2026
EXAMINATION

CBSE
QUESTION & CONCEPT BANK

Chapter-wise & Topic-wise
with 50% Competency Questions

CLASS 10

- Chapter-wise with PYQs Tagging **CONCEPT MAPS**
- Important Questions with Detailed Explanations **NCERT & EXEMPLAR**
- Handpicked & High yield from Past 10 Years **PYQs**
- Revision Blue Print & Solved Questions **COMPETENCY FOCUSED**
- CBSE 2025 Past Year & SQP Solved Papers **LATEST CBSE PAPERS**
- As per Latest Pattern **MOCK TESTS**

SCIENCE

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Samridhi Sharma
Sunil Vijay Hingorani

CHAPTER-WISE WEIGHTAGE AND TREND ANALYSIS

SCIENCE										
CHAPTERS	2020		2022		2023		2024		2025	
	DL	ODL	DL	ODL	DL	ODL	DL	ODL	DL	ODL
Chemical Reactions and Equations	5	7	–	–	8	6	7	7	6	6
Acids, Bases and Salts	5	5	–	–	8	10	4	5	6	6
Metals and Non-metals	5	5	–	–	4	6	8	7	6	7
Carbon and its Compounds	5	7	5	5	7	6	6	6	6	6
Periodic Classification of Elements (*Rationalised*)	5	5	5	5	–	–	–	–	–	–
Life Processes	5	8	–	–	10	10	5	8	8	6
Control and Coordination	3	4	–	–	3	1	6	6	7	7
How do Organisms Reproduce?	7	5	6	7	6	5	6	10	7	7
Heredity and Evolution (*Some portion is Rationalised*)	8	6	7	6	6	6	6	1	4	5
Light – Reflection and Refraction	9	11	–	–	12	9	7	10	7	6
The Human Eye and the Colourful World (*Some portion is Rationalised*)	3	4	–	–	2	5	5	2	5	6
Electricity (*Some portion is Rationalised*)	7	8	6	6	11	8	7	8	6	7
Magnetic Effects of Electric Current (*Some portion is Rationalised*)	6	2	6	6	5	5	6	5	7	6
Sources of Energy (*Rationalised*)	1	4	–	–	–	–	–	–	–	–
Our Environment	4	3	5	5	5	5	4	5	5	5
Sustainable Management of Natural Resources (*Rationalised*)	2	1	–	–	–	–	–	–	–	–

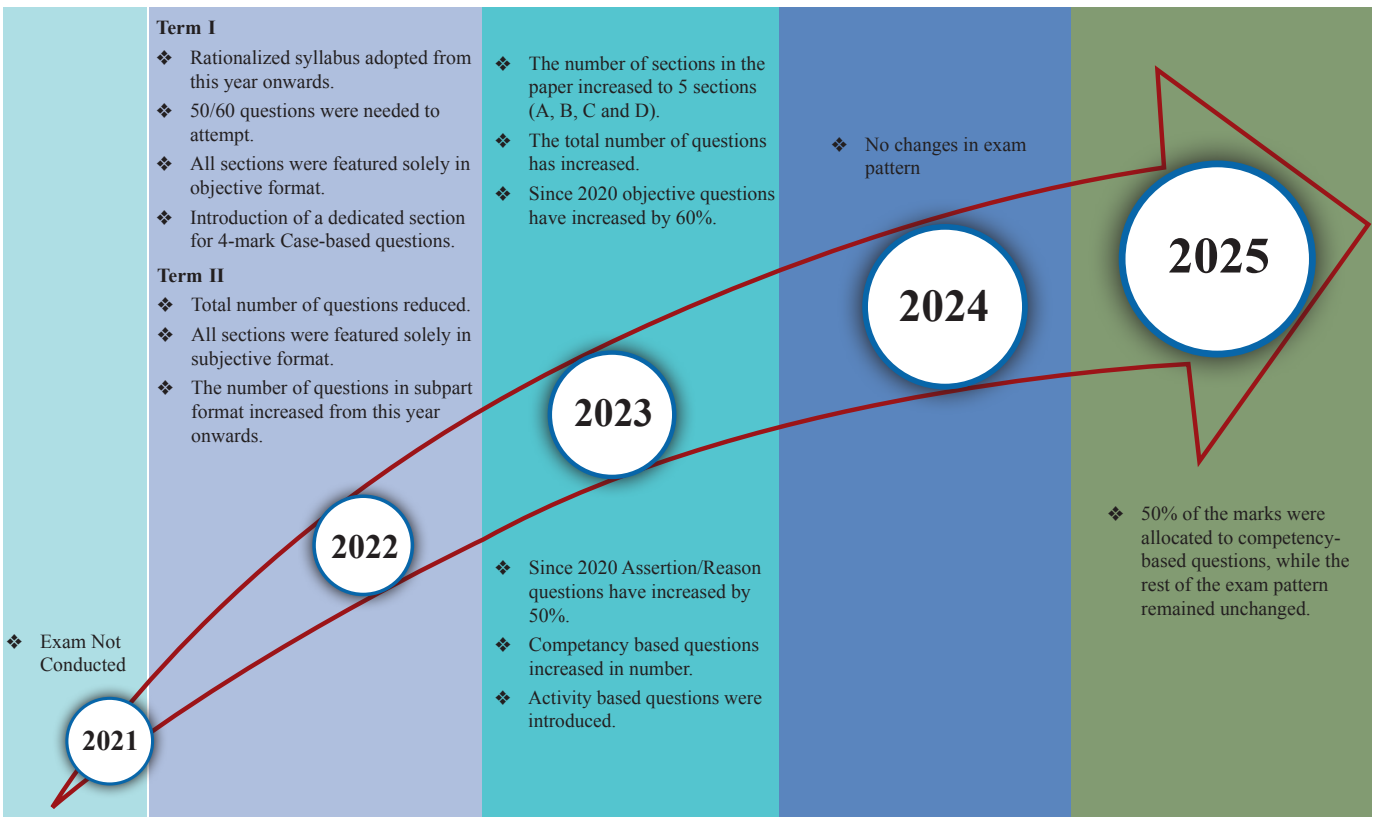
**The marks allotment mentioned above is chapter-wise and includes internal choice questions as well. Therefore, the total might not match the Maximum Marks of the respective Previous Year Paper. Here, DL is Delhi, ODL is Outside Delhi.*

**For the year 2021, the exam was not conducted.*

Question Typology

YEAR	Objective Questions		Subjective Questions			
	MCQs	A/R	VSA	SA	LA	Case-Based type
2025	16	4	6	7	3	3
2024	16	4	6	7	3	3
2023	16	4	6	7	3	3
2022 (Term II)	-	-	7	6	0	2
2022 (Term I)	43	5		-	-	12
2021	Exam Not Conducted					

Evolving Trends in CBSE Exam Patterns

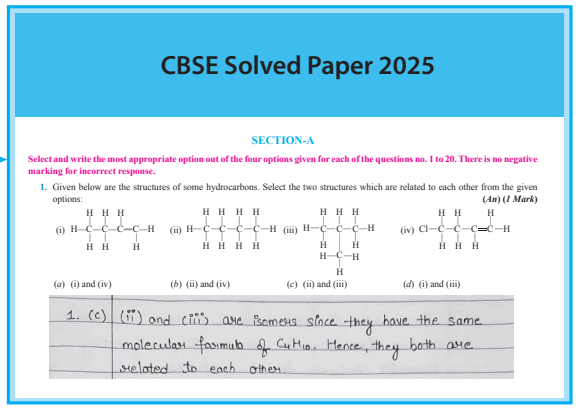


HOW TO USE THIS BOOK

This book is structured to support your learning journey of preparing for your board exams through a variety of engaging and informative elements. Here's how to make the most of it:

CBSE Solved Paper of 2025 with Handwritten Answers: *Get yourself updated with the latest Board Question Papers. With handwritten answers, learn the practical application of concepts and effective answering techniques to achieve higher scores.*

CBSE Solved Paper



Preview

"Chemical reactions are like miniature universes, full of secrets and wonders, constantly reminding us of the magic hidden in the atoms."
~Marie Curie

At the start of every chapter, you'll find a thoughtfully chosen image and a quote that captures the main idea and motivation of the topic. This approach aims to get your interest and give you a glimpse of the theme ahead.

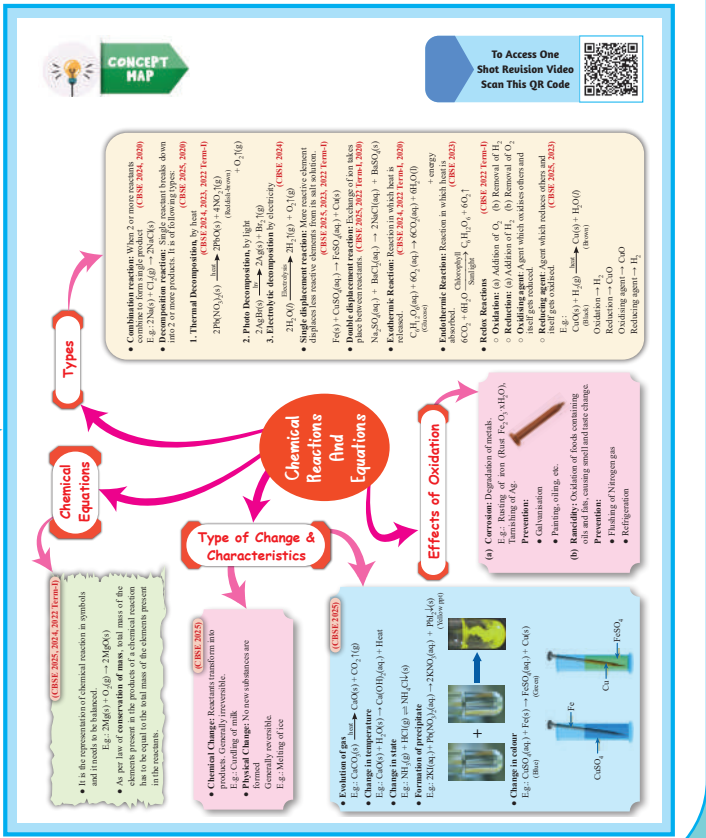
Before diving into the details, we outline the syllabus and analyze the weightage given to each topic over the past five years. This helps you prioritize your study focus based on the significance of each section.

SYLLABUS & WEIGHTAGE

LIST OF CONCEPT NAMES	YEARS				
	2020	2022 TERM-1	2023	2024	2025
Types of Changes and Characteristics of Chemical Reactions (Physical and Chemical Changes)	1 Q (1 M)	—	—	—	—
Chemical Equations and their Balancing	1 Q (3 M) 1 Q (5 M)	2 Q*	1 Q (1 M)	1 Q (2 M)	1 Q (1 M)
Types of Chemical Reactions (Combination, decomposition, displacement, double displacement, precipitation, endothermic exothermic reactions, oxidation and reduction)	1 Q (3 M)	6 Q*	3 Q (1 M) 1 Q (3 M)	1 Q (1 M) 1 Q (2 M) 1 Q (3 M)	1 Q (2 M) 1 Q (3 M)
Effect of Oxidation Reactions (Corrosion and Rancidity)	—		—	—	—

** For the year 2021, the exam was not conducted.*
** All questions were of MCQ type and carried equal marks.*

Concept Map



The concept map appears to be a comprehensive study aid that outlines key concepts in a structured format. Use it to understand the chapter's structure and as a quick reference to recall important highlights.

A QR Code to access One Shot Revision Video of the chapter.

TYPES OF CHANGES AND CHARACTERISTICS OF CHEMICAL REACTIONS

1

NCERT Definitions (Commonly asked in 1 mark)

- **Reactants:** Substances that **undergo** chemical changes in a reaction.
- **Products:** New substances **formed** as a result of a chemical reaction.
- **Physical State:** The state in which a substance exists (solid, liquid, gas, aqueous).
- **Physical Change:** A change in which **no new substances** are formed and the change is generally **reversible**
- **Chemical Change:** A process in which substances (reactants) transform into **new substances** (products) and the change is generally **irreversible**.
- **Chemical Reaction:** A process where substances (reactants) transform into different substances (products).

Important Facts

01 The protective layer on magnesium ribbon which is cleaned by rubbing it with a sand paper.
~Magnesium oxide

02 Burning a candle wax involves both chemical and physical changes.

03 Dazzling white light is given out during the burning of magnesium ribbon and is harmful to the eyes.

04 A chemical reaction is indicated by changes like colour change, temperature change, evolution of gas, state change, or precipitate formation.

