

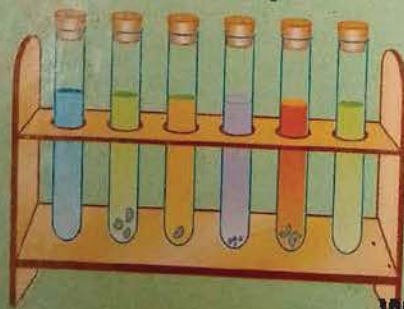
With Objective Questions

UPHAR

Language of Chemistry



(Chemical Equation)



UPHAR LANGUAGE OF CHEMISTRY

[For Schools, Colleges and Competitive Examinations]

NCERT & CBSE PATTERN

**Definitions, Formulae,
Balancing of Equations**

by

- Ion-Electron Method
- Oxidation-Number Method

with

PERIODIC TABLE

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NCERT Expert

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A STATEMENT / AN APPEAL

In the publication of this book full attention has been paid on the correctness of Text, Educational Researches, Changing syllabus of NCERT and Patterns of recent Examination Questions. Suggestions for improvement would be welcomed.

Preface

Having some problems with Chemistry ? Well, we are here to get you out of the woods with our latest book '**Uphar Language of Chemistry**'.

The uniqueness of this book lies in the fact that it will be useful not only for school and college students but also for those who will be appearing in various competitive examinations.

The book is an introduction to chemical formulae and equations. It has been prepared especially to solve the problems the students have to face while balancing the chemical equations.

As teachers, we have noticed that although students study chemistry they do not pay any special attention to the language of Chemistry. They do not practise balancing of equations. Thus they lose their interest in the subject.

In this book we have tried to explain the methods of writing chemical equations and balancing them properly in very simple ways. Ion-electron method and Oxidation-number method have been explained in detail for the benefit of students.

To enhance the utility of the book we have added two chapters entitled Test Yourself for the benefit of examinees. Just to give them information about the elements at a glance, a copy of modern periodic table has also been supplied in the book.

We have every reason to believe that this book will prove to be a boon for those for whom it is meant. Suggestions for improvement in the book will be thankfully acknowledged.

Authors

अवश्य पढ़ें!

अवश्य पढ़ें!

हिन्दी व्याकरण और रचना की सर्वश्रेष्ठ- पुस्तकें

1. उपहार हिन्दी व्याकरण प्रवेश
2. उपहार बाल व्याकरण
3. उपहार बाल रचना
4. उपहार हिन्दी व्याकरण और रचना (नेतराहट, हजारीबाग, नवोदय विद्यालय, सैनिक स्कूल के लिए)
5. उपहार हिन्दी भाषा भास्कर : भाग 1 (तृतीय से पंचम वर्गों के लिए)
6. उपहार हिन्दी भाषा भास्कर : भाग 2 (षष्ठ से अष्टम वर्गों के लिए)
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8. उपहार प्राइमरी स्कूल निबन्ध
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1. उपहार संस्कृत व्याकरण प्रवेश
2. उपहार संस्कृत अनुवाद प्रवेश
3. उपहार संस्कृत भाषा भास्कर : भाग 1 (तृतीय से पंचम वर्गों के लिए)
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Parts 1, 2 & 3

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से खरीदें

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उपहार प्रतियोगिता सामान्य विज्ञान	जूनियर
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गणित एवं रसायन की अनमोल पुस्तकें

उपहार रसायन की भाषा
उपहार गणित की भाषा



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उपहार हिन्दी भाषा भास्कर

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- उपहार हिन्दी भाषा भास्कर : भाग 1 : वर्ग 3, 4 एवं 5 के लिए

उपहार संस्कृत भाषा भास्कर

संस्कृत व्याकरण, अनुवाद एवं अनुच्छेद लेखन की सर्वश्रेष्ठ पुस्तकें

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- उपहार संस्कृत भाषा भास्कर : भाग 1 : वर्ग 3, 4 एवं 5 के लिए

राष्ट्रीय शिक्षा नीति एवं NCERT के बदलते नये पैटर्न एवं सिलेबस के अनुसार माध्यमिक स्तर पर पुनरीक्षित नवीन पाठ्यक्रम सारे भारत में लागू किया गया है। इसी नीति के तहत केन्द्रीय स्तर पर CBSE, ICSE एवं राज्य-स्तर पर बिहार विद्यालय परीक्षा समिति, पटना; झारखंड विद्यालय परीक्षा समिति, राँची; पश्चिम बंगाल हाई स्कूल बोर्ड, कोलकाता; उत्तर प्रदेश हाई स्कूल परीक्षा बोर्ड, लखनऊ एवं सभी राज्यों में परीक्षाएँ संचालित की जाती हैं।

उपर्युक्त परीक्षा बोर्डों के परीक्षार्थियों में यह जिज्ञासा बनी रहती है कि परीक्षा में किस प्रकार के प्रश्न पूछे जाएँगे और उनके आदर्श उत्तर कैसे लिखे जाएँगे? तो उन सभी परीक्षार्थियों की जिज्ञासा को ध्यान में रखते हुए उपहार संस्कृत भाषा भास्कर एवं उपहार हिन्दी भाषा भास्कर के इस नवीनतम संस्करण में सभी परीक्षा बोर्डों के अनुकूल पाठ्यक्रमों के समग्र बिन्दुओं की प्रचुर सामग्री प्रस्तुत की गई है।



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स्थानीय पुस्तक विक्रेताओं
से खरीदें

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Periodic Table of the Elements (Long Form)

← s-Block Elements → ← p-Block Elements →

Group 1 ← ← Notation Version → → 17 18 →
 IA ← → → VIIA 0 (Zero)

Period 1 2 3 4 5 6 7

STATE: Solid [S], Liquid [L], Gas [G], Not found in nature [X]

