

## SCIENCE (THEORY)

### CLASS - IX

#### PHYSICS

##### **Unit 1- Motion**

Motion - displacement, velocity, uniform and non-uniform motion along a straight line, acceleration, distance-time and velocity-time graphs for uniform and uniformly accelerated motion, equations of motion by graphical method, elementary idea of uniform circular motion.

##### **Unit 2 - Force**

Force and motion, Newton's laws of motion, inertia of a body, inertia and mass, momentum, force and acceleration. Elementary idea of conservation of momentum, action and reaction forces.

##### **Unit 3 - Gravitation**

Gravitation : Universal law of gravitation, force of gravitation of the earth (gravity), acceleration due to gravity, mass and weight, free fall, thrust and pressure, Archimedes Principle, Buoyancy, Elementary idea of relative density.

##### **Unit 4 - Work And Energy**

Work done by a force, energy, power, kinetic and potential energy, Law of conservation of energy.

##### **Unit 5 - Sound**

Nature of sound and its propagation in various media, speed of sound, range of hearing in humans, ultrasound, reflection of sound, echo and sonar, structure of the human ear (auditory aspect only).

#### CHEMISTRY

##### **Unit 1 - Matter In Our Surrounding**

Matter - Definition, classification of matter, different states of matter and their characteristics (shape, volume, density) change of state melting, freezing, evaporation, condensation, sublimation, absorption of heat.

**Unit 1 - Matter in our Surroundings****Topics to be taken****Materials****Matter**

- Particulate nature of matter
- Diffusion of matter
  - How small are the particles of matter?
  - Particles of matter attract each other

**Classification of Matter**

- Physical classification
  - Solid state
  - Liquid state
  - Gaseous state
- Molecular models of different states of matter
- Factors governing the states of matter

**Interconversion of States of Matter**

- Change of state by temperature
  - Melting and boiling points
  - Process of sublimation
  - Temperature remains constant during melting and boiling - why?
  - Latent heat of fusion (Latent heat of melting)
  - Latent heat of fusion of ice
  - Latent heat of vapourisation (Latent heat of boiling)
  - Latent heat of vapourisation of water

**Evaporation**

- Factors affecting the rate of evaporation
  1. Surface area
  2. Temperature
  3. Humidity
  4. Speed of wind
- Cooling by evaporation
  - What kind of clothes help us keep cool?
  - Why do wet clothes keep us feel cool?
  - Why do people sprinkle water on the open ground or roof after a hot sunny day?
  - Formation of water droplets on the outer surface of beaker containing ice-cold water.

**Unit2 - Is Matter Around Us Pure?****Topic to be adopted****Chemical Classification****Element**

- Some facts about element

**Classification of Elements**

- Metals
  - Characteristics of metals
  - Some facts about metals
- Non – Metals
  - Characteristics of non – metals
  - Some facts about non – metals
- Semi – Metals

**Compound**

- Characteristics of Compounds
- Difference between an element and a compound

**Mixture**

- Types of Mixtures
  - Homogeneous Mixtures
  - Heterogeneous Mixtures
  - Characteristics of a mixture
  - Difference between a compound and a mixture
  - Difference between an element and a mixture

**Solution**

- Types of Solutions
  - Solution of two liquids
  - Solution of two solids
  - Non – aqueous solution
- Characteristics of solution
- Importance of solution
- Concentration of a solution
  - Mass by mass percentage
  - Mass by volume percentage
  - Volume by volume percentage
  - Concentration in parts per million (ppm)
- Saturated and unsaturated solution

**Suspension**

- Properties of suspension
  1. Heterogeneous nature
  2. Particle size
  3. Separation with the help of paper
  4. Appearance

5. Transparency
6. Sedimentation

**Colloid**

1. Dispersed phase
2. Dispersion medium

Properties of a colloidal solution

1. Filterability
2. Heterogeneity
  
3. Visibility
4. Sedimentation
5. Inability to pass through animal membrane
6. Diffusion
  
7. Brownian Movement
8. Optical property – Tyndal effect

Test of Colloids

Application of colloids

1. In medicines
2. In food

Importance of colloids in nature

**Separating Components of a Mixture*****Reasons for separating the components of a mixture***

1. To get a pure sample of a substance
2. To remove any undesirable or harmful components
3. To obtain the useful components of a mixture

***Methods used for separating the components of a mixture***

- Separating a solid that sublimates
  - Sublimation
  
- Separating an insoluble solid from a liquid
  - Decantation and sedimentation
  - Filtration
  
- Obtaining a pure solid from an impure solid sample
  - Crystallization

- Separating a soluble solid from its solution
  - Evaporation
  - Application of Crystallization
- Separating a pure solvent from the solution of soluble salt
  - Simple distillation
  - Applications of simple distillation
- Separating the components of mixtures using more than one method
  - Separating a mixture of sulphur, common salt and sand
  - Separating a mixture of potassium chloride, sand and iodine
  - Separating the components of gun powder
  - Separating a mixture of sulphur, carbon and potassium chloride
  - Separating the components of air

### **Water Purification in Water Works**

- Chlorination of water and its advantages, details not required

### **Physical and Chemical Changes**

- Physical change
- Characteristics of physical change
- Chemical change
- Characteristics of chemical change

## **Unit 3 - Atoms And Molecules**

### **Law of Chemical Combination**

- Law of conservation of mass
- Law of constant proportion

### **Atoms and Atomic Theory of Matter**

- Postulates of Dalton's atomic theory
  - What is an atom?
  - How big are atoms?
- Symbol of atoms
  - Significance of the symbol of an element
  - Relative atomic mass (Ar)
  - How do atoms exist?