Difference Between

Physical Change	Chemical Change
No new substance is formed.	New substances are formed.
Usually reversible.	Usually irreversible.
Involves changes in physical properties like shape, size, state.	Involves changes in chemical properties and composition.
No energy change is involved.	Energy is absorbed or evolved.
Example: Melting of ice, Tearing of paper.	Example: Burning of paper.

NCERT Definitions: *It simplifies complex topics into brief, easy-to-understand explanations.*

Important Facts: *Quick, bullet point facts that are crucial for exams.*

Classification

Functions of an Eye		
S. No.	Function	Description
1.	Adjustment to Light	Iris and pupil regulate light entry
2.	Refraction of Light	Lens bends light rays to form a sharp image
3.	Visual Processing	Retina converts light into electrical signals for the brain

Vision Defects and Corrections of an Eye			
S. No.	Defect	Causes	Correction
1.	Myopia (Nearsightedness)	Elongated eyeball or increased lens power	Concave lenses
2.	Hypermetropia(Farsightedness)	Compressed eyeball or decreased lens power	Convex lenses
3.	Presbyopia	Age-related hardening of the lens	Bifocal lenses
4.	Cataract	Lens clouding typically due to aging	Surgical removal and lens replacement
5.	Astigmatism	Irregular curvature of cornea or lens	Cylindrical lenses

Difference Between

Pupil v/s Iris	
Pupil	Iris
The opening that allows light into the eye	Muscular ring around the pupil that gives eye color
Size adjusts to light intensity	Controls the size of the pupil
Does not have color	Pigmented to provide eye color
Directly involved in light entry	Indirectly involved by adjusting pupil size
Remains black in appearance	Can have various colors

Myopia v/s Hypermetropia	
Myopia (Nearsightedness)	Hypermetropia (Farsightedness)
Caused by an elongated eyeball	Caused by a compressed eyeball
Distant objects are blurred	Close objects are blurred
Corrected with concave lenses	Corrected with convex lenses
Far point is closer than normal	Near point is farther than normal
Light focuses before the retina	Light focuses behind the retina

Classification: *It organizes complex information into clear categories, making it easier for students to grasp differences, recognize patterns, and predict properties or behaviors in their learning.*

Difference Between: *Side-by-side comparisons to help distinguish similar concepts.*

Real Life Application Based Questions

1. **Have you ever wondered why cutting an apple and leaving it out causes it to turn brown? Explain what type of change i occurring and why it happens?**

Ans. When you cut an apple, it turns brown. Browning of apple takes place due to oxidation and this is a chemical change. Hence, w cannot restore it to original colour.

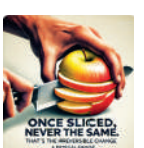
2. **While cooking pasta, Priya observed two processes: boiling water to cook pasta and frying onions until they turned brown Identify which process is a physical change and which is a chemical change?**

Ans. Boiling water to cook pasta is a physical change because boiling water involves **changing the state of water** from liquid to ga (steam) without altering its chemical composition.

Frying onions causes them to turn brown, indicating the chemical change because a **chemical reaction** occurs and the process i irreversible and results in the formation of new substances with different flavours and colours.

Myth Buster

- **Myth: All physical changes are reversible, and all chemical changes are irreversible.**
  Fact: While many physical changes are reversible (like melting and freezing of water), some are not (like breaking a glass, cutting of an apple). Similarly, not all chemical changes are irreversible. For example, the **synthesis of water** is a chemical change that can be reversed through electrolysis to yield hydrogen and oxygen gases.



- **Myth: Physical changes always involve states of matter transitions (solid, liquid, gas).**
  Fact: While state transitions are common examples of physical changes, not all physical changes involve them. Dissolving sugar in water is a physical change without a state transition.
- **Myth: If you mix two substances and they react, they must have undergone a chemical change.**
  Fact: While mixing two substances can lead to a chemical reaction, it is not always the case. For example, mixing alcohol and water alters neither's chemical composition, illustrating a physical change.

- **Myth: The burning of a candle is just a physical change because you can see the wax melting.**
  Fact: The burning of a candle is actually a chemical reaction. When a candle burns, the wax combines with oxygen in the air to form new substances like carbon dioxide and water vapour, indicating a chemical change. The melting of wax is a physical change, but the actual burning (combustion) is a chemical change.

Mnemonics

- **DROP**-To remember characteristics of chemical change
  - D → Dramatic change in chemical composition
  - R → Release of gas
  - O → Observed energy change
  - P → Production of new substance

Real-Life Application Based Questions: *Exercises that connect theory with practical scenarios. It will enhance your understanding and relevance of concepts.*

Myth Buster: *Clear up common misconceptions to ensure your understanding is accurate.*

Mnemonics: *Memory aids to help you retain and recall information.*

COMPETENCY BASED SOLVED EXAMPLES

Multiple Choice Questions (1 M)

1. **Which of the following metals exist in their native state in nature?** ***(Un)***
   (*i*) Ca (*ii*) Pt (*iii*) Al (*iv*) Ag
   (*a*) (*i*) and (*ii*) (*b*) (*ii*) and (*iii*)
   (*c*) (*ii*) and (*iv*) (*d*) (*iii*) and (*iv*)
2. **Aluminium is used in thermit welding because** ***(Un)***
   (*a*) Aluminium is a metal that has lightweight
   (*b*) Aluminium is a strong oxidising agent
   (*c*) Aluminium has more affinity for oxygen
   (*d*) Aluminium is considered a reactive metal
3. **During purification of a metal by electrolysis, what happens at the negative electrode?** ***(Re)*** **(CBSE APQ, 2023)**
   (*a*) Metal ions lose electrons to become neutral atoms.
   (*b*) Neutral metal atoms gain electrons to become ions.
   (*c*) Neutral metal atoms lose electrons to become ions.
   (*d*) Metal ions gain electrons to become neutral metal atoms
4. **Which of the following metals are obtained by electrolysis of their chlorides in the molten state?** ***(Ap)*** **(NCERT Exemplar)**
   (*i*) Na (*ii*) Ca (*iii*) Fe (*iv*) Cu
   (*a*) (*i*) and (*iv*) (*b*) (*iii*) and (*iv*)
   (*c*) (*i*) and (*iii*) (*d*) (*i*) and (*ii*)
5. **In the electrolytic refining of copper, the electrolyte used is** ***(Un)***
   (*a*) CuO (*b*) $Cu(OH)_2$
   (*c*) Acidified $CuSO_4$(aq) (*d*) $CuSO_4$(s)

Assertion and Reason (1 M)

Direction: The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

(*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.

1. **Assertion (A):** One of the steps involved in copper extraction is $Cu_2S + 2Cu_2O \longrightarrow 6Cu + SO_2$
   Reason (R): Cu_2S is the reducing agent in this reaction, while Cu_2O is the oxidising agent. ***(Un)***
2. **Assertion (A):** Highly reactive metals are extracted by electrolytic reduction.
   Reason (R): Metals are deposited at the cathode in electrolytic reduction. ***(Un)***
3. **Assertion (A):** Zinc oxide can be reduced to zinc metal on heating with carbon.
   Reason (R): Carbon is less reactive than zinc.
   (Un) **(CBSE APQ, 2023)**

Subjective Questions

Very Short Answer Type Questions (2 M)

1. **Priya is studying the occurrence of metals in nature. She has samples of five metals: gold, aluminium, lead, iron, and silver. These metals occur in different forms in nature. Some occur in native state, and some in the combined state with other elements.** ***(Un)***
   (A) Identify the metal(s) that are most likely to be found in their native state and those found in a combined state in the Earth's crust, which are positioned at the bottom of the reactivity series.
   (B) What is the name of the process in which sulphide ores are heated strongly in the presence of excess air to convert them into oxides?

Ans. (A)
- Gold and silver are often found in a native state and lies at the bottom of the reactivity series due to its low reactivity. *(½ M)*
- Silver can be found in the combined state as their sulphide or oxide ores or in the free state. It lies at the bottom of the reactivity series due to their low reactivity. *(½ M)*

(B) The process of converting sulphide ores into oxides by heating strongly in the presence of excess air is called roasting. *(1 M)*

Hints & Explanations

Multiple Choice Questions

1. (*c*) Pt and Ag are present in the bottom of the reactivity series and are the least reactive. Therefore, can exist in their native state in nature.
2. (*c*) Aluminium is used in thermit welding because aluminium has more affinity for oxygen. It can be understood from the following reaction:
   $Fe_2O_3(s) + 2Al(s) \rightarrow Al_2O_3(s) + 2Fe(l) + Heat$
3. (*d*) At negative electrode, metal ions gain electrons to become neutral metal atoms in electrolysis.
4. (*d*) Highly reactive metals like Na, Mg, Ca which are placed in the higher part of the reactivity series cannot be obtained by heating with carbon.
   Therefore, they are obtained by electrolysis of their chlorides in the molten state.

Solved Examples

For each topic, solved examples are provided including tagging of Competencies, PYQs, CBSE SQPs, etc., that exemplify how to approach and solve questions. This section is designed to reinforce your learning and improve problem solving skills.

MISCELLANEOUS EXERCISE

Multiple Choice Questions (1 M)

1. Which of the following is non-metal but is lustrous? ***(Un)*** **(NCERT Exemplar)**
   (*a*) Iodine (*b*) Mercury
   (*c*) Carbon (*d*) Bromine
2. Electrical wires have a coating of insulating material. The material, generally used is ***(Un)*** **(NCERT Exemplar)**
   (*a*) Sulphur (*b*) Graphite
   (*c*) PVC (*d*) All can be used
3. Krunal connected a copper plate and an iron plate to the positive and negative terminals of a battery respectively along with a switch. He immersed the plates into a beaker containing acidified copper sulphate solution. Which of the following is likely to happen when the current is started? ***(Ap)*** **(CFPQ)**
   (*a*) Iron will be deposited on the copper plate.
   (*b*) Copper will continue to be deposited on the iron plate.
   (*c*) No reaction will occur at the iron plate or at the copper plate.
   (*d*) The copper already deposited on the iron plate will go back into the solution.
4. In the list given below, a metal to the right is more reactive than a metal that is to its left.

Copper	Tin	Nickel	Cobalt	Iron	Zinc

The table below gives the colour of the metal sulphate salt solutions.

ANSWER KEYS

Multiple Choice Questions

1. (*a*)	2. (*c*)	3. (*b*)	4. (*c*)	5. (*b*)	6. (*a*)	7. (*d*)	8. (*c*)	9. (*d*)	10. (*d*)
11. (*b*)	12. (*d*)	13. (*b*)	14. (*a*)	15. (*d*)	16. (*a*)	17. (*c*)	18. (*d*)	19. (*b*)	20. (*b*)
21. (*c*)	22. (*c*)	23. (*c*)	24. (*c*)	25. (*b*)					

Assertion and Reason

1. (*d*)	2. (*d*)	3. (*a*)	4. (*a*)	5. (*c*)	6. (*c*)	7. (*b*)	8. (*c*)

Case Based Questions

Case Based-II

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

HINTS & EXPLANATIONS

Multiple Choice Questions

1. (*a*) Iodine is the only non-metal which is lustrous, that is, has a shiny appearance.
2. (*c*) An insulating material that is used in coating of electrical wire is PVC (Polyvinyl chloride).
3. (*b*) When the current is started, the iron plate (cathode, negative terminal) attracts Cu^{2+} ions from the solution, which are reduced to form metallic copper. Thus, copper continues to deposit on the iron plate.
11. (*b*) Iron is more reactive than copper. Therefore, iron displaces copper from copper sulphate solution, resulting in the formation of iron sulphate and deposition of copper on the iron nail, giving it the colour of reddish brown. This displacement reaction can be represented as:
    $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
12. (*d*) Gold(Au) will get dissolved in conc. HCl and conc. HNO_3, 3 : 1 mixture (aqua regia).

Answer Key

At the end of each chapter, you'll find additional exercises intended to test your grasp of the material. These are great for revision and to prepare for exams.

Answer Key and Explanations including Topper's Explanations, Mistake 101, Nailing the right answer and Key takeaway to know how to write the ideal answer.

Mock Test

Mock Test Papers: Test your preparedness with our Mock Test Papers designed to mirror the format and difficulty of real exams. Use the detailed explanations to identify areas of strength and opportunities for improvement.

