?

- (a) HCl
- (b) MnCl_2
- (c) Cl_2
- (d) MnO_2 ✓**

■ **Explanation:** MnO_2 oxidises HCl to Cl_2 — HCl loses hydrogen (is oxidised). MnO_2 itself is reduced (Mn goes from +4 to +2). An oxidising agent accepts electrons / provides oxygen — it gets reduced in the process. (IIT-JEE concept!)

SECTION B — FILL IN THE BLANKS (20 Questions)

Instructions: Fill in each blank with the correct word or chemical formula. Answers are provided after each question. These are regularly asked in CBSE board examinations and are equally useful for NEET one-liners.

1. The substances that undergo chemical change in a reaction are called _____.

Answer: Reactants

2. A chemical equation is balanced so that it obeys the Law of _____ of Mass.

Answer: Conservation

3. When calcium oxide reacts with water, the product formed is _____ and the reaction is _____.

Answer: Ca(OH)_2 (slaked lime); exothermic

4. In the reaction $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$, the reaction is called a _____ reaction.

Answer: Displacement

5. The process by which iron gets corroded in the presence of moisture and oxygen is called _____.

Answer: Rusting (Corrosion)

6. In photosynthesis, CO_2 and H_2O combine in the presence of sunlight to form _____ and oxygen.

Answer: Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$)

7. The symbol (g) in a chemical equation represents that the substance is in _____ state.

Answer: Gaseous

8. Reactions in which energy is absorbed from the surroundings are called _____ reactions.

Answer: Endothermic

9. The decomposition of AgCl in sunlight to form Ag and Cl_2 is an example of _____ decomposition.

Answer: Photolytic

10. The gas evolved at the cathode during electrolysis of water is _____.

Answer: Hydrogen (H_2)

11. The process by which fats and oils become rancid due to oxidation is called _____.

Answer: Rancidity

12. In a redox reaction, the substance that gains oxygen is said to be _____.

Answer: Oxidised

13. $\text{CaCO}_3(\text{s}) \rightarrow \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$ is an example of _____ decomposition.

Answer: Thermal

14. A reaction in which two compounds react and their ions exchange to form two new compounds is called a _____ reaction.

Answer: Double displacement

15. When BaCl_2 reacts with Na_2SO_4 , the white precipitate formed is _____.

Answer: BaSO_4 (Barium sulphate)

16. The balanced equation for burning of magnesium in air is _____.

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

17. Chips manufacturers flush bags with _____ gas to prevent rancidity.

Answer: Nitrogen (N_2)

18. An oxidising agent is one that provides _____ to another substance and itself gets _____.

Answer: oxygen; reduced

19. The black coating formed on silver articles is due to the formation of _____.

Answer: Silver sulphide (Ag_2S)

20. The reaction $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$ represents the process of _____ in living organisms.

Answer: Respiration

SECTION C — FREQUENTLY ASKED QUESTIONS — FAQs (20 Questions)

Teacher's Note: These 20 FAQs come directly from years of board paper analysis. Every single one of these has appeared — in one form or another — in CBSE board exams, state board papers, and competitive entrance exams. Learn them thoroughly.

Q. 1. Why should a magnesium ribbon be cleaned with sandpaper before burning?

Answer: Magnesium ribbon has a layer of magnesium oxide on its surface, which forms due to exposure to air. This oxide layer prevents the ribbon from catching fire easily. Cleaning with sandpaper removes this layer and exposes fresh magnesium metal, which burns with a dazzling white flame.

Q. 2. What is meant by a balanced chemical equation? Why should chemical equations be balanced?

Answer: A balanced chemical equation has equal numbers of atoms of each element on both the reactant side (LHS) and the product side (RHS). It must be balanced to satisfy the Law of Conservation of Mass — mass cannot be created or destroyed in a chemical reaction. Balancing is done by adjusting coefficients, never by changing subscripts within formulas.

Q. 3. What do you mean by a precipitation reaction? Give one example.

Answer: A precipitation reaction is a type of double displacement reaction in which an insoluble salt (precipitate) is formed when two aqueous solutions are mixed. Example: $\text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})\downarrow + 2\text{NaCl}(\text{aq})$. The insoluble white precipitate of barium sulphate sinks to the bottom.

