Written as per the revised syllabus prescribed by the Maharashtra State Board of Secondary and Higher Secondary Education, Pune.

STD. XI Sci.
Precise Chemistry

Salient Features

- Concise coverage of syllabus in Question Answer Format.
- Covers answers to all Textual Questions and Intext Questions.
- Includes Solved and Practice Numericals.
- Quick Review for instant revision and summary of the chapter.
- Exercise, Multiple Choice Questions and Topic test at the end of each chapter for effective preparation.

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Preface

In the case of good books, the point is not how many of them you can get through, but rather how many can get through to you.

"Std. XI Sci. : PRECISE CHEMISTRY" is a compact yet complete guide designed to boost students' confidence and prepare them to face the conspicuous Std. XI final exam.
This book is specifically aimed at Maharashtra Board students. The content of the book is framed in accordance with Maharashtra State board syllabus and collates each and every important concept in question and answer format.
This book has been developed on certain key features as detailed below:

- **Question and Answer** format of the book provides students with appropriate answers for all textual and intext questions. We've also included few additional questions to ensure complete exam preparation.
- **Solved Examples** provide step-wise solution to various numerical problems. This helps students to understand the application of different concepts and formulae.
- **Notes** cover additional bits of relevant information on each topic.
- **Quick Review** and **Formulae** sections facilitate instant revision.
- **Exercise** helps the students to gain insight on the various levels of theory and numercial-based questions.
- **Multiple Choice Questions** and **Topic Test** assess the students on their range of preparation and the amount of knowledge of each topic.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on : mail@targetpublications.org

A book affects eternity; one can never tell where its influence stops.

Best of luck to all the aspirants!

Yours faithfully,
Publisher

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Note: All the Textual questions are represented by * mark
All the Intext questions are represented by # mark

01 Some Basic Concepts of Chemistry

Syllabus

1.1 Introduction

Q.1. Define chemistry.

Ans: ***Chemistry*** *is defined as the study of the composition, structure and properties of matter and the reactions by which one form of matter may be converted into another form.*

Q.2. Give reason : Chemistry is called as a central science.

Ans: i. Chemistry is an active evolving science and is of vital importance to the entire world. Although the subject has very ancient roots, it is a modern science.

ii. The basic knowledge of chemistry is essential for development of subjects like physics, biology, geology, engineering, environmental science and many others.

Therefore, it is called as a central science.

1.2 Importance and scope of chemistry

Q.3. Explain the importance and scope of chemistry.

Ans: Chemistry has a wide scope and importance in various fields.

i. Processes based on chemical technology help to extract, purify, synthesize and analyse materials like iron, steel, aluminium, zinc, alloys like brass, amalgams as well as precious metals like silver, gold, platinum.

ii. All drugs are synthesized in chemical / pharmaceutical laboratories.
eg. Cisplatin and taxol: Life saving drugs to give relief to cancer patients.

iii. Photosynthesis is the process through which trees and plants prepare their food using chlorophyll (green pigment) in presence of sunlight.

$$CO_2 + H_2O \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{food grains/fruits/flowers/cotton/medicine etc.}$$

iv. Fossil fuels like coal, petroleum, natural gas, etc. are combustible chemicals which are used to produce energy which is used to drive trains, trucks, buses and all automobiles. The energy is also used to generate electricity.

v. Several electrochemical cells like Daniel cell, lead storage cell, dry cell, fuel cell, etc., are used as a source of energy. These cells are less polluting and more efficient.

vi. With the help of chemistry it is easy to design and generate large number of materials like polymers, plastic, liquid crystals, adhesives, etc.

vii. Microprocessors used in computers are silicon chips formulated and developed by chemists.

#Q.4. Give five applications of subject chemistry which are not mentioned in the book.

Ans: **i. Warfare:** With the knowledge of chemistry, various destructive gases and bombs have been invented which are used during wars.

ii. Cosmetics: Chemistry has helped to produce good quality cosmetics.

iii. Health: Chemistry plays an important role in maintaining one's good health by providing knowledge about proper intake of proteins, carbohydrates, fats, minerals, vitamins, etc.

iv. Education: Chemistry provides inter-relationship to study the para-chemistry subjects such as Bio-chemistry, Pharmacy, Herbal Science, Toxicology, Archaeology, Environmental Science, etc.

v. Others: In recent years, chemistry has given us new materials such as super–conducting ceramics, conducting polymers, optical fibres, micro alloys, carbon fibres, etc., which are used for various purposes.