MOCK TEST PAPER-1

Time allowed : 3 hours **Maximum Marks : 80**

NOTE:
(i) Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
*(ii) Please check that this question paper contains **39** questions.*
*(iii) **Please write down the Serial Number of the question in the answer-book before attempting it.***
(iv) 15 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

GENERAL INSTRUCTIONS:
Read the following instructions carefully and strictly follow them:
*(i) This question paper consists of **39** questions. **All** questions are compulsory.*
*(ii) Question paper is divided into **FIVE** sections viz. Section **A, B, C, D** and **E**.*
*(iii) In Section **A** - question number **1** to **20** are Multiple Choice Questions (MCQs) carrying **1** mark each.*
*(iv) In Section **B** - question number **21** to **26** are Very Short Answer (VSA) type questions carrying **2** marks each. Answer to these questions should be in the range of **30** to **50** words.*
*(v) In Section **C** - question number **27** to **33** are Short Answer (SA) type questions carrying **3** marks each. Answer to these questions should be in the range of **50** to **80** words.*
*(vi) In Section **D** - question number **34** to **36** are Long Answer (LA) type questions carrying **5** marks each. Answer to these questions should be in the range of **80** to **120** words.*
*(vii) In Section **E** - question number **37** to **39** are of **3** source-based/case-based units of assessment carrying **4** marks each with sub-parts.*
(viii) There is no overall choice. However, an internal choice has been provided in some Sections.

SECTION - A

Select and write one most appropriate option out of the four options given for each of the questions 1-20:

1. You are conducting a hands-on science experiment in your classroom. You start with a block of ice and let it melt into water, observing the changes that occur. To engage your students, you ask: "As we melt this block of ice into water, what do you think will happen to the mass of the substance throughout this physical change?" **1**
   (*a*) Mass increases (*b*) Mass decreases
   (*c*) Mass remains the same (*d*) Mass fluctuates unpredictably
2. Which of the following is **NOT** a metalloid? **1**
   (*a*) Selenium (*b*) Antimony (*c*) Arsenic (*d*) Silicon

CONTENTS

Upcoming CBSE SQPs/ APQs can be accessed through this QR

Questions have been categorized according to the Bloom's Taxonomy (as per CBSE Board). The following abbreviations have been used in the book:

(Un) - Understanding *(Re)* - Remembering *(Ap)* - Applying
(An) - Analysing *(Cr)* - Creating *(Ev)* - Evaluating

CBSE SOLVED PAPER 2025

Time allowed : 3 hours **Maximum Marks : 80**

GENERAL INSTRUCTIONS:

Read the following instructions very carefully and strictly follow them:

*(i) This question paper comprises **39** questions. **All** questions are compulsory.*

*(ii) This question paper is divided into **five** sections - **A, B, C, D** and **E**.*

*(iii) **Section A** - Questions No. **1** to **20** are Multiple Choice Questions. Each question carries **1** mark.*

*(iv) **Section B** - Questions No. **21** to **26** are Very Short Answer type questions. Each question carries **2** marks. Answer to these questions should be in the range of **30** to **50** words.*

*(v) **Section C** - Questions No. **27** to **33** are Short Answer type questions. Each question carries **3** marks. Answer to these questions should be in the range of **50** to **80** words.*

*(vi) **Section D** - Questions No. **34** to **36** are Long Answer type questions. Each question carries **5** marks. Answer to these questions should be in the range of **80** to **120** words.*

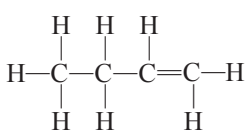
*(vii) **Section E** - Questions No. **37** to **39** are of **3** source-based/case-based units of assessment carrying **4** marks each with sub-parts.*

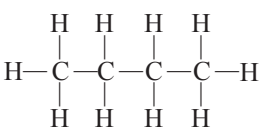
(viii) There is no overall choice. However, an internal choice has been provided in some sections. Only one of the alternatives has to be attempted in such questions.

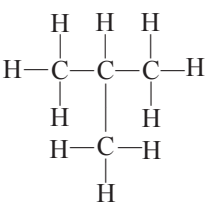
SECTION-A

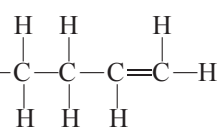
Select and write the most appropriate option out of the four options given for each of the questions no. 1 to 20. There is no negative marking for incorrect response.

1. Given below are the structures of some hydrocarbons. Select the two structures which are related to each other from the given options: **(*An*) (*1 Mark*)**

(i) 

(ii) 

(iii) 

(iv) 

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

1. (c) (ii) and (iii) are isomers since they have the same molecular formula of C_4H_{10}. Hence, they both are related to each other.

2. Choose the ***incorrect*** statement about the common reaction used in hydrogenation of vegetable oils. **(*Un*) (*1 Mark*)**

(*a*) It is an addition reaction.

(*b*) It takes place in the presence of nickel or palladium catalyst.

(*c*) The product contains only single bonds between carbon atoms.

(*d*) It is an addition reaction which occurs in the presence of an acid catalyst.

2. (d) Hydrogenation of vegetable oils is an addition reaction that occurs using a nickel catalyst or palladium catalyst to give saturated hydrocarbons.

3. Consider the following chemical equation: **(*Ev*) (*1 Mark*)**

$p\,Al + q\,H_2O \rightarrow r\,Al_2O_3 + s\,H_2$

To balance this chemical equation, the values of 'p','q',r' and 's' must be respectively:

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

3. (c) The complete balanced equation is:

$2Al + 3H_2O \longrightarrow Al_2O_3 + 3H_2$

Hence, $p = 2$, $q = 3$, $r = 1$, $s = 3$

4. Study the following cases: **(*1 Mark*)**

(i) $CuSO_4 + Mg \rightarrow$ (ii) $FeSO_4 + Pb \rightarrow$ (iii) $CaSO_4 + Al \rightarrow$ (iv) $ZnSO_4 + Ca \rightarrow$

The case/cases in which new product (s) will form is/are: **(*Un*)**

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

4. (c) According to reactivity series, only reaction (i) and (iv) will take place.

$CuSO_4 + Mg \longrightarrow MgSO_4 + Cu$

$ZnSO_4 + Ca \longrightarrow CaSO_4 + Zn$

5. Which of the given option represents a family of salts? **(*1 Mark*)(*Re*)**

(*a*) $NaCl$, Na_2SO_4, $CaSO_4$ (*b*) K_2SO_4, Na_2SO_4, $CaSO_4$ (*c*) $NaNO_3$, $CaCO_3$, Na_2CO_3 (*d*) $MgSO_4$, $CuSO_4$, $MgCl_2$

5. (b) Salts having the same positive or negative radicals are said to belong to a family. K_2SO_4, Na_2SO_4, and $CaSO_4$ belong to the family of sulphate salts.

6. Match Column-I with Column-II and select the correct option from the choices provided. **(*Re*) (*1 Mark*)**

	Column-I		Column-II
A.	Site of fertilisation of egg with the sperm	(i)	Vagina
B.	Site of implantation of embryo	(ii)	Uterus
C.	Site of entry of sperm into the female reproductive tract	(iii)	Oviduct
D.	Site through which the waste materials generated by the developing embryo are removed	(iv)	Placenta
		(v)	Cervix

(*a*) A -(ii), B -(i), C -(v), D -(iv)
(*b*) A -(iii), B -(i), C -(v), D -(iv)
(*c*) A -(iv), B -(ii), C -(iii), D -(i)
(*d*) A -(iii), B -(ii), C -(i), D -(iv)

6. (d) fertilisation of egg and sperm occurs in the oviduct, embryo implants in the uterus, sperm enters through the vagina, and the placenta removes waste from the developing embryo's blood, ensuring proper nutrient and waste exchange.

7. The part of the hind-brain controlling involuntary actions such as salivation and vomiting in humans is: **(*Re*) (*1 Mark*)**
(*a*) Cerebellum (*b*) Cerebrum (*c*) Pons (*d*) Medulla

7. (d) The medulla in the hindbrain controls involuntary actions like salvation and vomiting, regulating essential reflexes for body function.

8. Select a pair of bisexual flowers from the following : **(*Re*) (*1 Mark*)**
(*a*) Papaya and mustard (*b*) *Hibiscus* and mustard (*c*) *Hibiscus* and papaya (*d*) *Hibiscus* and watermelon

8. (b) Hibiscus and Mustard are bisexual flowers, containing both stamen (male) and carpels (female), enabling self and cross-pollination.

9. The plant hormone present in greater concentration in the areas of rapidly dividing cells is: **(*Re*) (*1 Mark*)**
(*a*) Auxin (*b*) Cytokinins (*c*) Gibberellins (*d*) Abscisic acid

9. (b) Cytokinins promote cell division and are found in high concentrations in actively growing regions like fruits and seeds.

10. Temporary finger-like extensions on the cell surface to take in food is formed in: **(*Re*) (*1 Mark*)**
(*a*) *Paramoecium* (*b*) *Amoeba* (*c*) *Leishmania* (*d*) *Rhizopus*

10. (b) Amoeba forms pseudopodia, a temporary finger-like extensions, to engulf food through phago-cytosis, aiding movement and nutrition intake.

3 SALTS

NCERT Definitions (Commonly asked in 1 mark)

- **Salts:** Salts are ionic compounds composed of positive ions (cations) and negative ions (anions) that are held together by ionic bonds. They are formed by the neutralization reaction between acids and bases. Example: Sodium chloride (NaCl)
- **Family of Salts:** Group of salts having the same positive or negative radicals. Examples: Na_2SO_4 and NaCl are sodium family salts; KCl and NaCl are chloride family salts etc.
- **Chlor-alkali process:** It is an industrial method for the electrolytic production of chlorine gas (Cl_2), sodium hydroxide (NaOH), and hydrogen gas (H_2) from the electrolysis of a sodium chloride (NaCl) solution(brine).

  $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g)\uparrow + H_2(g)\uparrow$
- **Water of Crystallisation:** The **number of water molecules** associated with each formula unit of the salt is constant and forms a fixed ratio. This water is called water of crystallisation.

  Example: $CuSO_4 \cdot 5H_2O$, $CaSO_4 \cdot 2H_2O$ etc.

Important Facts

01 A chemical compound used for bleaching, produced by the action of chlorine on dry slaked lime. ~ ***Bleaching Powder***

02 The chemical name of salt is sodium bicarbonate and it is used in cooking and as a mild non-corrosive base. ~ ***Baking Soda***

03 The chemical name of salt is Sodium carbonate decahydrate and it is used as a cleaning agent and for water softening. ~ ***Washing Soda***

04 The chemical name of salt is Calcium sulphate hemihydrate and it is used for casting moulds and for immobilizing broken bones. ~ ***Plaster of Paris***

05 Salt used in making Plaster of Paris through dehydration. ~ ***Gypsum***

Classification

Types of Salts (On the basis of their nature)			
Property	**Neutral Salt**	**Acidic Salt**	**Basic Salt**
Definition	Salt formed from the reaction of a **strong acid** and a **strong base**.	Salt derived from a **strong acid** and a **weak base**.	Salt resulting from a **strong base** and a **weak acid**.
Typical pH	Typically has a pH of **7**.	Generally has a pH **less than 7**.	Usually has a pH **greater than 7**.
Example Reaction	Sodium chloride (NaCl): $HCl + NaOH \rightarrow NaCl + H_2O$	Ammonium sulphate $(NH_4)_2SO_4$: $H_2SO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + 2H_2O$	Sodium acetate (CH_3COONa) : $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$

Real Life Application Based Questions

1. How does sodium hydroxide contribute to the soap and detergent manufacturing process?

Ans. Sodium hydroxide plays a critical role in soap and detergent manufacturing through a process called saponification. In this process, it reacts with oils and fats to create soap, a substance that can mix with both oil and water, allowing it to remove dirt and grease.

2. Rohit used baking soda in fire extinguishers. Do you know what is the advantage of using it?

Ans. Baking soda is used in some types of fire extinguishers as a non-toxic and non-corrosive agent to combat fires. It releases carbon dioxide when heated or combined with an acid, helping to smother the fire by cutting off the oxygen supply.

3. What makes baking soda a valuable component in personal care products?

Ans. Baking soda, or sodium bicarbonate, is commonly used in personal care products such as toothpaste, deodorant, and bath products due to its mild abrasive, neutralizing, and odour-absorbing properties. It helps in maintaining pH balance, neutralizing acidic odours, and gently scrubbing away surface stains, contributing to personal hygiene and care.

4. What role does Plaster of Paris play in building construction?

Ans. Plaster of Paris is widely used in building construction to create decorative mouldings and coatings for walls and ceilings. It's easy-to-mould property when mixed with water, followed by quick-setting into a hard form, makes it ideal for creating intricate designs and smooth finishes on interior surfaces.