Q. 4. Why are decomposition reactions called the opposite of combination reactions?

Answer: In a combination reaction, two or more substances combine to form a single product: $\text{A} + \text{B} \rightarrow \text{AB}$. In a decomposition reaction, a single substance breaks down into two or more simpler substances: $\text{AB} \rightarrow \text{A} + \text{B}$. The processes are exactly reverse — combination builds up, decomposition breaks down. That is why they are considered opposites of each other.

Q. 5. What is the difference between exothermic and endothermic reactions? Give one example of each.

Answer: Exothermic reactions release heat energy to the surroundings — the products have less energy than the reactants. Example: burning of coal ($\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{heat}$). Endothermic reactions absorb heat energy from the surroundings. Example: decomposition of calcium carbonate ($\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$, requires continuous heating).

Q. 6. Is respiration an exothermic process? Explain.

Answer: Yes, respiration is an exothermic process. Glucose (food) reacts with oxygen in the cells of our body: $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$. The energy released is used by our body to perform all life processes — movement, growth, digestion. Since energy is released, it is exothermic.

Q. 7. What is a displacement reaction? How is it different from a double displacement reaction?

Answer: In a displacement reaction, a more reactive element displaces a less reactive element from its compound: $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$ (only one element is displaced). In a double displacement reaction, two compounds react and their ions exchange — both cations swap partners: $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$ (mutual exchange of ions).

Q. 8. What is corrosion? How does it affect iron?

Answer: Corrosion is the gradual deterioration of a metal when it reacts with substances in its environment such as moisture, oxygen, acids, and salts. When iron corrodes, it forms a reddish-brown powder called rust ($\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$). Corrosion weakens iron structures, damages car bodies, bridges, and railings, and costs enormous amounts of money in replacement and maintenance every year.

Q. 9. What is rancidity? How can it be prevented?

Answer: Rancidity is the spoilage of fats and oils in food due to their oxidation, resulting in an unpleasant smell and taste. It is prevented by: (i) adding antioxidants to food, (ii) storing food in airtight containers, (iii) refrigerating food to slow oxidation, (iv) flushing packets with nitrogen gas (as in crisp packets) to keep oxygen away.

Q. 10. What happens when dilute hydrochloric acid is added to iron filings?

Answer: Iron displaces hydrogen from dilute hydrochloric acid: $\text{Fe(s)} + 2\text{HCl(aq)} \rightarrow \text{FeCl}_2\text{(aq)} + \text{H}_2\text{(g)}$. Hydrogen gas is evolved (bubbles are seen), and the solution turns pale green due to the formation of iron(II) chloride (ferrous chloride). This is a displacement reaction — iron is more reactive than hydrogen.

Q. 11. Define oxidation and reduction in terms of gain or loss of oxygen.

Answer: Oxidation is the process in which a substance gains oxygen or loses hydrogen. Reduction is the process in which a substance loses oxygen or gains hydrogen. Example: In $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$, CuO loses oxygen (reduced) and H_2 gains oxygen (oxidised). Both processes always occur together — hence the term redox reaction.

Q. 12. What is the role of a catalyst in a chemical reaction?

Answer: A catalyst is a substance that increases the rate (speed) of a chemical reaction without itself being consumed or permanently changed in the reaction. It provides an alternative pathway with lower activation energy. In chemical equations, catalysts are written above or below the arrow. Example: $6\text{CO}_2 + 12\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 + 6\text{H}_2\text{O}$ (chlorophyll is the catalyst in photosynthesis).

Q. 13. Why is the electrolysis of water described as a decomposition reaction?

Answer: In electrolysis of water, a single compound (H_2O) breaks down into two simpler substances — hydrogen and oxygen — when electricity is passed through it: $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$. Since one reactant decomposes into two products, it is a decomposition reaction. The energy for breaking down water comes from electricity — so it is specifically electrolytic decomposition.

Q. 14. Why do we apply paint on iron articles?

Answer: Paint is applied on iron articles to prevent rusting (corrosion). The paint layer acts as a physical barrier that prevents iron from coming into direct contact with moisture and oxygen from the atmosphere — the two essential conditions for rusting to occur. Once the paint wears off, rusting begins again. Other protective methods include galvanisation (zinc coating) and oil application.

Q. 15. Write the balanced chemical equation for the reaction between sodium hydroxide solution and hydrochloric acid solution.