KEY TO CHART: Atomic number, Symbol, Name, Atomic mass

Metals, Metalloids, Non-metals, Noble Gases

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18		
1	IIA												IIIA	IVA	VA	VIA	VIIA	VIIIA	VIIIA
1	H											B	C	N	O	F	Ne		
2	Li	Be										Al	Si	P	S	Cl	Ar		
3	Na	Mg										Al	Si	P	S	Cl	Ar		
4	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	
5	Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	
6	Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	
7	Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub	Uuq	Uuh	Uuq	Uuh	Uuq	Uuh	



← f-Block Elements →

*Lanthanides

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Caesium	Praseodymium	Neodymium	Promethium	Samarium	Europium	Gadolinium	Terbium	Dysprosium	Holmium	Erbium	Thulium	Ytterbium	Lutetium
140.116	140.908	144.908	(145)	150.36	151.964	157.25	158.925	162.50	164.930	167.26	168.934	173.04	174.967

**Actinides

90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
Thorium	Protactinium	Uranium	Neptunium	Plutonium	Americium	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium	Lawrencium
232.038	231.036	238.029	(237)	(242)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)

Note: (1) The new IUPAC format numbers the group from 1 to 18. The previous IUPAC numbering system and the system used by Chemical Abstracts Service (CAS) are also shown. For radioactive elements that do not occur in nature, the mass number of the most stable isotope is given in brackets with the longest half-life.
 (2) The symbols for elements 104-109 used in this table are those proposed by the American Chemical Society and for 110-116 those proposed by IUPAC.

अवश्य पढ़ें!

अवश्य पढ़ें!

अवश्य पढ़ें!

घंटों की पढ़ाई भिन्नताओं में

अंग्रेजी विदेशी भाषा जरूर है, लेकिन अगम-अगोचर नहीं, बशर्ते आप उन अंग्रेजी शब्दों का सही अर्थ जान लें, जो आपकी पाठ्यपुस्तक के संदर्भ से सम्बन्धित है। इस काम में सामान्य मोटी डिक्शनरी आपकी सहायता सहज ढंग से नहीं कर पाती है। आपको घंटों माथापच्ची करनी पड़ती है।

परम्पराओं से हटकर : नये संदर्भों से जुड़कर

उपहार डिक्शनरी

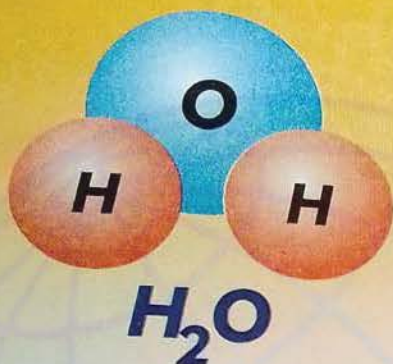
- उपहार चिल्ड्रेन्स डिक्शनरी : हनुमान चालीसा जैसी
- उपहार प्राइमरी स्कूल डिक्शनरी, क्लास 1, 2, 3, 4, 5
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- उपहार हाई स्कूल डिक्शनरी, क्लास 10
- UPHAR SPOKEN ENGLISH DICTIONARY

इनमें अंग्रेजी विषय की आपकी पाठ्यपुस्तकों के Lessonwise सभी पाठों के समस्त शब्दों के उच्चारण सहित सटीक अर्थ (Meaning) हिन्दी में दिए गए हैं। Spoken English, Miscellaneous Words और Finishing Touches इनकी आकर्षक विशेषताएँ हैं।



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स्थानीय पुस्तक विक्रेताओं से खरीदें



1

Introduction**THE LANGUAGE OF CHEMISTRY:**

Science is a wonderful subject. It has many branches. Every branch has its own terminology.

Chemistry is one of the branches. In Chemistry, apart from technical terms, some special symbols and formulae are used without the knowledge of which we cannot grasp the facts. For example, symbol 'H' is used for Hydrogen and formula 'H₂O' is used for Water. Thus in order to understand the language of Chemistry it is very necessary to know about its terminology, its symbols, formulae and equations. Here special attention has been given to these aspects of the language of Chemistry.

**Fig. 1.1****What is Chemistry?**

Chemistry is that branch of science which deals with the properties of matter, its composition, structure and the reactions, they undergo.

According to well-known chemist and Nobel Prize winner Pauling, "Chemistry is the science of matter, its structure, its properties and the reactions which transform them into other matters."

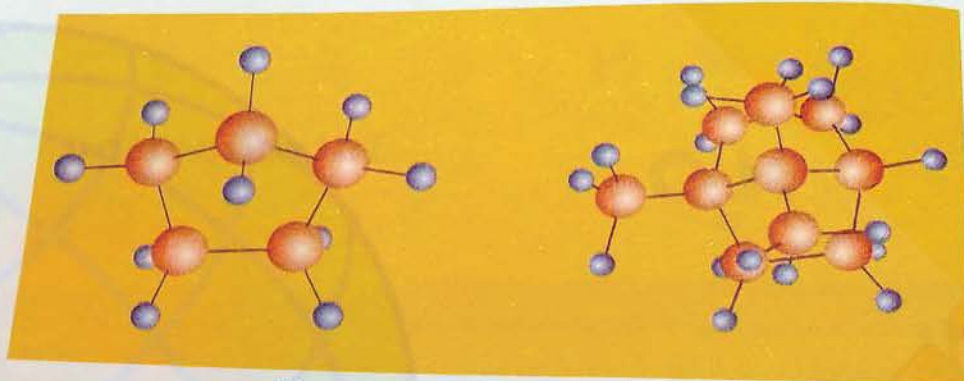


Fig. 1.2 Structure of atoms

Branches of Chemistry:

- 1. Inorganic Chemistry**—Under this branch, we study the methods of preparation of elements and their compounds (except organic compounds), their compositions, properties and uses.
- 2. Organic Chemistry**—In this branch we study mainly compounds of carbon (except carbonates, bicarbonates, carbon disulphide, carbon monoxide and carbon dioxide).
- 3. Physical Chemistry**—Under this branch the application of physics to chemical reactions are studied.