Myth Buster

- **Myth: All salts are neutral compounds with a pH of 7.**

  Fact: The pH of a salt solution depends on the **strength of the acid and base** from which the salt is derived. Salts from a strong acid and a strong base are neutral (pH = 7), but salts from a strong acid and a weak base are acidic (pH < 7), and those from a strong base and a weak acid are basic (pH > 7).

- **Myth: Salts do not contain water because they are dry crystalline substances.**

  Fact: Many salts contain water of crystallization, which is integral to their crystal structure. For example, hydrated copper sulphate ($CuSO_4 \cdot 5H_2O$) appears blue due to this water. When heated, the water is removed, and the salt turns white, demonstrating that the 'dry' appearance of salts can be deceptive.

- **Myth: The primary use of sodium chloride is in food seasoning and preservation.**

  Fact: While sodium chloride is widely used as a seasoning and preservative in the food industry, its application extend far beyond this. It is a critical raw material in the chemical industry, used in the production of numerous substances including sodium hydroxide, chlorine, hydrochloric acid, and many other chemicals.

Mnemonics

- **Half** way round the **Paris**, I drove in **2 gypsies**

$$CaSO_4 \cdot \frac{1}{2} H_2O + 1\frac{1}{2} H_2O \rightarrow CaSO_4 \cdot 2H_2O$$

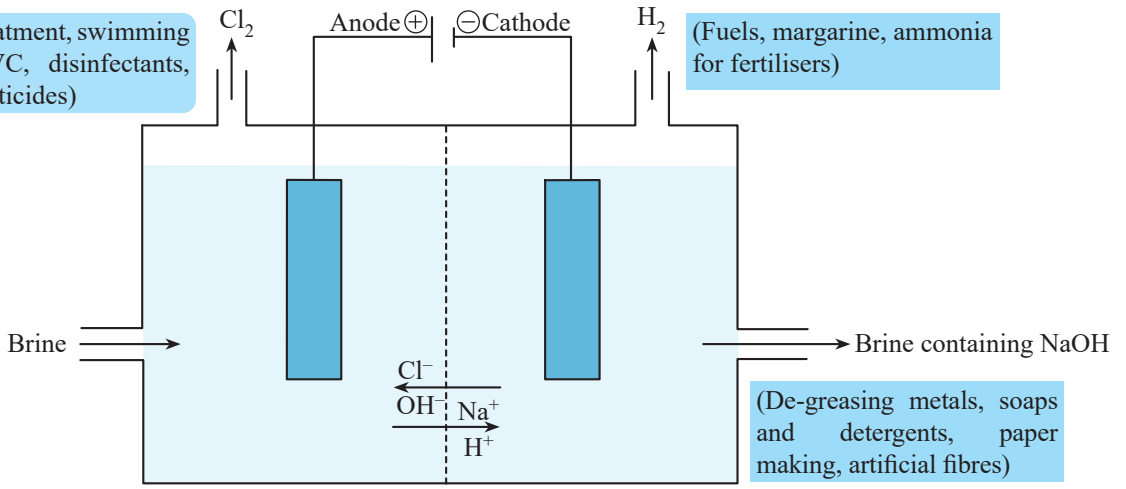
(Plaster of Pairs) (Gypsum)

- **"Chlorine gas is given off at the anode, and hydrogen gas at the cathode".**

Chloe **a**te **h**ot dog with the **cat**

↓ ↓ ↓ ↓

Chlorine Anode Hydrogen Cathode



COMPETENCY BASED SOLVED EXAMPLES

Multiple Choice Questions (1 M)

1. Sodium carbonate is a basic salt because it is a salt of
(*Un*) (NCERT Exemplar)

(*a*) strong acid and strong base
(*b*) weak acid and weak base
(*c*) strong acid and weak base
(*d*) weak acid and strong base

2. If 10 mL of H_2SO_4 is mixed with 10 mL of $Mg(OH)_2$ of the same concentration, the resultant solution will give the following colour with universal indicator:
(*Ap*) (CBSE 2020)

(*a*) Red (*b*) Yellow
(*c*) Green (*d*) Blue

3. Which of the following salts do not have the water of crystallization?
(*Re*) (CBSE 2022-Term I)

(*i*) Bleaching Powder (*ii*) Plaster of Paris
(*iii*) Washing soda (*iv*) Baking soda
(*a*) (*ii*) and (*iv*) (*b*) (*i*) and (*iii*)
(*c*) (*ii*) and (*iii*) (*d*) (*i*) and (*iv*)

4. Study the following table and choose the correct option:
(*Ap*) (CBSE 2022-Term I)

	Salt	Parent Acid	Parent Base	Nature of Salt
(*a*)	Sodium Chloride	HCl	NaOH	Basic
(*b*)	Sodium Carbonate	H_2CO_3	NaOH	Neutral
(*c*)	Sodium Sulphate	H_2SO_3	NaOH	Acidic
(*d*)	Sodium Acetate	CH_3COOH	NaOH	Basic

5. The name of the salt used to remove permanent hardness of water is:
(*Re*) (CBSE 2023)

(*a*) Sodium hydrogen carbonate ($NaHCO_3$)
(*b*) Sodium chloride (NaCl)
(*c*) Sodium carbonate decahydrate ($Na_2CO_3 \cdot 10H_2O$)
(*d*) Calcium sulphate hemihydrate ($CaSO_4 \cdot \frac{1}{2} H_2O$)

6. Match the chemical substances given in Column-I with their appropriate application given in Column-II
(*Re*) (NCERT Exemplar)

Column-I	Column-II
A. Bleaching powder	(*i*) Preparation of glass
B. Baking soda	(*ii*) Production of H_2 and Cl_2
C. Washing soda	(*iii*) Decolourisation
D. Sodium chloride	(*iv*) Antacid

(*a*) A - (*ii*), B-(*i*), C-(*iv*), D-(*iii*)
(*b*) A - (*iii*), B-(*ii*), C-(*iv*), D-(*i*)
(*c*) A - (*iii*), B-(*iv*), C-(*i*), D-(*ii*)
(*d*) A - (*ii*), B-(*iv*), C-(*i*), D-(*iii*)

7. Baking soda is a mixture of: **(*Re*) (CBSE 2020)**
(*a*) Sodium carbonate and acetic acid
(*b*) Sodium carbonate and tartaric acid
(*c*) Sodium hydrogen carbonate and tartaric acid
(*d*) Sodium hydrogen carbonate and acetic acid

Assertion and Reason (1 M)

Direction: The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:
(*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.

1. Assertion (A): All salts form neutral solutions with pH = 7.
Reason (R): Salts are formed by the neutralisation of an acid with a base. **(*Un*)**

2. Assertion (A): Salts of a strong acid and weak base are basic in nature.
Reason (R): It has a pH value less than 7. **(*Un*)**

3. Assertion (A): Bleaching powder is represented as $Na_2CO_3.10H_2O$.
Reason (R): Bleaching powder is produced by the action of chlorine on dry slaked lime **(*Re*)**

4. Assertion (A): The chemical name of baking soda is sodium hydrogencarbonate.
Reason (R): Baking soda is an acidic salt. **(*Re*)**

Subjective Questions

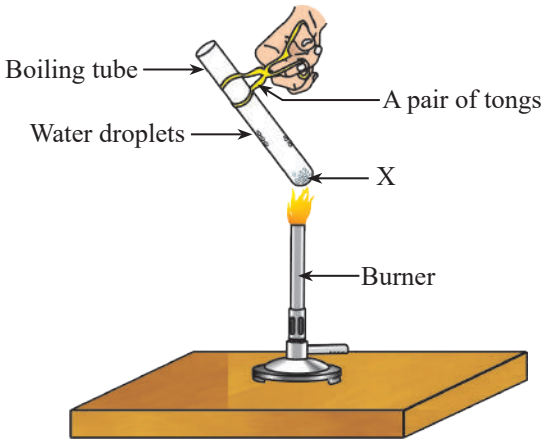
Very Short Answer Type Questions (2 M)

1. Why the salt solutions of strong acid and strong bases are neutral? **(*An*)**

Ans. Salt solutions of strong acids and strong bases are neutral because they do not hydrolyse in water as both the acid and base neutralize each other and hence, solution become neutral in nature. *(2 M)*

2. Sophia is a lab technician working in a high school chemistry lab. She was tasked with preparing different salts and observing their behaviour when subjected to heat. One day, Sophia decided to experiment with a salt (X) made from a strong acid (H_2SO_4) and a weak base ($Fe(OH)_2$). She carefully heated the salt and noticed a change in its colour.

(*a*) What happens to the colour of the salt (X) when it is heated, and why?



(*b*) How many water molecules are present in one formula unit of salt (X)? **(*An*)**

Ans. (*a*) The salt X is ferrous sulphate ($FeSO_4$). Ferrous sulphate, when hydrated ($FeSO_4.7H_2O$), is light green due to the presence of water of crystallisation. On heating, the water in the crystals is removed, resulting in the formation of anhydrous ferrous sulphate ($FeSO_4$), which changes the crystals' colour from light green to white. *(1 M)*

(*b*) One formula unit of hydrated ferrous sulphate ($FeSO_4.7H_2O$) contains seven water molecules. These water molecules are referred to as water of crystallisation. *(1 M)*

3. What is the chemical name of brine and bleaching powder? How bleaching powder is formed? **(*Re*)**

Ans. Chemical name of brine is aqueous sodium chloride solution which is represented as NaCl(aq.). *(½ M)*

Chemical name of Bleaching powder is calcium hypochlorite $Ca(OCl)_2$. *(½ M)*

Bleaching powder in obtained by the action of chlorine on dry slaked lime that is Calcium hydroxide. *(½ M)*

The complete reaction is given as.

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$ *(½ M)*

4. (*a*) (*i*) A compound 'X' which is prepared from gypsum has the property of hardening when mixed with proper quantity of water.
Identify 'X' and write its chemical formula.
(*Re*) (CBSE 2023)
(*ii*) State the difference in chemical composition between baking soda and baking powder:

Ans. (*a*) (*i*) Since, compound X gets hardened when mixed with water, therefore, X is Plaster of Paris and its chemical formula is $CaSO_4.1/2H_2O$. *(1 M)*

(*ii*) Baking soda is sodium hydrogen carbonate ($NaHCO_3$) and it is added to make cooking faster. *(½ M)*

Baking powder consists of baking soda in addition to cream of tartar and cornstarch. *(½ M)*

5. Answer the following questions

(*a*) Name the sodium compound which is used for softening hard water.

(*b*) Which gas is evolved when washing soda reacts with hydrochloric acid? (*Re*) (NCERT Intext)

Ans. (*a*) Washing soda or Sodium carbonate (Na_2CO_3) is the compound that is used for softening hard water. *(1 M)*

(*b*) Carbon dioxide gas is evolved when washing soda reacts with hydrochloric acid. *(½ M)*

$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2\uparrow$ *(½ M)*

Short Answer Type Questions (3 M)

1. You are at a medical-themed science fair with your family. There's an interactive exhibit showcasing the use of a white powder in medicine. The presenter engages the audience: (*Ap*)

(*a*) What's the name and chemical formula of the white powder used by doctors to support fractured bones?"

(*b*) When we mix this powder with water, it undergoes a transformation into a hard solid. Can someone explain this process and write down the balanced chemical equation?"

(*c*) "Can anyone share another medical application where this white powder is used effectively?"

Ans. (*a*) The chemical name of the powder is calcium sulphate hemihydrate. *(½ M)*

Its formula is:

$CaSO_4.\frac{1}{2}H_2O$ *(½ M)*

(*b*) When this white powder is mixed with water, a solid hard mass gypsum is formed. *(½ M)*

$CaSO_4.\frac{1}{2}H_2O + \frac{3}{2}H_2O \rightarrow CaSO_4.2H_2O$ *(½ M)*

(*c*) It is used for making toys, materials for decoration and to make surfaces smooth. *(1 M)*

Mistakes 101 : What not to do!

Students may mistakenly state that the white powder used by doctors for supporting fractured bones is calcium carbonate ($CaCO_3$) instead of calcium sulphate ($CaSO_4.\frac{1}{2}H_2O$). They may confuse the compounds or fail to recognize the correct chemical formula.

2. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed? (*Un*) (CBSE 2019)

Ans.
- Sodium chloride is obtained from a strong acid i.e. hydrochloric acid (HCl) and a strong base i.e. sodium hydroxide (NaOH). *(½ M)*
- Sodium chloride (NaCl) is a neutral salt as pH of its aqueous solution is 7. *(½ M)*
- It is called rock salt when sodium chloride is found in mineral form. These deposits of salt are large crystals which are often brown due to impurities. *(1 M)*
- Beds of rock salt are formed when seas get evaporated over a long period of time, leaving behind salt deposits. *(1 M)*

3. List the important products of the Chlor-alkali process. Write one important use of each.

OR

How is washing soda prepared from sodium carbonate? Give its chemical equation. State the type of this salt. Name the type of hardness of water which can be removed by it? (*Re*) (CBSE, 2020)

Ans. The reaction involved in the Chlor-alkali process is:

$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$ *(½ M)*

The important products formed in this process are sodium hydroxide (NaOH), chlorine gas (Cl_2) and hydrogen gas (H_2). Chlorine gas is given off at the anode, and hydrogen gas at the cathode. Sodium hydroxide solution is formed near the cathode. *(1 M)*

Uses of the products:

(*i*) H_2: Used as fuels, for manufacturing ammonia for fertilizers. *(½ M)*

(*ii*) Cl_2: Used in the water treatment, for manufacturing PVC, in pesticides etc. *(½ M)*

(*iii*) NaOH: It is widely used in the preparation of soaps and detergents, in paper making or artificial fibres etc. *(½ M)*

OR

Washing soda is prepared by recrystallisation of sodium carbonate. *(½ M)*

The involved chemical reaction is

$Na_2CO_3 + 10H_2O \longrightarrow Na_2CO_3.10H_2O$ *(½ M)*

- Washing soda is a basic salt. Since it is made from strong base, NaOH and weak acid, H_2CO_3. *(1 M)*
- It is used for removing permanent hardness of water. *(1 M)*

4. Answer the following questions

(*a*) Why is it said that the dehydration of copper sulphate crystals is a reversible process?

(*b*) What will happen if a solution of sodium hydrogen carbonate is heated? Give the equation of the reaction involved. (*Ap*)

Ans. (*a*) The dehydration of copper sulphate crystals is a reversible process because blue coloured copper sulphate crystals become white on strongly heating due to loss of water of crystallisation. *(½ M)*

When water is added to the anhydrous salt, the blue colour reappears due to formation of hydrated copper sulphate. *(1 M)*

(*b*) Sodium hydrocarbonate on heating yields sodium carbonate and carbon dioxide gas. *(½ M)*

$$2NaHCO_3 \xrightarrow{\text{heat}} Na_2CO_3 + H_2O + CO_2\uparrow \quad \textit{(1 M)}$$

5. Answer the following questions:

(*a*) Write three uses of the compound of calcium that exists as a yellowish-white powder and is obtained by the action of chlorine on dry slaked lime.

(*b*) How is bleaching powder manufactured? Write the properties of Bleaching powder. (*Re*)

Ans. (*a*) The compound referred in the question is bleaching powder. Some of its uses are given below:

(*i*) It is used for bleaching purposes in textile industries, paper factories, and in the laundry. *(½ M)*

(*ii*) It is used as an oxidizing agent in chemical industries. *(½ M)*

(*iii*) It is used as a disinfectant in the process of water purification. *(½ M)*

(*b*) Bleaching powder is prepared by the action of chlorine gas (Cl_2) on dry slaked lime. *(½ M)*

$$\underset{\text{Slaked lime}}{Ca(OH)_2} + \underset{\text{Chlorine}}{Cl_2} \longrightarrow \underset{\text{Bleaching powder}}{CaOCl_2} + \underset{\text{Water}}{H_2O}$$

(½ M)

The properties of bleaching powder are: *(½ M)*

(*i*) It is a white-yellow coloured powder which gives the odour of chlorine.

(*ii*) It is soluble in water.

Long Answer Type Questions (5 M)

1. A few crystals of ferrous sulphate were taken in a dry boiling tube and heated. Tiny water droplets were observed in the tube after some time.

(*i*) From where did these water droplets appear? Explain.

(*ii*) What colour change will be observed during heating?

(*iii*) How many molecules of water are attached per molecule of $FeSO_4$ crystal? Write the molecular formula of crystalline forms of (I) Copper sulphate, and (II) Sodium carbonate.

(*iv*) State how is Plaster of Paris obtained from gypsum. Write two uses of Plaster of Paris. (*Un*) (CBSE 2024)

Ans. (*i*) When ferrous sulphate crystals are heated,the water droplets comes out of the crystals and appear as free water which can be seen in the test tube. *(½ M)*

$$FeSO_4.7H_2O + \text{Heat} \rightarrow FeSO_4 + 7H_2O \quad \textit{(½ M)}$$

(*ii*) During heating, green colour of $FeSO_4$ crystal will fade and the crystal will become white in colour. *(1 M)*

(*iii*) Seven molecules are attached to per molecule of $FeSO_4$ crystal. *(½ M)*

(I) $CuSO_4.5H_2O$ *(½ M)*

(II) $Na_2CO_3.10H_2O$ *(½ M)*

(*iv*) POP is obtained when gypsum at 373 K (100°C) is heated which when loses water molecules and becomes calcium sulphate hemihydrate ($CaSO_4.\ ½\ H_2O$). This is called Plaster of Paris. *(½ M)*

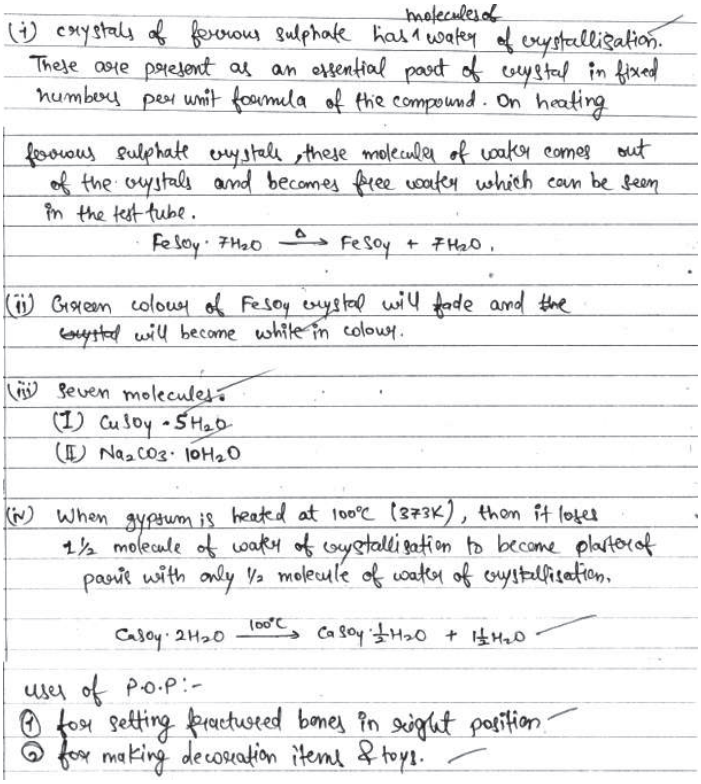
$$CaSO_4.2H_2O \xrightarrow{100°C} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$$

Uses of POP

1. It is used by doctors as plaster for supporting fractured bones in the right position. *(½ M)*

2. Used for making decoration items and toys. *(½ M)*

Topper's Explanation:


(i) crystals of ferrous sulphate has 7 molecules of water of crystallisation. These are present as an essential part of crystal in fixed numbers per unit formula of the compound. On heating ferrous sulphate crystals, these molecules of water comes out of the crystals and becomes free water which can be seen in the test tube.

$FeSO_4 \cdot 7H_2O \xrightarrow{\Delta} FeSO_4 + 7H_2O$.

(ii) Green colour of $FeSO_4$ crystal will fade and the crystal will become white in colour.

(iii) Seven molecules:
(I) $CuSO_4 \cdot 5H_2O$
(II) $Na_2CO_3 \cdot 10H_2O$

(iv) When gypsum is heated at 100°C (373K), then it loses 1½ molecule of water of crystallisation to become plaster of paris with only ½ molecule of water of crystallisation.

$CaSO_4 \cdot 2H_2O \xrightarrow{100°C} CaSO_4 \cdot \frac{1}{2}H_2O + 1\frac{1}{2}H_2O$

Uses of P.O.P:-
1. for setting fractured bones in right position
2. for making decoration items & toys.

Hints & Explanations

Multiple Choice Questions

1. (*d*) Sodium carbonate is a basic salt because it is formed by combination of strong base (NaOH) and weak acid (carbonic acid).

$$2NaOH + H_2CO_3 \longrightarrow Na_2CO_3 + 2H_2O$$

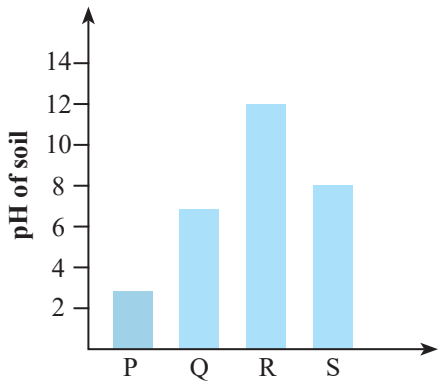
2. (*c*) $\underset{\text{(Acid)}}{H_2SO_4(aq)} + \underset{\text{(Base)}}{Mg(OH)_2(aq)} \longrightarrow \underset{\text{(Salt)}}{MgSO_4(aq)} + \underset{\text{(Water)}}{2H_2O}$

MISCELLANEOUS EXERCISE

Multiple Choice Questions (1 M)

1. Hydrangea plants develop blue or pink flowers depending on the availability of aluminium from the soil. When the soil is acidic, aluminium is more available to the roots, resulting in blue flowers. When the soil is alkaline, the availability of aluminium decreases, resulting in pink flowers.

The graph below is of the pH of the soil at different sections of a field.



In which section of the field will the flowers on ALL the hydrangea plants definitely be blue in colour and in which section will the flowers on ALL the hydrangea plants definitely be pink in colour? **(*An*) (CFPQ)**

Option	Blue flowers	Pink flowers
W	Section P and Q	Section R and S
X	Section R and S	Section P and Q
Y	Section P, Q and S	Section R
Z	Section P	Section R

(*a*) W (*b*) X
(*c*) Y (*d*) Z

2. Match List-I with List-II and select the correct answer by using the codes given below the list: **(*Re*)**

	List-I (Name of Acid)		List-II (Source)
A.	Lactic acid	(*i*)	Tamarind
B.	Oxalic acid	(*ii*)	Curd
C.	Acetic acid	(*iii*)	Tomato
D.	Tartaric acid	(*iv*)	Vinegar

	A	B	C	D
(*a*)	(*i*)	(*iv*)	(*ii*)	(*iii*)
(*b*)	(*ii*)	(*i*)	(*iv*)	(*iii*)
(*c*)	(*ii*)	(*i*)	(*iii*)	(*iv*)
(*d*)	(*ii*)	(*iii*)	(*iv*)	(*i*)

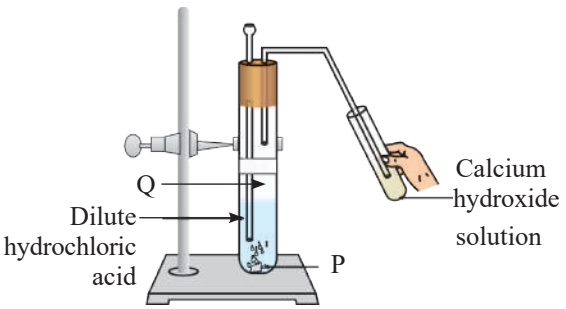
3. Which of the following gives the correct increasing order of acidic strength? **(*Re*) (NCERT Exemplar)**

(*a*) Water < Acetic acid < Hydrochloric acid
(*b*) Water < Hydrochloric acid < Acetic acid
(*c*) Acetic acid < Water < Hydrochloric acid
(*d*) Hydrochloric acid < Water < Acetic acid

4. Solid Calcium oxide reacts vigorously with water to form Calcium hydroxide accompanied by the liberation of heat. From the information given above it may be concluded that this reaction **(*Un*) (CBSE 2024)**

(*a*) is endothermic and pH of the solution formed is more than 7.
(*b*) is exothermic and pH of the solution formed is 7.
(*c*) is endothermic and pH of the solution formed is 7.
(*d*) is exothermic and pH of the solution formed is more than 7.