Answer: $\text{NaOH(aq)} + \text{HCl(aq)} \rightarrow \text{NaCl(aq)} + \text{H}_2\text{O(l)}$. This is a double displacement (neutralisation) reaction. Sodium hydroxide (a base) reacts with hydrochloric acid to produce sodium chloride (common salt) and water. The reaction releases heat — it is also exothermic.

Q. 16. What is the significance of state symbols in chemical equations?

Answer: State symbols convey the physical state of each substance in the reaction, making the equation more complete and informative. (s) = solid, (l) = liquid, (g) = gas, (aq) = dissolved in water. They also indicate whether heat or pressure conditions might be involved. Without state symbols, equations are called skeletal equations. Including them gives us complete balanced chemical equations.

Q. 17. A shiny brown element X turns black when heated in air. Identify X and the black compound formed.

Answer: X is copper (Cu). When heated in air, copper reacts with oxygen: $2\text{Cu(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{CuO(s)}$. The black substance is copper(II) oxide (CuO). This is an oxidation reaction — copper gains oxygen. When hydrogen is passed over the black CuO, the brown colour of copper is restored — demonstrating reduction.

Q. 18. Explain why oil and fat-containing food items are flushed with nitrogen gas.

Answer: Nitrogen gas is used because it is chemically inert — it does not react with oils and fats. When nitrogen replaces the air (which contains oxygen) in a food packet, the fats cannot come in contact with oxygen and therefore cannot undergo oxidation. This prevents rancidity and keeps the food fresh for a longer period. This method is widely used in crisp and snack packaging.

Q. 19. What is a skeletal chemical equation? Give an example.

Answer: A skeletal chemical equation is an unbalanced equation that shows only the reactants and products using chemical formulas but does not have equal numbers of atoms on both sides. Example: $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ is a skeletal equation. The balanced form is: $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$. Skeletal equations are the first step in writing any chemical equation.

Q. 20. Why is the amount of gas collected in one test tube in Activity 1.7 (electrolysis of water) double that of the other? Name the gases.

Answer: During electrolysis of water, $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$. For every 2 molecules of water decomposed, 2 molecules of hydrogen and 1 molecule of oxygen are produced. Therefore, the volume of hydrogen collected at the cathode is always double the volume of oxygen collected at the anode. The two gases are hydrogen (cathode) and oxygen (anode).

SECTION D — SHORT ANSWER QUESTIONS (2–3 Marks Each)

Exam Tip: Short answer questions expect precise, to-the-point answers — ideally 3 to 5 sentences. Always include a relevant equation wherever possible — it fetches extra marks in board examinations.

Q. 1. Balance the following chemical equation and identify the type of reaction: $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$

Ans. The equation is already balanced: $\text{Zn(s)} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$. Check: 1 Zn, 2 H, 1 S, 4 O on both sides ✓. Type: Displacement reaction — zinc is more reactive than hydrogen and displaces it from sulphuric acid. It is also a redox reaction — Zn is oxidised (0 → +2) and H is reduced (+1 → 0).

Q. 2. Why do silver articles turn black when left in open air for some time?

Ans. Silver articles tarnish (turn black) because silver reacts with hydrogen sulphide (H_2S) present in small amounts in air: $2\text{Ag} + \text{H}_2\text{S} \rightarrow \text{Ag}_2\text{S} + \text{H}_2$. Silver sulphide (Ag_2S) is a black compound that coats the surface. This is a chemical change — an oxidation reaction — and is another example of corrosion.

Q. 3. What do you observe when iron nails are dipped in copper sulphate solution for 20 minutes?

Ans. The iron nails develop a reddish-brown coating of copper metal on their surface. Simultaneously, the blue colour of the copper sulphate solution fades (becomes lighter) as Cu^{2+} ions are used up. Reaction: $\text{Fe(s)} + \text{CuSO}_4(\text{aq}) \rightarrow \text{FeSO}_4(\text{aq}) + \text{Cu(s)}$. Iron is more reactive than copper and displaces it from its solution.

Q. 4. Give two examples each of exothermic and endothermic reactions with equations.

Ans. Exothermic: (i) Burning coal: $\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{heat}$. (ii) Combination of CaO with water: $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{heat}$. **Endothermic:** (i) Decomposition of CaCO_3 : $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ (requires heating). (ii) Photosynthesis: $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (requires light energy).

