

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

# STD. XI Sci.

# Perfect Chemistry - I

## Salient Features

- Exhaustive coverage of syllabus in Question Answer Format.
- Covers answers to all Textual Questions, Intext Questions and relevant NCERT 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.
- Important inclusions: NCERT Corner and Apply Your Knowledge

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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. : PERFECT CHEMISTRY - I” is a treasure house of knowledge that’d not only prepare you to face the conspicuous Std. XI final exam but also equip you up on parallel ground to face the prospective NEET and JEE exam.

This book is specifically aimed at Maharashtra Board students. The content of the book is framed in accordance with Maharashtra State board syllabus splattered with additional snippets of information from the NCERT syllabus. This lethal combination of apt material from both the boards makes it the ultimate reference material for Std. XI.

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 additional questions to ensure complete coverage of every concept.
- **Solved Examples** provide step-wise solution to various numerical problems. This helps students to understand the application of different concepts and formulae.
- **NCERT Corner, Do You Know, Enrich Your Knowledge** and **Notes** cover additional bits of relevant information on each topic.
- **Apply Your Knowledge, Brain Teasers** and **Check Your Grasp** cover brain-storming questions to strengthen the students’ conceptual understanding.
- **Quick Review** and **Formulae** sections facilitate instant revision.
- **Exercise** helps the students to gain insight on the various levels of theory and numerical-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](mailto: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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**'Chapters 9 to 17 are a part of Std. XI: Perfect Chemistry - II'**

**Note: All the Textual questions are represented by \* mark**

**All the Intext questions are represented by # mark**

# 01 Some Basic Concepts of Chemistry

## Syllabus

1.0	Prominent scientists	1.6	Concept of elements, atoms and molecules
1.1	Introduction	1.7	Atomic and molecular masses
1.2	Importance and scope of chemistry	1.8	Avogadro's law
1.3	Historical approach to particulate nature of matter	1.9	Percentage composition and molecular formula
1.4	Laws of chemical combination	1.10	Chemical reactions and stoichiometry
1.5	Dalton's atomic theory		

### 1.0 Prominent scientists

Scientists		Contributions
<b>Joseph Louis Gay-Lussac</b> (1778 – 1850) (French chemist and physicist)	i. ii. iii.	Formulated the gas law. Collected samples of air at different heights and recorded temperatures and moisture contents. Discovered that the composition of atmosphere does not change with increasing altitude.
<b>Amedeo Avogadro</b> (1776 – 1856) (Italian scholar)	i. ii.	Published article in French journal on determining the relative masses of elementary particles of bodies and proportions by which they enter combinations. Published a research paper titled "New considerations on the theory of proportions and on determination of the masses of atoms."

### 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.



### Branches of chemistry:

There are several branches of chemistry. Few important branches are as follows:

- i. **Physical chemistry:** It is the branch of chemistry that deals with the structure of matter, the energy changes and the theories, laws and principles that explain the transformation of matter from one form to another.
- ii. **Inorganic chemistry:** It is the branch of chemistry that deals with chemistry of elements other than carbon and their compounds.
- iii. **Organic chemistry:** This branch of chemistry deals with reactions of the compounds of carbon.
- iv. **Analytical chemistry:** This is the branch of chemistry which deals with the separation, identification and quantitative determination of the compositions of different substances.
- v. **Biochemistry:** This is the branch of chemistry that deals with substances which are constituents of living organisms.

**Note:** Pharmaceutical, environmental and nuclear chemistry are also branches of chemistry.

### 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.**

	Drugs	Treatment of diseases
a.	L-dopa	For treatment of Parkinson's disease.
b.	Human insulin	For treatment of diabetes.
c.	Cisplatin and taxol	Life saving drugs to give relief to cancer patients.
d.	Azidothymidine (AZT)	For treatment of AIDS.
e.	Tamiflu	For treatment of swine flu.