5. Study the experimental set up shown in given figure and choose the correct option from the following:
(*An*) (CBSE 2022-Term-1)



	P	Q	Change observed in calcium hydroxide solution
(*a*)	K_2CO_3	Cl_2 gas	No change
(*b*)	$KHCO_3$	CO_2 gas	No change
(*c*)	$KHCO_3$	H_2 gas	Turns milky
(*d*)	K_2CO_3	CO_2 gas	Turns milky

6. If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?
(*Un*) (NCERT Exemplar)

(*a*) Wash the hand with saline solution
(*b*) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate
(*c*) After washing with plenty of water, apply solution of sodium hydroxide on the hand
(*d*) Neutralise the acid with a strong alkali

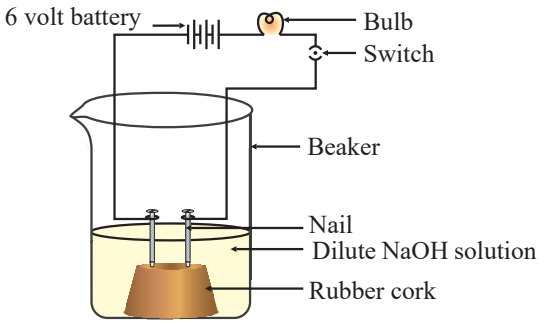
7. 10 mL of a solution of NaOH is found to be completely neutralised by 8 mL of a given solution of HCl. If we take 20 mL of the same solution of NaOH, the amount HCl solution (the same solution as before) required to neutralise it will be **(*Ap*) (NCERT Intext)**

(*a*) 4 mL (*b*) 8 mL

(*c*) 12 mL (*d*) 16 mL

8. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus was set up.

(*Ap*) (NCERT Exemplar)



Which among the following statement(s) is/are correct?

(*i*) Bulb will not glow because electrolyte is not acidic.

(*ii*) Bulb will glow because NaOH is a strong base and furnishes ions for conduction.

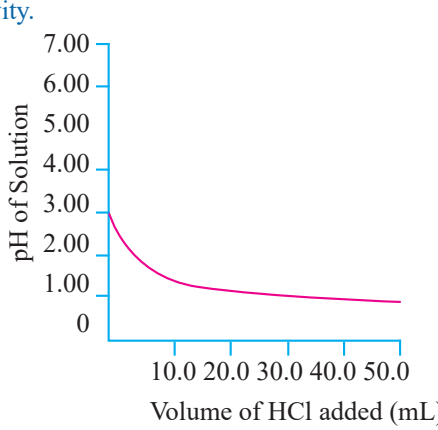
(*iii*) Bulb will not glow because circuit is incomplete.

(*iv*) Bulb will not glow because it depends upon the type of electrolytic solution.

(*a*) (*i*) and (*iii*) (*b*) (*ii*) and (*iv*)

(*c*) (*ii*) only (*d*) (*iv*) only

9. 50.0 mL of tap water was taken in a beaker. Hydrochloric acid was added drop by drop to water. The temperature and pH of the solution was noted. The following graph was obtained. Choose the correct statements related to this activity. **(*An*)**



(***i***) The process of dissolving an acid in water is highly endothermic.

(***ii***) The pH of the solution increases rapidly on addition of acid.

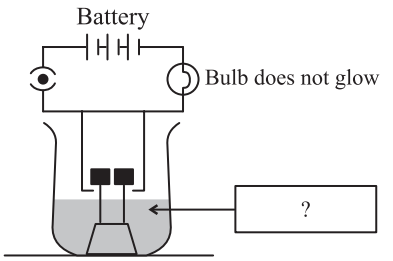
(***iii***) The pH of the solution decreases rapidly on addition of acid.

(***iv***) The pH of tap water was around 7.0.

(*a*) (*i*) and (*ii*) (*b*) (*i*) and (*iii*)

(*c*) (*iii*) and (*iv*) (*d*) (*ii*) and (*iv*)

10.



The solution in the given figure is likely to be

(*An*) (CBSE SQP, 2024)

(*a*) HNO_3 (*b*) C_2H_5OH

(*c*) H_2SO_4 (*d*) CO_2 in water

11. The yellow colour of turmeric changes to red on addition of soap solution. When substance P is added to turmeric, there is no change in colour. **(*Ap*)**

Which of the following is definitely true about substance P?

(*a*) P is an acid. (*b*) P is not a salt.

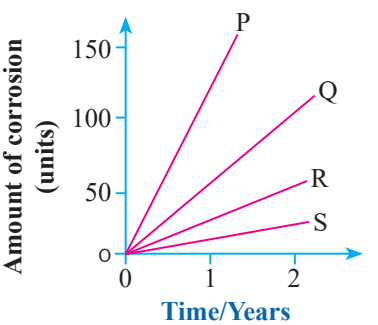
(*c*) P is not a base. (*d*) P is a neutral substance.

12. The presence of acidic gases in the air increases the rate of corrosion. Furthermore, an increase in temperature can also increase the rate of corrosion.

The graph below is created under 4 different conditions (shown below in the table) of temperature and acidic nature of air.

Condition	Temperature (in °C)	pH value
1	20	6
2	30	6
3	30	7
4	20	7

Which of the graphs represents condition 2? **(*An*) (CFPQ)**



(*a*) P (*b*) Q

(*c*) R (*d*) S

13. Sulphur powder is heated on a spatula. A piece of both, moist blue and red litmus papers are brought one by one near the gas evolved during heating. The action of gas on the moist litmus papers will be: **(*Re*)**

(*a*) No change in colour in both the litmus papers.

(*b*) Blue litmus paper becomes red.

(*c*) Red litmus paper becomes blue.

(*d*) Blue litmus paper turns black.

14. Two salts 'X' and 'Y' are dissolved in water separately. When phenolphthalein is added to these two solutions, the solution 'X' turns pink and the solution 'Y' does not show any change in colour, therefore 'X' and 'Y' are **(*Ap*)**

	(X)	(Y)
(*a*)	Na_2CO_3	NH_4Cl
(*b*)	Na_2SO_4	$NaHCO_3$
(*c*)	NH_4Cl	Na_2SO_4
(*d*)	$NaNO_3$	Na_2SO_4

15. Sheetal has two test tubes, one containing dilute hydrochloric acid and the other dilute sulphuric acid but they are not labelled. Adding which of the following to the test tubes will help her to find out which test tube contains hydrochloric acid and which contains sulphuric acid? **(*An*) (CFPQ)**

(*a*) Blue litmus paper (*b*) Zinc metal strips

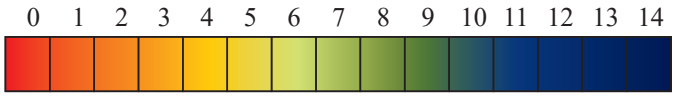
(*c*) Sodium carbonate (*d*) Barium carbonate

16. An unknown solution in a test tube was given to a student, when universal indicator solution is added to test tube, it turned out violet. The unknown solution is: **(*Un*)**

(*a*) Vinegar solution (*b*) Iodine solution

(*c*) Caustic Soda solution (*d*) Baking soda solution

17. Equal volumes of hydrochloric acid and sodium hydroxide solutions of same concentration are mixed and the pH of the resulting solution is checked with a pH paper. What would be the colour obtained? **(*Ap*)**



(*a*) Red (*b*) Yellow

(*c*) Yellowish green (*d*) Blue

18. Sonia has aqueous solutions of three salts, sodium acetate, sodium chloride and ammonium chloride in three test tubes. The test tubes are not labeled. On checking, she finds the pH of the solutions to be 4.6, 7.0 and 8.9.

Which of the following correctly matches the salts with their respective pH? **(*An*) (CBSE APQ, 2023)**

	pH 4.6	pH 7.0	pH 8.9
A	sodium acetate	sodium chloride	ammonium chloride
B	sodium chloride	ammonium chloride	sodium acetate
C	ammonium chloride	sodium acetate	sodium chloride
D	ammonium chloride	sodium chloride	sodium acetate

(*a*) A (*b*) B

(*c*) C (*d*) D

19. A man is using excess quantities of chemical fertilizers in fields for a number of years. The crop productivity gradually began to decrease inspite of using chemical fertilizers. Which of the following are correct statements? **(*Un*)**

1. The soil has become more acidic in nature
2. The soil has become more alkaline in nature
3. The productivity of crop is enhanced by adding slaked lime to the soil.
4. The productivity of crop is enhanced by adding some organic matter.
5. The productivity of crop can be enhanced by adding NaCl.

(*a*) 1 and 5 (*b*) 1 and 3

(*c*) 2 and 5 (*d*) 2 and 4

20. Payal has to arrange the following in DECREASING order of hydroxide ion concentration. Wine (pH 4.0), milk of magnesia (pH 10.5), blood (pH 7.4) **(*An*)**

Which of the following arrangements is correct?

(*a*) wine → milk of magnesia → blood

(*b*) blood → milk of magnesia → wine

(*c*) milk of magnesia → blood → wine

(*d*) wine → blood → milk of magnesia

21. You are provided with aqueous solutions of three salts- A, B and C, 2-3 drops of blue litmus solution, red litmus solution and phenolphthalein were added to each of these solution in separate experiments. The change in colours of different indicators were recorded in the following table. **(*An*)**

Sample	With blue Litmus Solution	With red Litmus Solution	With Phenolphthalein Solution
A	No change	No change	No change
B	Turns red	No change	No change
C	No change	Turns blue	Turns pink

On the basis of above observations, identify A, B and C from the following options:

(*a*) A = NH_4Cl, B = NaCl, C = CH_3COONa

(*b*) A = NH_4Cl, B = CH_3COONa, C = NaCl

(*c*) A = NaCl, B = NH_4Cl, C = CH_3COONa

(*d*) A = CH_3COONa, B = NH_4Cl, C = NaCl

22. When four dilute solutions of (I) HCl, (II) common salt, (III) caustic soda and (IV) milk of magnesia are tested with universal indicator, then which of the following is the correct observation? **(*Ap*)**

(*a*) I-Green, II-violet, III-Blue, IV-Red

(*b*) I-Green, II-Blue, III-Violet, IV-Red

(*c*) I-Red, II-Green, III-Violet, IV-Blue

(*d*) I-Red, II-Violet, III-Green, IV-Blue

23. Consider the following compounds:

$FeSO_4$; $CuSO_4$; $CaSO_4$; Na_2CO_3

The compound having maximum number of water of crystallisation in its crystalline form in one molecule is:

(*Un*) (CBSE 2024)

(*a*) $FeSO_4$ (*b*) $CuSO_4$

(*c*) $CaSO_4$ (*d*) Na_2CO_3

24. A researcher is studying a compound 'X' which is a by-product in the production of bleaching powder and is neutral in nature.

$Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + X$

'X' is also formed when an acid reacts with a specific substance.The researcher is interested in identifying the type of substance that, when reacted with an acid, produces compound 'X.'

Which of the following substances, when reacted with an acid, will produce compound 'X'? **(*An*)**

(A) Metal (B) Non-metal

(C) Base (D) Metallic oxide

(E) Non-metallic oxide

(F) Metal carbonate or metal hydrogen carbonate

(*a*) (A), (C), (D) and (E) (*b*) (B), (D) and (E)

(*c*) (C), (D) and (F) (*d*) (B), (D), (E) and (F)

25. 'Z' is a substance that is water soluble and its aqueous solution turns red litmus to blue and release H_2 gas on reaction with zinc metal. It is prepared by electrolysis of NaCl (aq). What is Z? **(*Ap*)**

(*a*) $NaNO_3$ (*b*) $NaClO_3$

(*c*) NaOH (*d*) NH_4OH

26. In one of the industrial processes used for manufacture of NaOH, a gas A is formed as by-product. The gas A reacts with lime water to give a compound B which is used as a bleaching agent in chemical industry. The compounds A and B could be **(*Ap*)**

(*a*) H_2 and $NaHCO_3$ respectively

(*b*) H_2 and Na_2CO_3 respectively

(*c*) Cl_2 and $CaOCl_2$ respectively

(*d*) Cl_2 and $NaHCO_3$ respectively

27. Adding which of the following to a colourless solution would give an indication that the solution could possibly be hydrochloric acid? **(*Ap*)**

(*a*) Copper metal strips (*b*) Silver metal strips

(*c*) Calcium carbonate (*d*) Sodium chloride

28. An acid (X) with sodium hydrogen carbonate is used in making the cakes fluffy and spongy. It is due to the release of (Y) gas in the reaction. Here, X and Y are **(*Un*)**

(*a*) (X) : Oxalic acid and (Y) : CO_2

(*b*) (X) : Tartaric acid and (Y) : O_2

(*c*) (X) : Citric acid and (Y) : H_2

(*d*) (X) : Tartaric acid and (Y) : CO_2

29. When sodium chloride (NaCl) is mixed with water and carbon-dioxide and ammonia, two products A and B are produced. On heating A, sodium carbonate is obtained as product. And when sodium carbonate reacts with sufficient water, product C is formed. What are A, B and C? **(*Ap*)**

(*a*) A = NaOH, B = H_2O and C is washing soda

(*b*) A = Na_2CO_3, B = NH_4Cl and C = Baking soda

(*c*) A = NH_4Cl, B = $NaHCO_3$ and C = Washing soda

(*d*) A = $NaHCO_3$, B = NH_4Cl and C = $Na_2CO_3.10H_2O$

30. The correct order of increasing pH values of the aqueous solutions of baking soda, rock salt, washing soda and slaked lime is **(*An*)**

(*a*) Baking soda < Rock salt < Washing soda < Slaked lime

(*b*) Rock salt < Baking soda < Washing soda < Slaked lime

(*c*) Slaked lime < Washing soda < Rock salt < Baking soda

(*d*) Washing soda < Baking soda < Rock salt < Slaked lime

Assertion and Reason (1 M)

Direction: The following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions by selecting the appropriate option given below:

(*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.