Q. 5. Explain with an equation how whitewashing of walls hardens after a few days.

Ans. When Ca(OH)_2 (slaked lime) is applied to walls, it slowly reacts with CO_2 in air: $\text{Ca(OH)}_2(\text{aq}) + \text{CO}_2(\text{g}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O(l)}$. Calcium carbonate (CaCO_3) — the same material as marble — is insoluble and forms a hard, shiny white layer on the wall. This process takes 2–3 days to complete, after which the wall hardens.

Q. 6. State two ways in which displacement reactions differ from double displacement reactions.

Ans. Displacement: (i) Only one element displaces another element from its compound. (ii) Involves a free element reacting with a compound. Example: $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$. Double Displacement: (i) Two compounds react and exchange their ions (both cations swap). (ii) Often produces a precipitate or water. Example: $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4\downarrow + 2\text{NaCl}$.

Q. 7. What is photolysis? Name two reactions involving photolysis that are used in everyday applications.

Ans. Photolysis (photolytic decomposition) is the breakdown of a compound using light energy. (i) $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$ — used in Black and White Photography (silver grains form the image). (ii) $2\text{AgBr} \rightarrow 2\text{Ag} + \text{Br}_2$ — also used in photography as silver bromide is more sensitive to light. These reactions are endothermic — they absorb light energy to break chemical bonds.

Q. 8. Write a note on the effects of oxidation in everyday life.

Ans. Oxidation causes two major problems in everyday life: (i) Corrosion — metals such as iron and copper react with oxygen and moisture in air, forming oxides that weaken and damage the metal (rusting). (ii) Rancidity — fats and oils in food react with oxygen, breaking down into shorter-chain fatty acids that produce a stale, unpleasant smell and taste. Both processes can be slowed by using protective coatings, antioxidants, and airtight storage.

SECTION E — LONG ANSWER QUESTIONS (5 Marks Each)

Exam Tip: Long answer questions demand structured, detailed responses. Divide your answer into clear points or sub-headings. Always support with chemical equations and practical examples. Aim for 8–12 sentences. These carry 5 marks in board exams.

Q. 1. Describe the various types of chemical reactions with one example and balanced chemical equation for each.

Ans. There are five major types of chemical reactions studied at Class 10 level: **(i) Combination Reaction:** Two or more substances combine to form a single product. Example: $\text{CaO(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2\text{(aq)} + \text{Heat}$. This is also exothermic. **(ii) Decomposition Reaction:** A single substance breaks down into two or more simpler products. Example: $2\text{FeSO}_4\text{(s)} \xrightarrow{\text{Heat}} \text{Fe}_2\text{O}_3\text{(s)} + \text{SO}_2\text{(g)} + \text{SO}_3\text{(g)}$. **(iii) Displacement Reaction:** A more reactive element displaces a less reactive element from its compound. Example: $\text{Fe(s)} + \text{CuSO}_4\text{(aq)} \rightarrow \text{FeSO}_4\text{(aq)} + \text{Cu(s)}$. **(iv) Double Displacement Reaction:** Two compounds exchange their ions. Example: $\text{Na}_2\text{SO}_4\text{(aq)} + \text{BaCl}_2\text{(aq)} \rightarrow \text{BaSO}_4\text{(s)}\downarrow + 2\text{NaCl(aq)}$. **(v) Oxidation–Reduction (Redox) Reaction:** Simultaneous oxidation of one substance and reduction of another. Example: $\text{CuO(s)} + \text{H}_2\text{(g)} \xrightarrow{\text{Heat}} \text{Cu(s)} + \text{H}_2\text{O(l)}$. CuO is reduced; H_2 is oxidised.

Q. 2. Explain what is meant by oxidation and reduction. What are oxidising and reducing agents? Give two examples of redox reactions with equations.