1.3 Historical approach to particulate nature of matter

Q.5. Define matter.

Ans: ***Matter*** *is anything which has mass and occupies space.*

Q.6. Explain the classification of matter on the basis of its chemical composition.

Ans: Matter on the basis of chemical composition can be classified as follows:

i. Pure substances: *Substances which always have a fixed composition are called* ***pure substances.***
They are of two types:

a. Elements: Elements are the pure substances which are made up of only one component.
eg. Gold, silver, copper, mercury, bromine, oxygen, etc.

b. Compounds: Compounds are the pure substances which are made up of two or more components.
eg. Water, ammonia, methane, etc.

ii. Mixtures: ***A mixture*** *is a simple combination of two or more substances in which the constituent substances retain their separate identities.*Mixtures do not have a fixed composition.
eg. Mixture of ethyl alcohol and water, salt in water, mixture of gases, etc.
Mixtures are of two types:

a. Homogeneous mixture: *A mixture in which the concentration of the constituents remains uniform throughout the mixture and all the constituents are present in one phase, is called a* ***homogeneous mixture.***
eg. Mixture of salt and water.

b. Heterogeneous mixture: *If two or more phases are present in a mixture, it is called a* ***heterogeneous mixture.***
eg. Phenol - water system, silver chloride-water system, iron fillings-sand system, etc.

***Q.7. Define: i. Elements ii. Compounds**

Ans: i. *An* ***element*** *is defined as a substance which cannot be separated into simpler substances by any chemical process.*

ii. ***Compounds*** *are defined as substances of definite compositions which can be decomposed into two or more substances by a simple chemical process.*

Q.8. Explain the following with the help of examples.
i. Elements ii. Compounds

Ans: **i. Elements:**

a. ***An element*** *is defined as a substance which cannot be separated into simpler substances by any chemical process.*
eg. Gold, silver, copper, carbon, etc.

b. Out of 118 elements that have been identified till recently, most are naturally occuring and a few are prepared in the laboratory (man-made).

c. Chemists use one or two letter symbols to represent elements.

d. All the chemical symbols have first letter capital and second letter small (if present).

e. The symbols of the elements are derived either from English names or from Latin names of the elements.
eg. Aluminium – Al , Einsteinium – Es, Gold – Au (Aurum)

f. Elements contain only one type of atom. Elements are further classified as metals, non-metals, metalloids.

ii. Compounds:

a. ***Compounds*** *are defined as substances of definite compositions which can be decomposed into two or more substances by a simple chemical process.*
   eg. Water, sodium chloride, sugar, alcohol, etc.

b. The properties of compounds differ from the properties of the substances and elements obtained from decomposition of the compounds.
   eg. Hydrogen and oxygen are obtained from decomposition of water. Water can be used to extinguish fire whereas oxygen supports combustion and hydrogen is combustible.

c. Compounds are classified into two subclasses, organic compounds and inorganic compounds.

d. Compounds contain two or more components.

Q.9. Classify the following substances into elements, compounds, homogeneous mixtures and heterogeneous mixtures.
Sand in water, Sodium chloride, Nitrogen, Sodium chloride in water, Pumice stone, Air, Carbon dioxide, Gold, Phenol-water system

Ans: i. Sand in water : Heterogeneous mixture
ii. Sodium chloride : Compound
iii. Nitrogen : Element
iv. Sodium chloride in water : Homogeneous mixture
v. Pumice stone : Heterogeneous mixture
vi. Air : Homogeneous mixture
vii. Carbon dioxide : Compound
viii. Gold : Element
ix. Phenol-water system : Heterogeneous mixture

Q.10. Distinguish between i. Mixtures and compounds. ii. Compounds and elements.
Ans:
i.