Fig. 1.3 Making Lamp Black



Fig. 1.4 Soap

4. Industrial Chemistry—In this branch of chemistry we study about preparation and properties of the products like plastic, soap, clothes, varnish etc. of daily use.

5. Bio-Chemistry—In this branch we study the chemical reactions and materials which obtained from living sources such as animals and plants.

Introduction

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6. Analytical Chemistry—Under this branch, the process of identifying various substances, measuring of volume, mass and their analyses are studied.

7. Agriculture Chemistry—In this branch of Chemistry, the use of chemicals such as fertilizers, salt etc. in agriculture is studied.

8. Medicinal Chemistry—In this branch we study about drug combinations, production and properties of substances used in the preparation of medicines.

Apart from these, Chemistry has some specific branches also, e.g. Photo-chemistry, Radio-chemistry, Geo-chemistry, Electro-chemistry etc.



Fig. 1.5 Pasteurisation : kills harmful bacteria

LAVOISIER

Chemistry is an experimental science, which deals with the study of chemical properties of matter. Priestley, Sheele and Lavoisier have contributed much in the development (evolvment) of science. Lavoisier, French chemist, is called the "Father of Modern Chemistry."



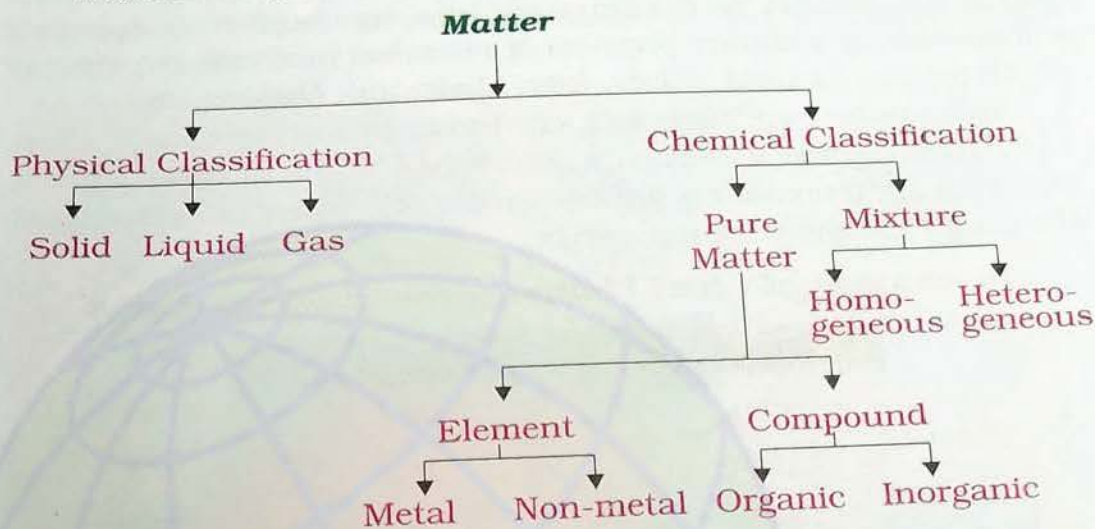
Fig. 1.6 Antoine Laurent Lavoisier

QUESTIONS

- I. What are the special features of the language of chemistry?
- II. Explain the difference between organic and inorganic chemistry.
- III. Define the following:
 - (a) Chemistry
 - (b) Agriculture-chemistry
 - (c) Bio-chemistry
 - (d) Analytical-chemistry
 - (e) Medicinal-chemistry
- IV. Why is Lavoisier called 'the father of modern Chemistry'?

Classification of Matter:

Matters may be divided in the following sub-groups:



Changes in Matter:

There may be two types of changes in a matter :

- (i) Physical Changes and
- (ii) Chemical Changes

(i) Physical Changes—A temporary change, in which only the physical properties of the matter change and no new matter is formed and by reversing the reaction the matter changes into its previous form, is called a physical change, e.g., the melting of solid wax, the melting of ice, etc.



Fig. 2.2 Melting of ice

(ii) Chemical Changes—A permanent change, in which the physical and chemical properties of matter changes and new substances are formed which do not get back into their original form by reversing the reaction, is called a chemical change, e.g., the burning of coal or wood, the curdling of milk, forming of rust on iron, etc.

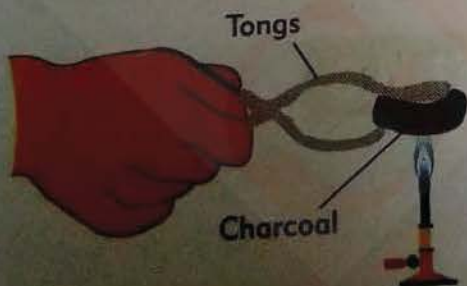


Fig. 2.3 A piece of burning charcoal

Different Types of Matter :

Elements—Such homogeneous and pure substances, which can neither be decomposed into, nor built from simpler substances by ordinary physical or chemical methods are known as Elements. As Gold, Silver, Iron, Hydrogen, Oxygen, etc.

Though known elements are today in number more than 110 in which only 8 elements constitute 97.2% of earth's crust while other elements constitute only 2.8%. Oxygen is the most abundant element on the earth.

Percentage of Chief Elements found on the Earth

Elements	Percentage
Oxygen	49.9
Silicon	26.0
Iron	4.1
Magnesium	2.1
Sodium	2.3
Calcium	3.2
Aluminium	7.3
Potassium	2.3
Others	2.8

TYPES OF ELEMENTS

There are mainly two types of Elements—(i) Metals and (ii) Non-metals.

(i) Metals—Metals are good conductors of electricity and heat. In solid form they are malleable and ductile. **Examples :** Gold, Silver, Copper, Iron, Aluminium, etc.