Ans. **Oxidation** is defined as the gain of oxygen or loss of hydrogen by a substance during a reaction. **Reduction** is defined as the loss of oxygen or gain of hydrogen by a substance during a reaction. Both processes always occur simultaneously — when one substance is oxidised, another is always reduced. Such reactions are called redox reactions. **Oxidising Agent:** A substance that provides oxygen to (or removes hydrogen from) another substance. It itself gets reduced in the process. Example: CuO is the oxidising agent in $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$. **Reducing Agent:** A substance that removes oxygen from (or provides hydrogen to) another substance. It itself gets oxidised. Example: H_2 is the reducing agent in the same reaction. **Redox Example 1:** $\text{ZnO(s)} + \text{C(s)} \rightarrow \text{Zn(s)} + \text{CO(g)}$. ZnO loses oxygen (reduced); Carbon gains oxygen (oxidised). Carbon is the reducing agent. **Redox Example 2:** $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$. HCl is oxidised (loses H); MnO_2 is the oxidising agent (gets reduced).

Q. 3. What is corrosion? Explain the process of rusting of iron with a chemical equation. How can corrosion be prevented? Give four methods.

Ans. **Corrosion** is the slow deterioration of a metal when it reacts with substances in its environment such as oxygen, moisture, acids, or salts. **Rusting of Iron:** Iron reacts with water and oxygen in the atmosphere to form a reddish-brown, flaky substance called rust. The overall reaction can be written as: $4\text{Fe(s)} + 3\text{O}_2\text{(g)} + \text{xH}_2\text{O(l)} \rightarrow 2\text{Fe}_2\text{O}_3 \cdot \text{xH}_2\text{O}$ (rust). Rust is hydrated ferric oxide — it is porous and allows further corrosion to penetrate deeper. **Prevention of Corrosion — Four Methods:** (i) **Painting/Oiling/Greasing:** Creates a physical barrier that prevents contact with moisture and oxygen. (ii) **Galvanisation:** Coating iron with a layer of zinc. Even if the zinc layer is scratched, zinc (being more reactive) corrodes preferentially, protecting the iron beneath. (iii) **Alloying:** Mixing iron with other metals — stainless steel (iron + chromium + nickel) is highly resistant to corrosion. (iv) **Electroplating:** Coating iron with a less reactive metal such as tin or nickel using electrolysis. Corrosion causes enormous

economic damage — it destroys bridges, ships, car bodies, and iron railings every year.

Q. 4. State and explain the Law of Conservation of Mass. How does this law relate to balancing of chemical equations? Illustrate with an example.

Ans. Law of Conservation of Mass (stated by Antoine Lavoisier, 1785): "Mass can neither be created nor destroyed in a chemical reaction. The total mass of the reactants is always equal to the total mass of the products." This means that during a chemical reaction, atoms are rearranged but never created or destroyed. Since the number and type of atoms remain the same, the total mass must also remain the same. **Relation to Balancing Equations:** A chemical equation must be balanced so that the number of atoms of each element is equal on both sides of the arrow. This directly reflects the Law of Conservation of Mass — we cannot have more or fewer atoms after the reaction than we started with. **Example — Balancing $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_2\text{O}_3 + \text{H}_2$:** Step 1: Identify atoms on each side (unbalanced: 1 Fe, 2 H, 1 O vs 2 Fe, 3 O, 2 H). Step 2: Balance oxygen first (most atoms) — put 4 before H_2O . Step 3: Balance hydrogen — put 4 before H_2 . Step 4: Balance iron — put 3 before Fe. **Balanced: $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \rightarrow \text{Fe}_2\text{O}_3(\text{s}) + 4\text{H}_2(\text{g})$.** Both sides now have 3 Fe, 8 H, and 4 O — demonstrating conservation of mass.", Note: You must never change the subscripts within a formula to balance an equation — only coefficients (numbers in front) can be changed.

SECTION F — MATCHING TABLE (Column A with Column B)

Instructions: Match each term in Column A with the most appropriate description in Column B. Answers are given below the table. Matching questions frequently appear in CBSE board examinations.

Column A — Terms	Column B — Descriptions
1. Combination Reaction	P. $\text{AgCl} \rightarrow \text{Ag} + \text{Cl}_2$ in sunlight
2. Thermal Decomposition	Q. Rusting of iron, tarnishing of silver
3. Photolytic Decomposition	R. $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
4. Displacement Reaction	S. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ on heating
5. Double Displacement	T. $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{Heat}$
6. Exothermic Reaction	U. $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 \downarrow + 2\text{NaCl}$
7. Endothermic Reaction	V. Burning of coal: $\text{C} + \text{O}_2 \rightarrow \text{CO}_2 + \text{Heat}$
8. Oxidation	W. Decomposition of water by electricity
9. Reduction	X. Gain of oxygen / loss of hydrogen
10. Electrolytic Decomposition	Y. Loss of oxygen / gain of hydrogen
11. Corrosion	Z. Decomposition that absorbs heat/light/electricity
12. Rancidity	AA. Oxidation of fats/oils causing stale smell