1. **Assertion (A):** H_2CO_3 is a strong acid.

Reason (R): Acids give H^+ ions in presence of water. **(*Un*)**

2. **Assertion (A):** Ammonia (NH_3) solution is an alkali.

Reason (R): Ammonia solution turns blue litmus paper red. **(*Re*)**

3. **Assertion (A):** Carbonic acids (H_2CO_3) is found in almost all soft drinks.

Reason (R): Carbonic acid is an organic acid. **(*Re*)**

4. **Assertion (A):** CH_3COOH is used as vinegar in cooking and food preservatives.

Reason (R): Strong acids ionise almost completely in aqueous solution and hence produce a large amount of H^+ ions.**(*Un*)**

5. **Assertion (A):** In basic solutions, phenolphthalein gives pink colour.

Reason (R): Phenolphthalein is a natural indicator. **(*Re*)**

6. **Assertion (A):** Higher the hydrogen ion concentration, lower is the pH value.

Reason (R): For acidic solution, pH > 7. **(*Un*)**

7. **Assertion (A):** Pure water is neutral.

Reason (R): The pH of a solution is directly proportional to the concentration of hydrogen ions present in it. **(*Re*)**

8. **Assertion (A):** Salts are the products of an acid-base reaction.

Reason (R): Salt may be acidic or basic. **(*Un*)**

9. **Assertion (A):** Tooth decay starts when the pH of the mouth is lower than 5.5.
Reason (R): Tooth enamel is made up of calcium hydroxyapatite and is the softest substance in the body. ***(Re)***

10. **Assertion (A):** $CaOCl_2$ is the chemical formula of bleaching powder.
Reason (R): Calcium oxide reacts with chlorine to form bleaching powder. ***(Re)***

Subjective Questions

Very Short Answer Type Questions (2 M)

1. Name the acid present in
(*a*) Honeybee sting
(*b*) Hair of nettle leaves ***(Re)***

2. Ramesh has four conical flasks containing dilute nitric acid (HNO_3), dilute hydrochloric acid (HCl), dilute sulphuric acid (H_2SO_4) and dilute sodium hydroxide (NaOH) respectively. The beakers are not labelled, and he does not have any pH indicator.
By making mixtures of pairs of the substances, which solution will Ramesh be able to identify and what observation will help him to make this identification? ***(Un)***

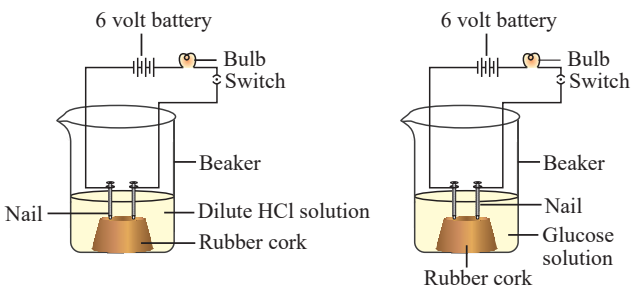
3. Why do acids not show acidic behaviour in the absence of water? ***(Un)*** **(NCERT)**

4. Dry ammonia gas has no action on litmus paper, but a solution of ammonia in water turns red litmus paper blue. Why is it so? ***(An)***

5. Name the type of reaction where salt and water are obtained as products. Give an example of basic salt. ***(Un)***

6. While performing an experiment in his laboratory, Ajay by mistake dropped a little copper oxide into hydrochloric acid solution. He observed some changes in the solution. Account for his observation. ***(Ap)***

7. In which of the given cases will the bulb glow? ***(An)***



8. Answer the following questions
(*a*) If the pH of a vegetable soup is 6.5, how is the taste of the soup likely to be?
(*b*) What effect does an increase in concentration of H^+ (aq.) in a solution have on the pH of solution? ***(Re)***

9. Among KOH, NaCl, and H_2SO_4, which compound has the highest pH value? ***(Ap)***

10. A knife which is used to cut a fruit was immediately dipped into water containing drops of blue litmus solution. If the colour of the solution is changed to red, what inference can be drawn about the nature of the fruit and why? ***(Un)*** **(CBSE 2023)**

11. Write balanced chemical equation for the reaction that occurs when:
(*i*) blue coloured copper sulphate crystals are heated and
(*ii*) Sodium hydrogen carbonate is heated during cooking. ***(Re)*** **(CBSE 2023)**

12. The industrial process used for the manufacture of caustic soda involves electrolysis of an aqueous solution of compound 'X'. In this process, two gases 'Y' and 'Z' are liberated. 'Y' is liberated at cathode and 'Z', which is liberated at anode, on treatment with dry slaked lime forms a compound 'B'. Name X, Y, Z and B. ***(Un)*** **(CBSE 2023)**

13. Salts are formed by the neutralisation reaction between an acid and a base. Complete the following table by filling the missing data: ***(Un)*** **(CBSE APQ, 2023)**

S. No.	Name of the Salt	Formula	Parent Base	Parent Acid
1	Ammonium Chloride	NH_4Cl	.....	.....
2	Copper Sulphate	.....	$Cu(OH)_2$	.....

Short Answer Type Questions (3 M)

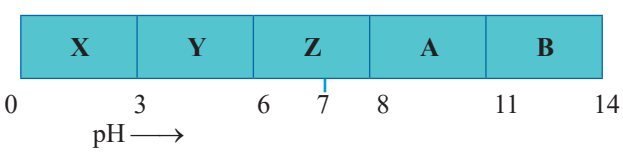
1. Blue litmus solution is added to two test tubes A and B containing dilute HCl and NaOH solution respectively. In which test tube a colour change will be observed? State the colour change and give its reason. ***(Un)*** **(CBSE 2019)**

2. You are given three test tubes. The three test tubes contain distilled water, acidic solution and the basic solution respectively. There is only red litmus paper available in order to identify what is there in each test tube. How will you find out what is in each of the test tubes? ***(Ap)*** **(NCERT Intext)**

3. What is observed when 2 mL of dilute hydrochloric acid is added to 1 g of sodium carbonate taken in a clean and dry test tube? Write chemical equation for the reaction involved. ***(Un)*** **(CBSE 2019)**

4. A substance 'X' is used as a building material and is insoluble in water. When it reacts with dil. HCl, it produces a gas which turns lime water milky.
(*a*) Write the chemical name and formula of 'X'.
(*b*) Write chemical equations for the chemical reactions involved in the above statements. ***(Un)*** **(CBSE 2023)**

5. 20 mL of water and 15 mL of sulphuric acid are to be mixed in a beaker. ***(Re)***
(*a*) State the method that should be followed with reason.
(*b*) What is this process known as?

6. 

In which region will the given substances be present? ***(Ap)***
(*i*) Coffee
(*ii*) Blood
(*iii*) Milk of magnesia

Case Based Questions

Case Based-I:

1. $\boxed{A} + H_2O \xrightarrow{\text{ELECTROLYSIS}} \underset{\text{CAUSTIC SODA}}{\boxed{X}} + \underset{\text{ANODE}}{\boxed{Y\uparrow}} + \underset{\text{CATHODE}}{\boxed{Z\uparrow}}$

2. $\underset{\text{MOLTEN}}{\boxed{A}} \xrightarrow{\text{ELECTROLYSIS}} \underset{\text{CATHODE}}{\boxed{M}} + \underset{\text{ANODE}}{\boxed{Y\uparrow}}$

3. $\boxed{M} + CH_3COOH \longrightarrow \boxed{P} + \boxed{Z\uparrow}$

4. $CH_3COOH + \boxed{Q} \xrightarrow[H_2SO_4]{\text{Conc.}} \boxed{R}$

5. $\boxed{R} + \boxed{X} \longrightarrow \boxed{P} + \boxed{Q}$ **(*Ap*) (CBSE SQP, 2024)**

(*i*) Derive the names of A, Y, Z, M, P & R *(3 M)*

Attempt either subpart (ii) or (iii).

(*ii*) Improvise an activity to test Z. *(1 M)*

OR

Name the process in which compounds X, Y & Z are formed from (A). Justify your response. *(1 M)*

Case Based-II: Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them. **(*Un*) (CBSE 2024)**

(*i*) Identify the acid and base from which Sodium chloride is formed. *(1 M)*

(*ii*) Find the cation and the anion present in Calcium sulphate. *(1 M)*

(*iii*) "Sodium chloride and washing soda both belong to the same family of salts." Justify this statement. *(2 M)*

OR

Define the term pH scale. Name the salt obtained by the reaction of Potassium hydroxide and Sulphuric acid and give the pH value of its aqueous solution. *(2 M)*

Case Based-III: A chemist named John is studying the reactions of a substance 'X' with various chemicals. 'X' is a commonly used compound in laboratories and industries, often utilized for cleaning metals and known for producing chloride ions in solution. Here are the observations:

1. When 'X' reacts with a metal 'Y', a gas 'A' is produced which burns with a pop sound.
2. When 'X' reacts with 'Z', a different gas 'B' is produced.
3. The gas 'B' reacts with water in the presence of sunlight to form a substance 'W' and another gas 'C' and water.
4. The substance 'W' contains hydrogen atoms but is not categorized as an acid.
5. The gas 'A' is known to be used in the reduction of a metal oxide 'V'.
6. When 'V' reacts with 'X', the resulting solution turns blue-green. **(*An*)**

Based on these observations, answer the following questions:

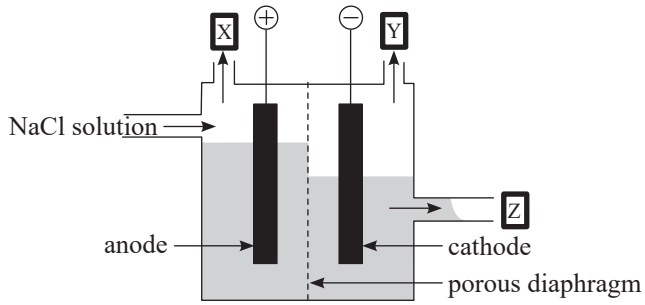
(*i*) Identify 'X' and 'W'. *2 M)*

(*ii*) Out of 'V' and 'B', which one is non-metallic oxide? Also, identify gas 'A'. *(2 M)*

OR

What is the effect of the blue litmus solution on the compound formed by the reaction of V and X? *(2 M)*

Case Based-IV: In the diagram given below when electricity is passed through an aqueous solution of a common salt, A substance 'Z' is produced along with the evolution of gases 'X' and 'Y'. When a burning matchstick is brought near the gas 'Y' it burns with a pop sound, whereas X is used for disinfecting drinking water. When gas 'X' is passed through a solution of slaked lime, an insoluble substance 'A' is produced. **(*Ap*) (CBSE APQ, 2023)**



(*i*) Write the name of gases 'X' and 'Y'. *(1 M)*

(*ii*) Write the balanced chemical equation for the formation of substance 'A'. *(1 M)*

(*iii*) Write your observations: *(2 M)*

(*i*) If a drop of blue litmus solution is added to the aqueous solution of substance 'Z'

(*ii*) If methyl orange is added to substance 'Z'

OR

Write a balanced chemical reaction that takes place when 'X' and 'Y' react with each other. The product so produced will turn blue litmus red only when wet, why? *(2 M)*

ANSWER KEYS

Multiple Choice Questions

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

Assertion and Reason

1. (*d*)	**2.** (*c*)	**3.** (*c*)	**4.** (*b*)	**5.** (*c*)	**6.** (*c*)	**7.** (*c*)	**8.** (*b*)	**9.** (*c*)	**10.** (*c*)

HINTS & EXPLANATIONS

Multiple Choice Questions

1. (*d*) Blue flowers will definitely be in Section P (low pH, acidic soil). Pink flowers will definitely be in Section R (high pH, alkaline soil).