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

$$\text{CO}_2 + \text{H}_2\text{O} \xrightarrow[\text{chlorophyll}]{\text{sunlight}} \text{food grains/fruits/flowers/cotton/medicine etc.}$$
- 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. Several electrochemical cells like Daniel cell, lead storage cell, dry cell, nickel cadmium cell, lithium ion cell, fuel cell, etc., are used as a source of energy. These cells are less polluting and more efficient. There are attempts being made to convert solar energy into electrical energy using photovoltaic cells, the solar cells. Attempt is also made to obtain hydrogen from water, which is used in fuel cells to generate electricity.
- v. With the help of chemistry it is easy to design and generate large number of materials like polymers, plastic, liquid crystals, adhesives and surface coating materials like latex paints. 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.**

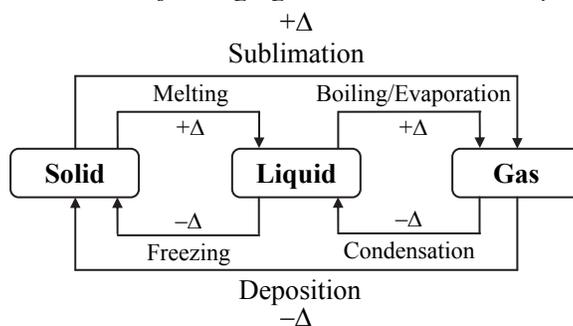
**Ans:** *Matter is anything which has mass and occupies space.*

#### NCERT Corner

##### States of matter:

Solid	Liquid	Gas
Particles held closely. No freedom of movement.	Particles are close to each other but have some degree of freedom to move around.	Particles are far apart with easy and fast movement.
Have definite volume and definite shape	Have definite volume but not definite shape	Neither have definite volume nor definite shape

The states of matter are interconvertible by changing the conditions of temperature and pressure.



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



### Enrich Your Knowledge

#### Phlogiston theory:

According to this theory, a combustible substance contains phlogiston (a mysterious matter) and some clax. During combustion, phlogiston evolves and is lost in the atmosphere. Clax remains in the form of an ash.

**eg.** During the combustion of a candle in a closed container, the air inside the container is saturated with phlogiston. Since air cannot accommodate more phlogiston, the candle gets extinguished.

Joseph Priestley (a British scientist) focussed sunrays on a substance (mercuric oxide) to heat it. A gas evolved, in which substances could burn more vigorously than in air. A burning candle became brighter in this gas. Priestley was of the view that this gas is the normal air without phlogiston. Hence he named it “dephlogisticated air”.

Sir Henry Cavendish carried out the reaction of a dilute acid with metals such as zinc, iron, etc. He named the gas evolved as “flammable air”. It was found that this gas burnt in air and in dephlogisticated air and produced water. Cavendish suggested that flammable air is water associated with phlogiston. This is in continuation with the idea of phlogiston.

The theory of phlogiston was ruled out by Antoine Lavoisier (a French Scientist). He proved that a part of air is used in chemical reaction during combustion. This part of air was called oxygen. It means ‘acid forming’. He also proved that oxygen was the gas formed in Joseph Priestley’s experiment. He also proved that the flammable air produced by Cavendish was a new gas, which he named as hydrogen, meaning ‘water forming’.

#### \*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:**

- An **element** is defined as a substance which cannot be separated into simpler substances by any chemical process.*  
**eg.** Gold, silver, copper, carbon, etc.
- Out of 118 elements that have been identified till recently, most are naturally occurring and a few are prepared in the laboratory (man-made).
- Chemists use one or two letter symbols to represent elements.
- All the chemical symbols have first letter capital and second letter small (if present).
- 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)
- Elements contain only one type of atom. Elements are further classified as metals, non-metals, metalloids.

**ii. Compounds:**

- 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.
- 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.
- Compounds are classified into two subclasses, organic compounds and inorganic compounds.
- Compounds contain two or more components.