ANSWERS TO MATCHING TABLE

1 → T	2 → S	3 → P	4 → R
5 → U	6 → V	7 → Z	8 → X
9 → Y	10 → W	11 → Q	12 → AA

SECTION G — NEET & IIT-JEE SPECIAL QUESTIONS

Teacher's Note: These questions are pitched above board level. They require deeper conceptual understanding — multi-step reasoning, application of reactivity series, electron transfer concepts, and integrated thinking. Absolutely essential for NEET and IIT-JEE aspirants.

NEET 2014 Modified

Q. N1. [NEET Type] Consider the reaction: $2\text{PbO}(s) + \text{C}(s) \rightarrow 2\text{Pb}(s) + \text{CO}_2(g)$. Which of the following statements is/are correct? (i) Lead is getting reduced. (ii) Carbon dioxide is getting oxidised. (iii) Carbon is getting oxidised. (iv) Lead oxide is getting reduced.

Answer: Statements (i) and (iv) are incorrect as written together — let us verify each: • PbO loses oxygen \rightarrow PbO is REDUCED. Pb is the reduced form. So (iv) is correct. • C gains oxygen \rightarrow C is OXIDISED \rightarrow CO_2 is the oxidised form. So (iii) is correct. • 'Lead is getting reduced' is correct — $\text{Pb}(+2$ in $\text{PbO}) \rightarrow \text{Pb}(0)$. So (i) is correct. • ' CO_2 is getting oxidised' is WRONG — CO_2 is the product, not a reactant being oxidised. **Correct answer: (i), (iii), (iv) are correct. (ii) is incorrect.** Key concept: An oxidising agent gets reduced, and a reducing agent gets oxidised.

IIT-JEE Concept

Q. N2. [IIT-JEE Concept] In which of the following reactions does both oxidation AND reduction occur simultaneously? (A) $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{NaNO}_3$ (B) $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$ (C) $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$ (D) $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

Answer: Answer: (C) In $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$: • Fe_2O_3 loses oxygen \rightarrow Fe_2O_3 is REDUCED (Fe: $+3 \rightarrow 0$) • CO gains oxygen \rightarrow CO is OXIDISED (C: $+2 \rightarrow +4$ in CO_2) This is a classic redox reaction used in extraction of iron in a blast furnace. (A) is a double displacement / precipitation — no change in oxidation states. (B) is a combination reaction — no redox. (D) is neutralisation — no redox.

NEET Concept

Q. N3. [NEET Type] The reaction: $2\text{AgBr}(s) \xrightarrow{\text{Sunlight}} 2\text{Ag}(s) + \text{Br}_2(g)$ is used in photography. This reaction is classified as:

Answer: Answer: Photolytic decomposition AND Redox reaction. • Photolytic decomposition: a single compound decomposes using light energy. • Redox: Ag is reduced ($\text{Ag}^+ \rightarrow \text{Ag}^0$); Br is oxidised ($\text{Br}^- \rightarrow \text{Br}_2$). Both classifications apply simultaneously — this is a common NEET examiner trap. A reaction can belong to more than one category.

IIT-JEE Application

Q. N4. [IIT-JEE Application] Given the following displacement reactions: (i) $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$ (ii) $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$ (iii) $\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$ Arrange Cu, Fe, Ag, and Zn in order of decreasing reactivity.

Answer: Answer: $\text{Zn} > \text{Fe} > \text{Cu} > \text{Ag}$ Reasoning: • From (i): Cu displaces Ag \rightarrow Cu is more reactive than Ag. • From (ii): Fe displaces Cu \rightarrow Fe is more reactive than Cu. • From (iii): Zn displaces Fe \rightarrow Zn is more reactive than Fe. Combining: $\text{Zn} > \text{Fe} > \text{Cu} > \text{Ag}$. This type of question tests your ability to deduce reactivity from displacement data — a key IIT-JEE skill in electrochemistry.