2. (*d*) Lactic Acid - Curd
Oxalic acid - Tomato
Acetic Acid - Vinegar
Tartaric Acid - Tamarind

3. (*a*) HCl ionises completely in water to give H^+ ions, hence it is a strong acid. CH_3COOH partially ionises in water, hence it is a weak acid. The pH value of water is 7. Hence, the increasing order of acidic strength is :

Water < Acetic acid < Hydrochloric acid

4. (*d*) Since, the product formed in the given reaction is calcium hydroxide, $Ca(OH)_2$, which is the base and the reaction is accompanied by the liberation of heat, therefore, the reaction is exothermic and the pH of the solution formed is more than 7.

5. (*d*) On observing the experimental setup given in the above figure, the best suitable option is given in (*d*).

If P is potassium carbonate and when it is treated with dil HCl solution, it reacts vigorously producing carbon dioxide gas that is Q. The released CO_2 gas turns lime water ($Ca(OH)_2$) milky due to the formation of calcium carbonate. The complete observed reactions are given as,

$$\underset{\text{Potassium carbonate}}{K_2CO_3(s)} + 2HCl(l) \rightarrow \underset{\text{Carbon dioxide}}{H_2O(l) + CO_2(g)\uparrow} + \underset{\text{Potassium chloride}}{2KCl(aq)}$$

$$\underset{\substack{\text{Calcium hydroxide}\\\text{(Lime water)}}}{Ca(OH)_2(aq)} + \underset{\substack{\text{Carbon}\\\text{dioxide}}}{CO_2(g)} \rightarrow \underset{\substack{\text{Calcium carbonate}\\\text{(White ppt)}\\\text{(Makes limewater}\\\text{milky)}}}{CaCO_3(s)} + \underset{\text{Water}}{H_2O(l)}$$

6. (*b*) Sodium hydrogen carbonate is a mild non-corrosive base and can be used to neutralise the acid.

7. (*d*) 10 mL of NaOH requires 8 mL of HCl solution to neutralise

20 mL of NaOH requires = (8 × 20/10) = 16mL of HCl

8. (*c*) NaOH is a strong electrolyte and it ionises in water to produce ions (Na^+ and OH^-), hence the solution will conduct electricity and the bulb will glow.

9. (*c*) The process of dissolving an acid in water is exothermic in nature.

The pH of tap water is around 7.0 i.e., neutral and on addition of HCl to the beaker containing tap water, the pH of the solution decreases.

10. (*b*) C_2H_5OH

11. (*c*) When substance P is added to turmeric, there is no change in colour, this implies, that, P can be an acid or a neutral substance, but definitely not a base.

12. (*a*) Corrosion increases with:

1. Lower pH (more acidic).

2. Higher Temperature (30°C > 20°C).

Since condition 2 involves higher temperature and acidic air (pH 6), it is expected to have a higher rate of corrosion compared to conditions with less acidic air or lower temperature.

- Condition 2 corresponds to graph P, as it represents significant corrosion due to high temperature (30°C) and acidic air (pH 6),

13. (*b*) When the sulphur powder is heated on a spatula, the gas evolved is sulphur dioxide (SO_2). Since SO2 is an oxide of non-metal so, it will be acidic in nature and turns blue litmus paper to red.

14. (*a*) Phenolphthalein is an indicator that turns pink in basic solutions, and remains colourless in neutral and acidic solutions. Based on this information, Salt 'X' must be basic and Salt 'Y' can be either neutral or acidic.

In the given choices,Na_2CO_3 (Sodium Carbonate) is basic, and NH_4Cl (Ammonium Chloride) is acidic.

15. (*d*) Barium carbonate reacts differently with dilute hydrochloric acid (HCl) and dilute sulphuric acid (H_2SO_4) because of the solubility of the resulting salts. The formation of a white precipitate when using barium carbonate indicates the presence of sulphuric acid, as barium sulphate is insoluble. In contrast, no precipitate forms with hydrochloric acid due to the solubility of barium chloride.

MOCK TEST PAPER-2

Time allowed : 3 hours **Maximum Marks : 80**

GENERAL INSTRUCTIONS:

*(i) This question paper consists of **39** questions. **All** questions are compulsory.*

*(ii) Question paper is divided into **FIVE** sections viz. Section **A, B, C, D** and **E**.*

(iii) There is no overall choice. However, an internal choice has been provided in some Sections.

SECTION - A

Select and write the most appropriate option out of the four options given for each of the questions 1 - 20. There is no negative mark for the incorrect response.

1. Riya was a chemist working in a water treatment plant. Her supervisor asks her to prepare a batch of bleaching powder for disinfecting the water supply. Which of the following chemicals would she choose as the primary ingredient for making the bleaching powder? **1**

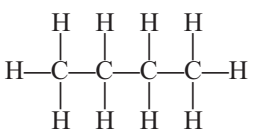
(*a*) Calcium carbonate (*b*) Calcium hydroxide

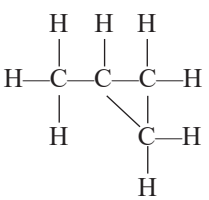
(*c*) Calcium chloride (*d*) Calcium hypochlorite

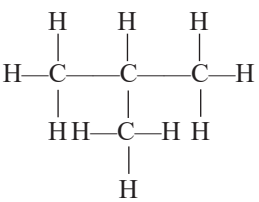
2. Which of the following metal does **NOT** corrode easily and does not require any special treatment for prevention? **1**

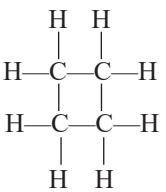
(*a*) Iron (*b*) Copper (*c*) Aluminum (*d*) Gold

3. Which of the following are correct structural isomers of butane? **1**

(*i*) 

(*ii*) 

(*iii*) 

(*iv*) 

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

4. Which of the following reactions is a redox reaction? **1**

(*a*) $2Mg + O_2 \rightarrow 2MgO$ (*b*) $NaOH + HCl \rightarrow NaCl + H_2O$

(*c*) $CaCO_3 \rightarrow CaO + CO_2$ (*d*) None of the above

5. While camping, you discover a plant with yellow roots. Testing its juice with lemon (acid) and soap (base), any color change could suggest it's a natural acid-base indicator. Which indicator might it resemble? **1**

(*a*) Methyl orange (*b*) Phenolphthalein

(*c*) Turmeric (*d*) Universal indicator

6. When ammonia (NH_3) reacts with oxygen (O_2) to produce nitrogen monoxide (NO) and water (H_2O), the balanced chemical equation is: **1**

(*a*) $4NH_3 + \frac{3}{2}O_2 \rightarrow 4NO + 6H_2O$ (*b*) $2NH_3 + \frac{5}{2}O_2 \rightarrow 2NO + 3H_2O$

(*c*) $NH_3 + O_2 \rightarrow NO + H_2O$ (*d*) $3NH_3 + 4O_2 \rightarrow 3NO + 6H_2O$

7. Which of the following metals can be extracted by the electrolytic reduction process? **1**

(*a*) Copper (*b*) Zinc (*c*) Aluminum (*d*) Iron

8. Rahul is learning about the human excretory system in his biology class. He is curious about how urine travels through the body after it is formed. Can you help Rahul identify the correct path of urine? **1**

(*a*) Kidney → urinary bladder → urethra → ureter (*b*) Urinary bladder → ureter → kidney → urethra

(*c*) Kidney → ureter → urethra → urinary bladder (*d*) Kidney → ureter → urinary bladder → urethra

9. Consider the following statements regarding genetic traits:

1. Dominant traits are only expressed in heterozygous individuals.
2. Recessive traits can reappear in subsequent generations.
3. Traits are inherited through alleles.
4. All offspring have identical traits as their parents.

Which of the above statements is/are correct?

(*a*) 1 and 2 (*b*) 2 and 3 (*c*) 1 and 3 (*d*) 1 and 4

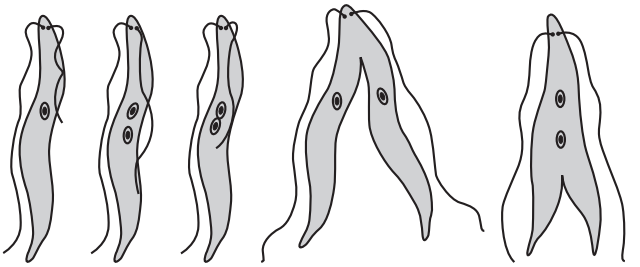
10. Which of the following plants can be developed by leaf propagation? **1**

(*i*) Potato (*ii*) Mint (*iii*) *Bryophyllum* (*iv*) Rose

The correct plants for leaf propagation is/are:

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

11. Choose the correct order of the stage of binary fission in *Leishmania*. **1**



(I) (II) (III) (IV) (V)

(*a*) I, II, III, IV, V (*b*) I, III, II, V, IV (*c*) I, III, V, II, IV (*d*) I, II, III, V, IV

12. What is heredity? **1**

(*a*) Transmission of physical characters from one generation to the next.

(*b*) Transmission of sexual and morphological characters from one generation to the next.

(*c*) Transmission of anatomical characters from one generation to the next.

(*d*) Transmission of genetic characters from parents to offspring or one generation to the next.

13. What type of lens is used to correct astigmatism in the eye? **1**

(*a*) Concave lens (*b*) Convex lens (*c*) Biconcave lens (*d*) Cylindrical lens

14. In the context of the human eye, what is the term for the black opening that exists between the clear fluid (aqueous humor) and the lens? **1**

(*a*) Ciliary muscles (*b*) Iris (*c*) Cornea (*d*) Pupil

15. As the cricket match progresses, some players begin to experience muscle cramps. The coach gathers the team to discuss the possible causes. What is the likely reason for these cramps? **1**

(*a*) The conversion of pyruvate to ethanol (*b*) The conversion of pyruvate to glucose

(*c*) The conversion of glucose to pyruvate (*d*) The conversion of pyruvate to lactic acid

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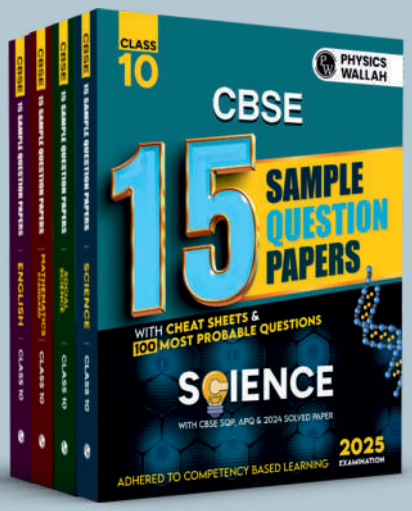

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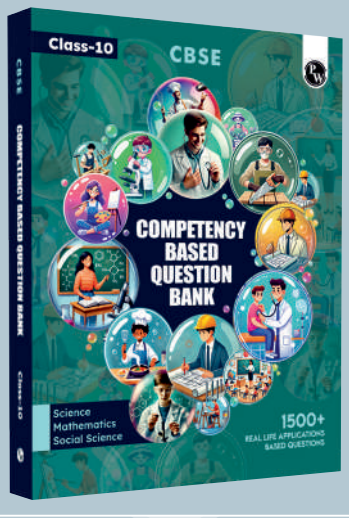

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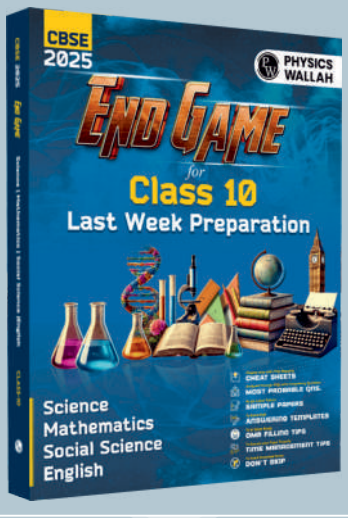

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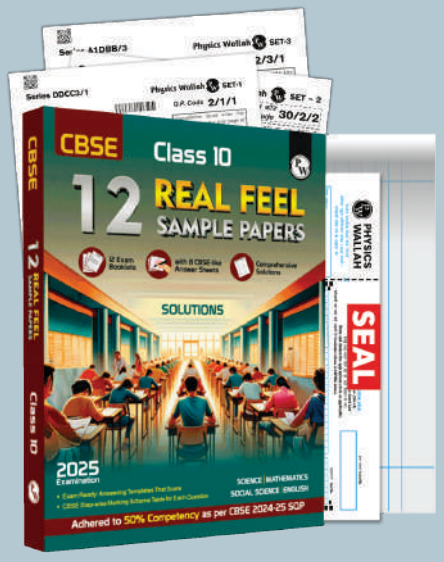

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