

REVISION NOTES

Chemical Reactions and Equations

Complete notes with solved examples

SUBJECT

Science (Chemistry)

CLASS / COURSE

Class 10 • CBSE

PREPARED BY

Subject Teacher

How to Use These Notes

These notes cover the chemistry portion on chemical reactions, equations and their types. Each chapter starts with a short overview, then lists the key definitions, explains the core concepts with examples, and ends with practice questions. Answers to the multiple-choice questions are at the end.

Study plan

- Read the overview and definitions first
- Work through the solved examples without looking at the answers
- Attempt the practice questions in timed conditions
- Revise using the summary sheet the night before the exam

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Chapter 1: Chemical Reactions and Equations

A chemical reaction is a process in which one or more substances change into new substances with different properties. We recognise reactions by changes in state, colour, temperature or the evolution of a gas, and we represent them with balanced chemical equations.

Key Definitions

Term	Meaning
Reactant	A substance that takes part in a chemical reaction
Product	A new substance formed in the reaction
Chemical equation	A symbolic representation of a reaction using formulae
Balanced equation	An equation with equal numbers of atoms of each element on both sides
Law of conservation of mass	Mass can neither be created nor destroyed in a chemical reaction

Signs of a Chemical Reaction

Most reactions show at least one observable change. Burning magnesium ribbon, for example, gives a dazzling white flame and leaves a white powder of magnesium oxide.

- Change in state
- Change in colour
- Evolution of a gas
- Change in temperature (heat given out or absorbed)

Writing and Balancing Equations

A word equation is first converted into a skeletal equation using formulae. Coefficients are then placed in front of formulae — never changing the subscripts — until each element has the same number of atoms on both sides.

State symbols (s), (l), (g) and (aq) show the physical state, and conditions such as heat or a catalyst are written above the arrow.

- Write the skeletal equation
- Count atoms of each element on both sides
- Balance the element that appears in the fewest formulae first
- Check the final count; add state symbols

Solved Examples

Q1. Balance: $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \text{H}_2$

Place 3 before Fe and 4 before H_2O , then 4 before H_2 : $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$. Each side now has 3 Fe, 8 H and 4 O atoms.

Q2. Why is a magnesium ribbon cleaned before burning?

It is covered with a layer of magnesium oxide; rubbing with sandpaper removes the layer so that the metal can react directly with oxygen.

Exam tip

In balancing questions, always show the atom count in a small table – examiners award a step mark for it even if the final coefficient is wrong.

Practice Questions

A. Multiple choice

- Which of these is a chemical change?
(a) Melting of ice (b) Rusting of iron (c) Dissolving sugar (d) Boiling water
- The law of conservation of mass was given by
(a) Dalton (b) Lavoisier (c) Newton (d) Bohr
- The state symbol (aq) means
(a) Solid (b) Gas (c) Dissolved in water (d) Liquid
- In a balanced equation, what is changed to balance it?
(a) Subscripts (b) Coefficients (c) Formulae (d) State symbols

B. Short answer

- Why should a chemical equation be balanced?
- Write two observations when lead nitrate is heated.
- What is a skeletal equation?

C. Long answer

- Explain the steps of balancing a chemical equation with a suitable example.
- Describe four observable signs of a chemical reaction with one example each.

Chapter 2: Types of Chemical Reactions

Reactions are classified by what happens to the reactants: whether they combine, break apart, swap partners, or gain and lose oxygen or electrons. Recognising the type helps predict products.

Key Definitions

Term	Meaning
Combination reaction	Two or more substances combine to form a single product
Decomposition reaction	A single substance breaks into two or more simpler substances
Displacement reaction	A more reactive element displaces a less reactive one from its compound
Double displacement	Two compounds exchange ions to form two new compounds
Precipitate	An insoluble solid formed in a solution
Exothermic reaction	A reaction that releases heat

Combination and Decomposition

Burning of coal ($\text{C} + \text{O}_2 \rightarrow \text{CO}_2$) and the formation of slaked lime from quicklime are combination reactions. Both release heat, so they are also exothermic.

Decomposition needs energy in the form of heat (thermal), light (photolytic) or electricity (electrolytic). Silver chloride turning grey in sunlight is a photolytic decomposition used in black-and-white photography.

Displacement and Double Displacement

When an iron nail is dipped in copper sulphate solution, the blue colour fades and a brown coating appears, because iron is more reactive than copper.

Mixing sodium sulphate and barium chloride solutions forms a white precipitate of barium sulphate — a double displacement or precipitation reaction.

- $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
- $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4\downarrow + 2\text{NaCl}$

Solved Examples

Q1. Identify the type: $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ (on heating)

Thermal decomposition — one reactant breaks into two products when heated.