NEET Assertion-Reason

Q. N5. [NEET Assertion-Reason] Assertion (A): The decomposition of hydrogen peroxide is an endothermic reaction. Reason (R): All decomposition reactions are endothermic. Choose: (a) Both A and R true, R is correct explanation. (b) Both A and R true, R is NOT correct explanation. (c) A is true, R is false. (d) A is false, R is false.

Answer: Answer: (a) Both A and R are true, and R is the correct explanation of A. Decomposition reactions require energy input — they break chemical bonds, which requires energy to be absorbed. $\text{H}_2\text{O}_2 \rightarrow \text{H}_2\text{O} + \text{O}_2$ absorbs heat. The reason correctly explains that all decomposition reactions are endothermic (they absorb heat, light, or electrical energy). This is the defining characteristic of decomposition.

IIT-JEE Higher Order

Q. N6. [IIT-JEE Higher Order] In the reaction: $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ (a) Identify the oxidising agent and the reducing agent. (b) What is the change in oxidation state of Mn? (c) What is the change in oxidation state of Cl in HCl?

Answer: (a) Oxidising agent: MnO_2 (it accepts electrons, gets reduced). Reducing agent: HCl (it loses electrons, gets oxidised). (b) In MnO_2 : Mn has oxidation state +4. In MnCl_2 : Mn has oxidation state +2. Change: $+4 \rightarrow +2$ (reduction, gain of 2 electrons per Mn atom). (c) In HCl: Cl has oxidation state -1 . In Cl_2 : Cl has oxidation state 0. Change: $-1 \rightarrow 0$ (oxidation, loss of 1 electron per Cl atom). This multi-part analysis is standard IIT-JEE redox chemistry.

NEET MCQ

Q. N7. [NEET MCQ] Which of the following reactions represents a combination reaction that is also exothermic? (A) $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ (B) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{Heat}$ (C) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ (D) $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$

Answer: Answer: (B) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{Heat}$ is a combination reaction (two reactants \rightarrow one product) AND exothermic (releases heat). The beaker becomes warm when this reaction is performed. (A) is decomposition and endothermic. (C) is thermal decomposition. (D) is photolytic decomposition. **Key point:** Not all combination reactions are exothermic, but this one is a classic example.

IIT-JEE / NCERT Activity Based

Q. N8. [IIT-JEE Concept] A student mixes solutions of lead(II) nitrate and potassium iodide. (a) What type of reaction occurs? (b) Write the balanced equation with state symbols. (c) What is the colour of the precipitate formed?

Answer: (a) Double displacement reaction (also a precipitation reaction — an insoluble salt forms). (b) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + 2\text{KI}(\text{aq}) \rightarrow \text{PbI}_2(\text{s})\downarrow + 2\text{KNO}_3(\text{aq})$. (c) The precipitate PbI_2 (lead iodide) is bright yellow in colour. This activity (Activity 1.2 in NCERT) is a beautiful demonstration — the vivid yellow precipitate instantly confirms the double displacement reaction.

■ ■ QUICK REFERENCE — ALL IMPORTANT EQUATIONS

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Burning of Mg	$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$	Combination
Quicklime + Water	$\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$	Combination, Exothermic
Formation of water	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$	Combination
Limestone heating	$\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$	Thermal Decomposition
Ferrous sulphate	$2\text{FeSO}_4 \rightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$	Thermal Decomposition
Lead nitrate	$2\text{Pb(NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$	Thermal Decomposition
Electrolysis water	$2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$	Electrolytic Decomposition
Silver chloride	$2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$	Photolytic Decomposition
Silver bromide	$2\text{AgBr} \rightarrow 2\text{Ag} + \text{Br}_2$	Photolytic Decomposition
Fe + CuSO ₄	$\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$	Displacement
Zn + CuSO ₄	$\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$	Displacement
BaCl ₂ + Na ₂ SO ₄	$\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 \downarrow + 2\text{NaCl}$	Double Displacement
CuO + H ₂	$\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$	Redox
ZnO + C	$\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$	Redox
Burning methane	$\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}$	Combustion, Exothermic
Respiration	$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$	Exothermic, Redox
Fe + Water	$3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$	Displacement, Redox
Whitewash + CO ₂	$\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$	Combination
Pb(NO ₃) ₂ + KI	$\text{Pb(NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 \downarrow + 2\text{KNO}_3$	Double Displacement

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