(ii) Non-metals—Non-metals are generally bad conductors of electricity and heat.

Examples : Phosphorus, Sulphur, Bromine, Oxygen, etc.

METALS–NON-METALS

- ★ Found in solid state—Sodium, Sulphur, Phosphorus, etc.
- ★ Found in liquid state—Mercury, Bromine, etc.
- ★ Found in gaseous state—Oxygen, Hydrogen, Nitrogen, Chlorine, etc.

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Metalloids—The elements in which the properties of both metal and non-metal are found, are known as Metalloids.
Examples : Boron, Silicon, Germanium, Arsenic, Antimony, Tellurium, etc.



Fig. 2.4 Some (metal and non-metal) elements found in earth-crust

Compounds—When two or more elements are combined chemically in definite ratio by weight, a pure substance is formed. This is known as a compound. The newly formed substance has different properties from the constituent elements.

Through chemical process, a compound can be decomposed into elements. For example, Water is a compound.

When electricity is passed through water, it decomposes and Hydrogen and Oxygen gases are obtained. Water is made by the combination of Hydrogen and Oxygen in fixed ratio (1 : 8) by weight. But their properties are quite different. Hydrogen burns itself, Oxygen helps it in burning and Water acts as firefighter. Thus Water is a compound.

Classifications of Compound :

As per sources, compounds are mainly divided into two classes :

- (i) Organic Compounds
- (ii) Inorganic Compounds

(i) Organic Compounds—Compounds obtained from animal and plant kingdom are known as Organic Compounds.

According to modern scientists such compounds of Carbon (except carbon dioxide, carbon monoxide, carbonates, bicarbonates and carbon disulphide) are called organic compounds.

(ii) Inorganic Compounds—Such compounds which are obtained from earth crust or mines are called Inorganic compounds. Examples : Sodium sulphate, Sodium chloride, Calcium sulphate, etc.

Mixture—A mixture is a substance that is obtained by combining two or more elements in any ratio. Their constituents can be separated by physical means. The properties of the mixture are similar to its primary constituents. For example, Air is a mixture of Oxygen, Nitrogen and Carbon dioxide and their properties are present in it. Constituents of a mixture can be separated by physical methods.

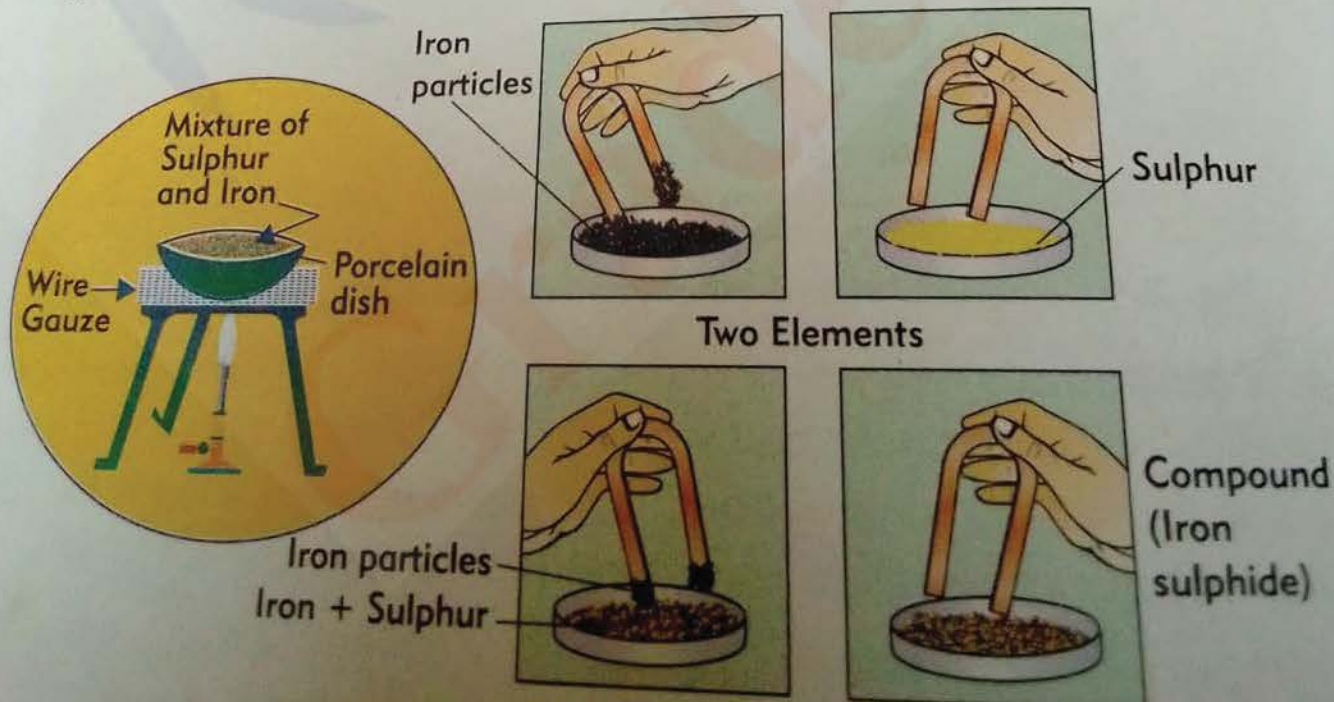


Fig. 2.5

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TYPES OF MIXTURE

There are mainly two types of mixture :

- (i) Homogeneous Mixture
- (ii) Heterogeneous Mixture.

(i) **Homogeneous Mixture**—In this type of mixture properties are the same in every portion. **Examples** : Cement, Milk, etc.

(ii) **Heterogeneous Mixture**—A mixture in which there is difference in composition and properties in every portion is called heterogeneous mixture. **Examples** : Fog, gun-powder, etc.