	Mixtures	Compounds
a.	The constituents of a mixture may be present in any ratio.	The constituents of a compound are always present in a fixed ratio.
b.	Mixtures may or may not be homogeneous in nature.	Compounds are always homogeneous in nature.
c.	The properties of a mixture are in between those of its constituents.	The properties of a compound are entirely different from those of its constituent elements.
d.	The constituents of a mixture can be easily separated by simple physical means.	The constituents of a compound cannot be easily separated by simple physical means but can be separated by chemical processes.
e.	The melting and boiling points of mixtures are usually not sharp.	Chemical compounds possess sharp melting and boiling points.

ii.

	Compounds	Elements
a.	A compound is a substance composed of two or more different chemical elements.	An element is a pure chemical substance made of same type of atoms.
b.	A compound can be separated into simpler substances by chemical reactions.	Elements cannot be broken down into simpler substances.
c.	Compounds contain different elements in a fixed ratio arranged in a defined manner through chemical bonds.	Elements are distinguished by their atomic number (number of protons in their nucleus).
d.	A compound is represented using a formula.	An element is represented using symbols.
e.	The list of compounds is endless but can broadly be classified as ionic and covalent.	There are about 118 elements that have been identified and can be classified as metals, non-metals or metalloids.
eg.	Sodium chloride (NaCl), Sodium bicarbonate ($NaHCO_3$), etc.	Iron, copper, silver, gold, etc.

Q.11. Define a unit.

Ans: *The arbitrarily decided and universally accepted standards used in the measurement of physical quantities are called* ***units****.*
eg. meter (m), kilogram (kg).

Q.12. State the need of units.

Ans: i. In chemistry, several experiments are carried out which involve observation and collection of both qualitative and quantitative data.

ii. Measurement of physical properties such as mass, length, volume, temperature, pressure, time, etc., comprise of the quantitative data.

iii. For this purpose, the magnitude or size of physical quantity is compared with a suitable standard. These units are arbitrarily chosen on the basis of universally accepted standards.

iv. To express any measured property, a number and an appropriate unit has to be used. Only number does not give any idea about the property.

Q.13. What are the various systems in which units are expressed?

Ans: Units are expressed in various systems like CGS (centimetre for length, gram for mass and second for time), FPS (foot, pound, second) and MKS (metre, kilogram, second) systems, etc.

Q.14. What are SI units? Name the fundamental SI units.

Ans: SI Units: In 1960, the general conference of weights and measures proposed revised metric system, called International system of Units i.e. SI system abbreviated from its French name Systeme Internationale d′ Units. The seven fundamental SI units are as given below:

No.	Fundamental quantity	SI unit	Symbol
i.	Length	Metre	m
ii.	Mass	Kilogram	kg
iii.	Time	Second	s
iv.	Temperature	Kelvin	K
v.	Amount of substance	Mole	mol
vi.	Electric current	Ampere	A
vii.	Luminous intensity	Candela	cd

Q.15. What are derived units?

Ans: *The units of all physical quantities can be derived from the seven fundamental SI units. These units are known as* ***derived units.***

eg. i. Area = Length squared (m^2) ii. Concentration = mole per cubic metre (mol m^{-3})

Note: i. The table given below shows some common derived units:

Physical quantity	Relationship with fundamental unit	Unit
Area	Length squared	m^2
Volume	Length cubed	m^3
Density	Mass per unit volume	kg m^{-3}
Velocity	Distance travelled in unit time	m s^{-1}
Acceleration	Velocity change per unit time	m s^{-2}
Force	Mass × Acceleration	kg m s^{-2} (Newton, N)
Pressure	Force per unit area	kg m^{-1} s^{-2}
Electric charge	Current × Time	A s (coulomb, C)
Electric potential or Potential difference	Energy per unit charge	kg m^2 s^{-2} A^{-1} (J A^{-1} s^{-1} or Volt,V or J C^{-1})
Energy (work or heat)	Force × distance travelled	kg m^2 s^{-2} (Joule s^{-1})
Concentration	Mole per cubic metre	mol m^{-3}
Heat capacity	C_p = dH / dT C_v = dE / dT	J K^{-1} mol^{-1}
Electrochemical equivalent	Z = E/F	kg C^{-1} (kg/Coulomb)