Q2. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

Iron displaces copper from copper sulphate, forming pale green iron sulphate; the blue colour of Cu^{2+} ions fades.

Exam tip

Learn one standard example for every reaction type, with its balanced equation — most 3-mark questions ask for exactly that.

Practice Questions**A. Multiple choice**

- Electrolysis of water is an example of
(a) Combination (b) Decomposition (c) Displacement (d) Neutralisation
- A white precipitate forms when Na_2SO_4 reacts with
(a) NaCl (b) BaCl_2 (c) KNO_3 (d) HCl
- Respiration is
(a) Endothermic (b) Exothermic (c) A displacement reaction (d) Physical change
- Which metal can displace copper from CuSO_4 ?
(a) Silver (b) Gold (c) Zinc (d) Platinum

B. Short answer

- Give one example each of photolytic and electrolytic decomposition.
- Why is respiration considered an exothermic reaction?
- What is a precipitation reaction?

C. Long answer

- Explain combination, decomposition and displacement reactions with balanced equations.
- Describe an activity to show a displacement reaction and state the observations.

Chapter 3: Oxidation, Reduction and Everyday Effects

Oxidation and reduction always occur together, which is why such reactions are called redox reactions. Two everyday consequences of oxidation are corrosion of metals and rancidity of food.

Key Definitions

Term	Meaning
Oxidation	Gain of oxygen or loss of hydrogen by a substance
Reduction	Loss of oxygen or gain of hydrogen by a substance
Oxidising agent	The substance that gives oxygen or removes hydrogen
Corrosion	Slow eating away of a metal by air, moisture or acids
Rancidity	Oxidation of fats and oils in food causing bad smell and taste

Redox Reactions

In $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$, copper oxide loses oxygen (is reduced) while hydrogen gains oxygen (is oxidised). Copper oxide acts as the oxidising agent and hydrogen as the reducing agent.

Corrosion and Rancidity

Rusting of iron needs both air and moisture; it weakens bridges, railings and vehicles. Painting, oiling, galvanising and alloying are common ways to prevent it.

Food manufacturers prevent rancidity by adding antioxidants, flushing packets with nitrogen and storing food in airtight containers or refrigerators.

- Painting and greasing
- Galvanising with zinc
- Using stainless-steel alloys
- Nitrogen-flushed packaging for chips

Solved Examples

Q1. In $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$, identify the substance oxidised and reduced.

Carbon is oxidised to CO; zinc oxide is reduced to zinc.

Q2. Why are chips packets filled with nitrogen?

Nitrogen is unreactive and keeps oxygen away, so the oil in the chips does not oxidise and turn rancid.

Exam tip

When asked to identify oxidising and reducing agents, first mark which substance gains oxygen — that substance is the reducing agent.

Practice Questions**A. Multiple choice**

1. Rusting of iron requires

- (a) Only air (b) Only water (c) Air and water (d) Neither

2. In $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$, the reducing agent is

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

3. Rancidity can be prevented by

- (a) Adding salt (b) Adding antioxidants (c) Heating (d) Stirring

4. Galvanisation is coating iron with

- (a) Copper (b) Tin (c) Zinc (d) Lead

B. Short answer

11. Define oxidation and reduction in terms of oxygen.

12. State two methods to prevent rusting.

13. What is rancidity?

C. Long answer

14. What are redox reactions? Explain with two examples, naming the oxidising and reducing agents.

15. Explain corrosion and rancidity, their harmful effects and methods of prevention.

Quick Revision Sheet

Chapter	Term	Remember
Chemical Reactions and Equations	Reactant	A substance that takes part in a chemical reaction
Chemical Reactions and Equations	Product	A new substance formed in the reaction
Chemical Reactions and Equations	Chemical equation	A symbolic representation of a reaction using formulae
Types of Chemical Reactions	Combination reaction	Two or more substances combine to form a single product
Types of Chemical Reactions	Decomposition reaction	A single substance breaks into two or more simpler substances
Types of Chemical Reactions	Displacement reaction	A more reactive element displaces a less reactive one from its compound
Oxidation, Reduction and Everyday Effects	Oxidation	Gain of oxygen or loss of hydrogen by a substance
Oxidation, Reduction and Everyday Effects	Reduction	Loss of oxygen or gain of hydrogen by a substance
Oxidation, Reduction and Everyday Effects	Oxidising agent	The substance that gives oxygen or removes hydrogen

Answer Key

Chapter	Question	Answer
1	1	b
1	2	b
1	3	c
1	4	b
2	1	b
2	2	b
2	3	b
2	4	c
3	1	c
3	2	b
3	3	b
3	4	c