QUESTIONS

I. Define the following:

- (a) Matter
- (b) Element
- (c) Compound
- (d) Mixture
- (e) Physical change
- (f) Chemical change

II. 'Water is a Compound'—Prove this statement.

III. Distinguish between Element and Compound.

IV. Distinguish between Physical change and Chemical change.

V. Find out Element, Compound and Mixture out of the following : Common Salt, Coal, Air, Ammonia Gas, Sugar, Blood, Chalk, Saltpetre (Nitre), Diamond, Gold, Hydrogen.

VI. What do you understand by the nature of Matter? Explain.

COMPOSITION OF MATTER BY FIVE ELEMENTS

Man has the power of reasoning. He has been inquisitive right from the beginning of life. He has been trying to know and analyse the mystery of nature. Indians and Greeks had made remarkable attempts in this regard. According to them, all the substances of nature are made of five elements.

Such as five elements are earth, water, fire, sky and air.

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Atoms and Molecules

John Dalton was born in England in 1766. In 1802 he put forward his Atomic Theory and named the smallest particle of an element, **an atom**. According to him, atom is indivisible. But modern experiments have made it clear that an atom can also be divided.

Atom—An atom is the smallest part of an element in which all the properties of the matter remain alike and which participates in a chemical reaction. It is not capable of independent existence. The size of an atom is very small and the



Fig. 3.1 Colour samples of some common atom.

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Atoms and Molecules

mass is even less. Among atoms, Hydrogen atom is the smallest and lightest. Its radius is around 0.3×10^{-10} cm.

The radius of an atom is measured in Nanometer (nm)
 10^{-9} m = 1 nm; 1 m = 10^9 nm

Absolute size	
Radius (in Meter)	Example
10^{-1}	Watermelon
10^{-9}	Water molecule
10^{-2}	Ant
10^{-4}	Sand particle
10^{-10}	Hydrogen atom
10^{-8}	Haemoglobin particle

Fundamental Particles :

An atom is mainly made up of three types of particles which are known as Fundamental Particles. These are Electron, Proton and Neutron.

Atomic Number—This number shows the position of an element in the periodic table. The number of protons present in the nucleus or the number of electrons present outside the nucleus of an atom of an element is known as Atomic Number. It is denoted by Z.

Atomic Number = Number of Protons = Number of Electrons

Mass Number—The sum of neutrons and protons present in the nucleus of an atom is called Mass Number. It is denoted by A.

Mass Number = No. of Neutrons + No. of Protons
 Or, $A = n + p$

Atomic Mass—The atomic mass of an element is a number which expresses as to how many times an atom of the element is heavier than $1/12$ th of the mass of carbon atom (C^{12}).

$$\text{Atomic Mass} = \frac{\text{Mass of an atom of an element}}{12 \text{ Mass of a carbon atom } (C^{12})}$$

Atomic Mass Unit—One atomic mass unit is defined as the quantity of mass equal to $1/12$ of the mass of an atom of carbon (C^{12}). In the past, Atomic mass unit in short form was termed as *amu*. But today after the latest recommendation of IUPAC, it is denoted by 'u' — Unified mass. It is beneficial to present mass units in unified mass, hence it is being shown in 'u'.

Atomic mass unit = $\frac{1}{12}$ × the mass of a carbon -12 atom

or, $1u = \frac{1}{12}$ × the mass of a carbon -12 atom.

Gram-atomic mass—When atomic mass of an element is expressed in gram it is called Gram-atomic mass or gram-atom.

- 1g-atom H = 1.008 g H
- 1g-atom C = 12.0 g C
- 1g-atom O = 16.0 g O
- 1g-atom N = 14.0 g N

Molecule—The smallest particle of an element or a compound which is capable of independent existence is called molecule. The molecule of an element is made of one or more atoms of the same element. They can be monovalent, Divalent, Tri-valent.



Fig. 3.2 : Pieces of Phosphorus

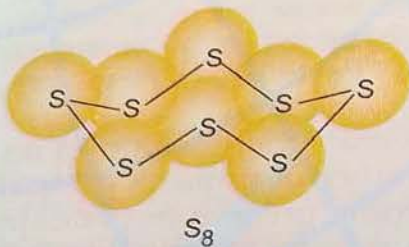


Fig. 3.3 : Molecules of Sulphur

Atomicity—The number of atoms present in a molecule of an element is known as the atomicity of the element. For example, the number of atoms present in the molecules of oxygen (O₂) is 2 (two), thus the atomicity of Oxygen 'O₂' is 2. It is said to be **diatomic**. Similarly, Ozone (O₃) is **triatomic**. P₄ and S₈ are called polyatomic molecules.

Atomicity of Some Elements

Types of Elements	Name	Atomicity
Non-Metal	Hydrogen	2
	Helium	1
	Argon	1
	Oxygen	2
	Nitrogen	2
	Phosphorus	4
	Sulphur	8
	Chlorine	2

Atoms and Molecules

Metal	Sodium	1
	Aluminium	1
	Iron	1
	Copper	1

(ii) Molecules of a Compound—One or more atoms of different elements, chemically join together in whole numbers to form the molecules of a compound. For example, a molecule of Water (H_2O), a molecule of Ammonia (NH_3), a molecule of Carbon dioxide (CO_2), etc.

Molecular Mass or Molar Mass—The molecular mass of a substance is a number which indicates how many times the mass of one molecule of carbon the substance is heavier than the mass of 12th part of C^{12} .

$$\text{Molecular mass of a substance} = \frac{\text{mass of one molecule of the substance}}{\text{12th part of the mass of } C^{12}}$$

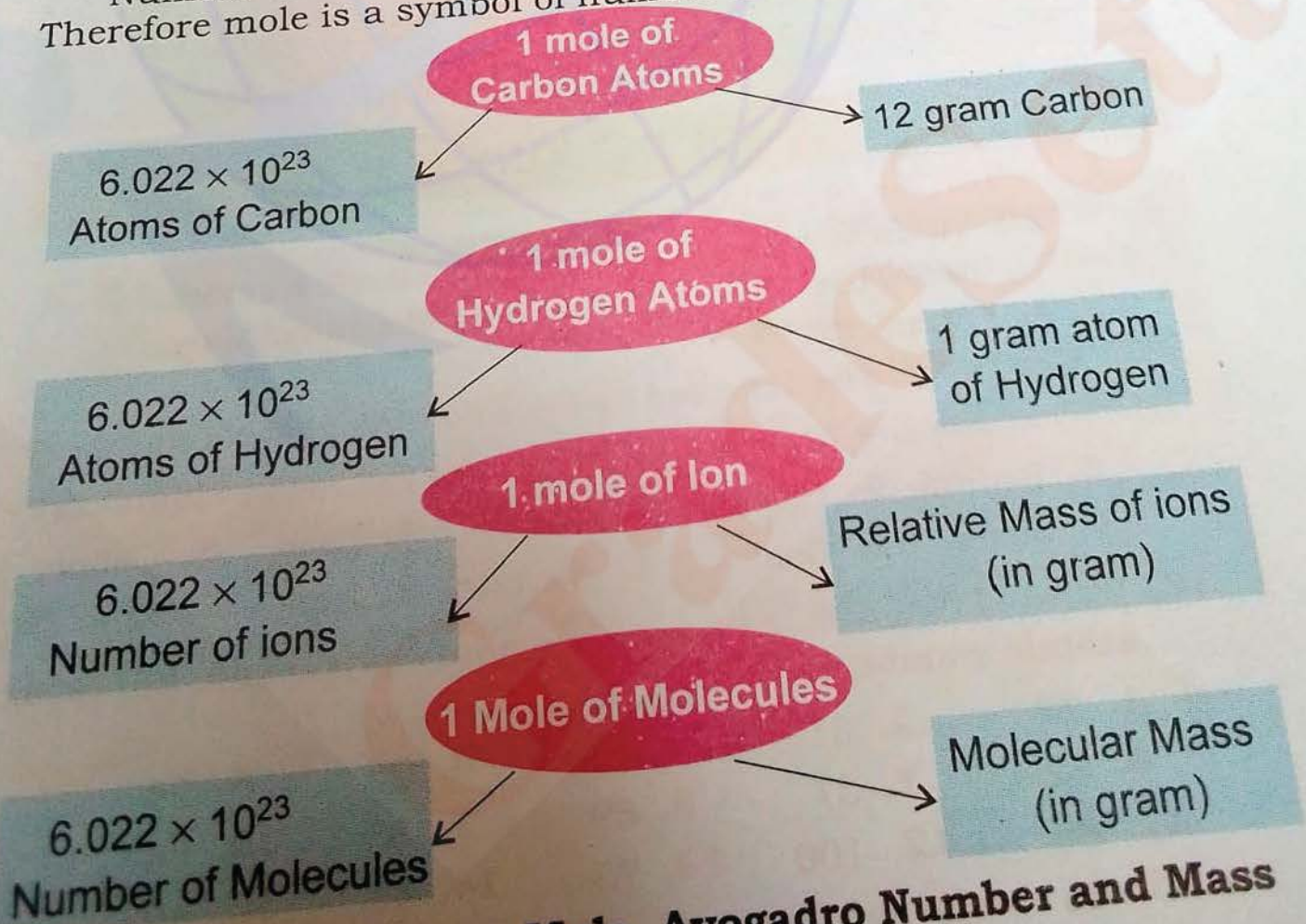
Mole—According to mole concept, mole is a unit which expresses 6.022×10^{23} particles.

$$1 \text{ mole atom} = 6.022 \times 10^{23} \text{ atoms.}$$

$$1 \text{ mole molecules} = 6.022 \times 10^{23} \text{ molecules}$$

$$1 \text{ mole ion} = 6.022 \times 10^{23} \text{ ions.}$$

Number 6.022×10^{23} is also called Avogadro number. Therefore mole is a symbol of number and mass both.



Relationship between Mole, Avogadro Number and Mass

24

Molar volume of a gas—The volume occupied by one gram-mole of a gas is called molar volume of the gas and equal to 22.4 litres at N.T.P.

Avogadro's Number—It is a fundamental constant in science, being the number of molecules in a gram-molecular weight of a substance and from Avogadro's hypothesis it follows that it is equal to the number of molecules present in volume of 22.42 litres of any gas at N.T.P. Its numerical value is 6.022×10^{23} .

$$\text{Hence } N_0 = 6.022 \times 10^{23}$$

Now-a-days Avogadro's Number is also known as *Avogadro's constant*. This name is adopted in honour of Italian physicist, Amadeo Avogadro (1776–1856).

REMEMBER

- ★ Atomic Mass Unit $u = 1/12$ th of a C^{12} -atom = 1.66×10^{-27} kg
- ★ Mole = 6.022×10^{23} molecules.
- ★ Mass of an atom = $\frac{\text{Atomic Mass}}{6.022 \times 10^{23}}$
- ★ Mass of a molecule = $\frac{\text{Molecular Mass}}{6.022 \times 10^{23}}$
- ★ At Normal Temperature and Pressure (NTP), volume of one mole of a gas = 22.4 litre

QUESTIONS

I. Define the following:

- | | |
|----------------|--------------------|
| (a) Atom | (b) Atomic Number |
| (c) Molecule | (d) Molecular Mass |
| (e) Atomicity. | |

II. What do you understand by Mole and Avogadro's Number?

III. What are the Atomic Number of the following elements?

- | | | | | |
|-----------|------------|------------|---------|-----------|
| 1. Sodium | 2. Calcium | 3. Tin | 4. Lead | 5. Copper |
| 6. Silver | 7. Gold | 8. Mercury | 9. Iron | 10. Zinc |

IV. Write down the name of elements with the following atomic numbers:

- | | | | | |
|--------|---------|--------|--------|--------|
| 1. 27 | 2. 31 | 3. 19 | 4. 25 | 5. 24 |
| 6. 52 | 7. 37 | 8. 89 | 9. 35 | 10. 56 |
| 11. 85 | 12. 100 | 13. 75 | 14. 47 | 15. 49 |
| 16. 46 | | | | |

Atoms and Molecules

V. Write down the name of elements present in the following compounds:

- (i) Baking Soda
- (ii) Potassium sulphate
- (iii) Quick lime
- (iv) Slaked lime
- (v) Hydrogen bromide



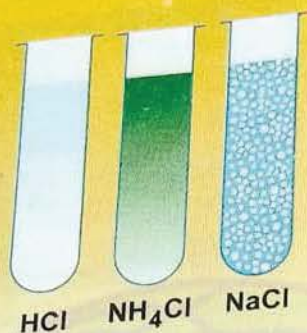
Fig. 3.4 Baking Soda

ANSWERS

- III. 1. 11 2. 20 3. 50 4. 82 5. 29
 6. 47 7. 79 8. 80 9. 26 10. 30

IV	Sl. No.	At. No.	Name of Elements	Sl.No.	At. No.	Name of Elements
	1	27	Cobalt	9	35	Bromine
	2	31	Gallium	10	56	Barium
	3	19	Potassium	11	85	Astatine
	4	25	Manganese	12	100	Fermium
	5	24	Chromium	13	75	Rhenium
	6	52	Tellurium	14	47	Silver
	7	37	Rubidium	15	49	Indium
	8	89	Actinium	16	46	Palladium

V.	Sl. No.	Name of Compounds	Name of Elements present
	1.	Baking soda	Sodium, Hydrogen, Carbon & Oxygen
	2.	Potassium sulphate	Potassium, Sulphur, Oxygen
	3.	Quick lime	Calcium, Oxygen
	4.	Slaked lime	Calcium, Hydrogen, Oxygen
	5.	Hydrogen bromide	Hydrogen and Bromine.



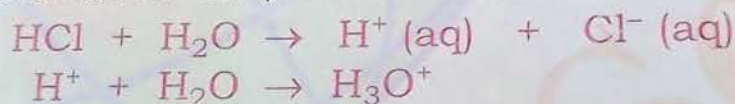
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Acids, Bases and Salts

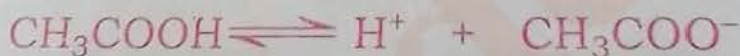
ACIDS

An acid is a compound which contains one or more hydrogen atoms replaceable partially or completely by a metal or a positive radical to produce a salt.

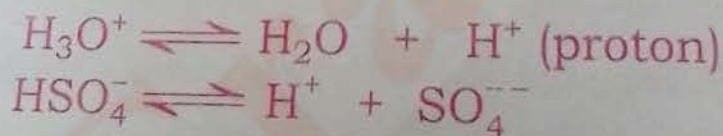
Arrhenius' Ionic Theory—An acid is a substance which when dissolved in water gives Hydrogen ion (H⁺) or better hydronium ions H₃O⁺. For example : HCl, H₂SO₄, HNO₃ are acids, which provide H⁺ ion, when dissolved in water.



Bronsted and Lowry's Concept—Acids are those substances which have the capacity to give protons to other substances. For example : CH₃COOH, HNO₃, H₂SO₄ are acids which have the capacity to provide protons.



Some ions have the capacity to provide protons, thus they are also acids.



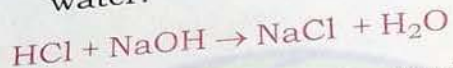
PROPERTIES OF ACIDS

The following are the properties of Acids :

- (i) Acids turn blue litmus paper red.
- (ii) The taste of acids is sour.

Acids, Bases and Salts

- (iii) Acids turn Methyl Orange red.
- (iv) Acids react with bases or alkalis to give salt and water.
- (v) Strong acids are good conductors of electricity.
- (vi) Acids react with active metals and release hydrogen gas.



(v) Strong acids are good conductors of electricity.

(vi) Acids react with active metals and release hydrogen gas.

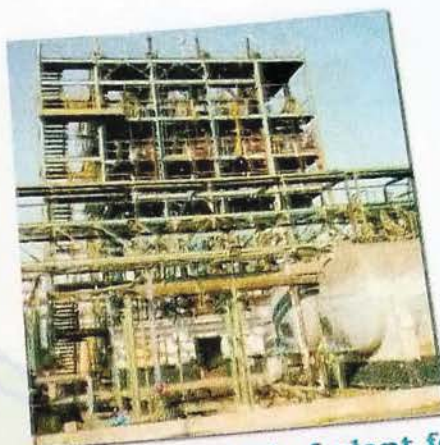
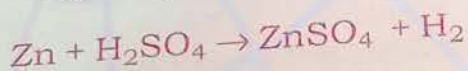


Fig. 4.1 A model of plant for preparing Hydrochloric acid

TYPES OF ACID

1. Oxy-Acids—Those acids in which Hydrogen and Oxygen both are present are known as Oxy-acids, e.g. Nitric Acid (HNO_3), Nitrous Acid (HNO_2), Phosphoric Acid (H_3PO_4) and Sulphuric Acid (H_2SO_4), etc.

2. Hydra-Acids—Those acids in which only Hydrogen is present are known as Hydra-Acids, e.g. Hydrobromic Acid (HBr), Hydrochloric Acid (HCl), Hydrocyanic Acid (HCN) etc.

Some Natural Acids

Name	Source
Acetic Acid	Vinegar
Amino Acid	Protein
Ascorbic Acid	Vitamin-C
Citric Acid	Lemon/Citrus Fruits
Lactic Acid	Curd
Hydrochloric Acid	Enzymes
Malleic Acid	Unripe Apple/Fruits
Tanic Acid	Tea
Uric Acid	Urine
Formic Acid	Bite of ant/bees



Fig. 4.2

Chemical Formulae of Some Important Acids

Name of Acid	Chemical Formula
1. Hydrochloric acid	HCl
2. Nitric acid	HNO ₃
3. Sulphuric acid	H ₂ SO ₄
4. Carbonic acid	H ₂ CO ₃
5. Acetic acid	CH ₃ COOH*
6. Formic acid	HCOOH*

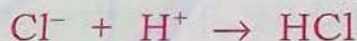
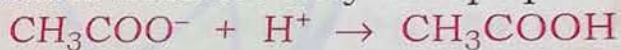
* H is common in compounds, thus they are acids.

Bases:

Oxides and hydroxides of metals are called bases.

Ionic theory of Arrhenius—Bases are those substances which give Hydroxide ions (OH⁻) when dissolved in water. For example : NaOH, KOH, Ca(OH)₂, NH₄OH are bases because they give OH⁻ ion when dissolved in water.

Bronsted-Lowry's Concept—“Bases are those substances which accept protons from an acid.” For example : OH⁻, CH₃COO⁻ are bases because they accept protons.



Properties of Bases:

The following are the properties of bases :



Fig. 4.3 Industrial production of Sodium hydroxide

- (i) It turns red litmus paper blue.
- (ii) It has bitter taste.

Acids, Bases and Salts

- (iii) Its solution tastes bitter like soap.
- (iv) It turns Methyl Orange yellow.
- (v) It yields salt and water when it reacts with acids.
- (vi) A strong base is a good conductor of electricity.

Base—A base is an oxide or hydroxide of a metal. Bases which are soluble in water are called *Alkalis*. All alkalis are bases but all bases are not alkalis because all bases are not soluble in water.

TYPES OF BASES

Bases are mainly of two types :

1. Soluble in water
2. Insoluble in water.

1. Soluble in Water—Bases which are soluble in water are called **Alkalis**. **Examples** : Potassium hydroxide (KOH), Sodium hydroxide (NaOH), Calcium hydroxide [Ca(OH)₂], etc. are alkalis.

2. Insoluble in Water—Insoluble bases in water when react with acid, form salt and water. **Examples** : FeO, ZnO, Al₂O₃, Fe(OH)₂, etc. insoluble in water, are bases.

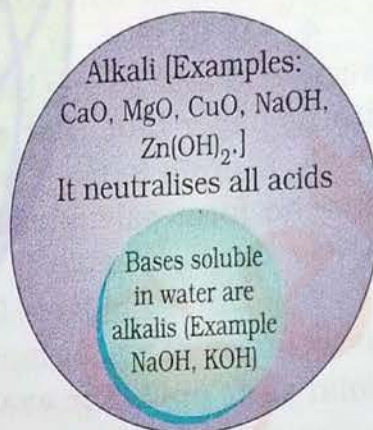
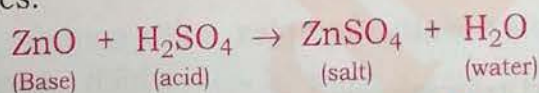


Fig. 4.4



Formulae of Some Important Bases

Base	Formulae	Base	Formulae
Sodium hydroxide	NaOH	Potassium hydroxide	KOH
Calcium oxide	CaO	Ammonium hydroxide	NH ₄ OH
Magnesium oxide	MgO	Lithium hydroxide	LiOH
Calcium hydroxide	Ca(OH) ₂	Aluminium hydroxide	Al(OH) ₃
Magnesium hydroxide	Mg(OH) ₂	Zinc hydroxide	Zn(OH) ₂

Salts :

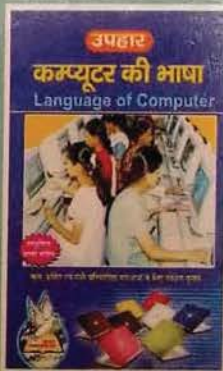
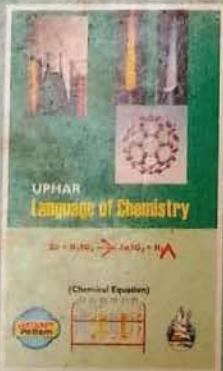
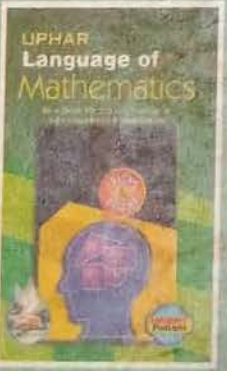
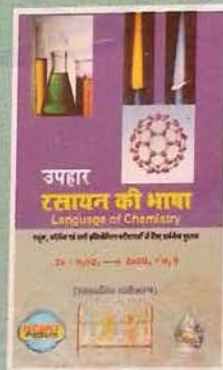
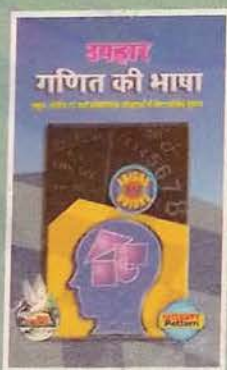
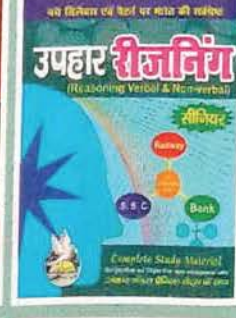
When acid and base react with each other, a substance is formed, which is known as Salt.



अवश्य पढ़ें

निश्चित सफलता की गारंटी

स्कूल, कॉलेज एवं सभी प्रतियोगिता परीक्षाओं के लिए



स्थानीय पुस्तक विक्रेताओं से खरीदें।



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