### **Molecules and their Chemical Formulae**

- Molecules
- Chemical formula
- Molecular formula

- Significance of molecular formula
- Molecules of elements
- Molecules of compounds

### Ions and Ionic Compounds

- Empirical formula of compound
- Writing of chemical formula
- Valence electrons and valency

### Molecular Mass

- Relative molecular mass ( $M_r$ )
- Molecular mass ( $M$ )
  - Calculation of molecular mass from atomic mass
  - Molecular mass of water
  - Molecular mass of nitric acid ( $\text{HNO}_3$ )
- Formula unit mass of compounds
- Percentage composition of a compound
  - When the masses of compound and each element are given
  - When the formula of the compound and the atomic masses of the elements are given

### Mole Concept

- How large is one mole?
- Gram – atomic mass of an element
- Gram – molecular mass of a compound
- How many moles are there in a certain mass of a substance?
- How many molecules are there in a certain mass of a substance?

Atoms and molecules, Laws of chemical combination, Atoms and atomic theory of matter, Atomic and molecular masses, Mole concept, Relationship of mole to mass of the particles and numbers valency, chemical formulae of common compounds.

## Unit 4 - Structure of Atom

### Electrical Nature of Matter

#### Discovery of Electron – Study of Cathode Rays

Definition of electron. Who discovered electron and year?

- Mass of an electron

#### Discovery of Proton

- Mass of proton

#### Discovery of Neutron

- Characteristics of a Neutron
- Other particles in the nucleus

**Structure of Atom**

- J. J. Thompson of an atom
- Rutherford's alpha – particle scattering experiment
- Drawbacks of Rutherford's nuclear model of atom
- Present Concept of atom – Bohr's model of atom
- Arrangement of electrons in different shells: Bohr – Bury Scheme

**Atomic Number and Mass Number**

- Atomic number
- Mass number

**Valence Electrons and Valency**

- Valence electrons
- Valency

**Isotopes and Isobars**

- Isotopes
- Isotopes of hydrogen
- Isotopes of chlorine
- Isotopes of carbon
- Characteristics of isotopes
- Application of isotopes
  - Medicinal use
  - Radiocarbon dating o Tracer technique
  - Industrial use o Agricultural use
  - Generation of cheaper electricity in nuclear reactors
- Reasons for the fractional atomic masses of elements
- Isobars

Structure of atom, Rutherford's experiment, Electrons, Protons, Neutrons, valence electrons and valency, Isotopes and Isobars, Atomic number and mass number.

**BOLOGY****Unit-1 Cell- The Structural and Functional Unit of Life.**

Cell as a basic unit of life, basic idea of cell division, Prokaryotic and Eukaryotic cells, multicellular organisms, cell membrane and cell wall, cell organelles - chloroplast, mitochondria, vacuoles, ER, Golgi apparatus, nucleus, Chromosomes - basic structure, number; diffusion/exchange of substances between cells and their environment and between the cells themselves in the living system, role in nutrition, water and food, transport, excretion, gaseous exchange.

**Unit 2 - Tissues- The Building Block of Life.**

Tissues, organs, organs systems, organisms, structure and functions of animal and plant tissues (four types in animals, meristematic and permanent tissues in plants)

**Unit 3 - Diversity In Living Organism**

Diversity of plants and animals, basic issues in scientific naming, basis of classification, hierarchy of categories/groups, major groups of plants (salient features) (Bacteria, Thallophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms). Major groups of animals (salient features) (Non-chordates upto phyla and Chordates upto classes).

**Unit 4 - Why Do We Fall Ill?**

Health and its failure, disease and its causes, diseases caused by microbes and their prevention typhoid, diarrhoea, malaria, hepatitis, rabies, AIDS, TB, polio, pulse polio programme.

**Unit 5 - Natural Resources**

Physical resources - Air, water, soil; air - for respiration, for combustion, for moderating temperatures. Movements of air and its role in bringing rains across India. Air, water and soil pollution (brief introduction). Holes in ozone layer and the probable damages. Bio-geochemical cycle in nature - water, oxygen, carbon and nitrogen cycle.

**Unit 6 - Improvement In Food Resources**

Plant and animal breeding and selection for quality improvement, use of fertilizers, manures; protection from pests and diseases; organic farming.

**Textbook Prescribed: Science & Technology Class 9 (updated Edition)**

- Published by Ratna Sagar Pvt. Ltd., 60, Dr. Sundari Mohan Avenue, Kolkata - 700014.



**(PRACTICAL)**

Every student will perform atleast fifteen experiments (atleast five experiments from each unit) during the academic year.

**PHYSICS**

1. To determine the density of a solid (denser than water) by using a spring balance and measuring cylinder.
2. To study the variation in time period of a simple pendulum with length and to plot L - T graph.
3. To determine the value of acceleration due to gravity by simple pendulum.
4. To verify Archimede's principle.
5. To determine the boiling point of water and melting point of solid (eg. Ice, Urea).
6. To measure the temperature of hot water as it cools and plot a time-temperature graph.
7. To determine the velocity of a pulse propagated through a stretched string/slinky.

**BIOLOGY**

1. To study the main parts of compound microscope.
2. To make a temporary stained mount of onion peel under a microscope.
3. To study major groups of plants (Thallophyta, Bryophyta, pteridophyta, Gymnosperms and Angiosperms) and their salient features.
4. Study of major groups of animals (non-chordates and chordates) and their
5. salient
  - a. Features.
6. To study the life cycle of mosquito.
7. Collection of newspaper articles regarding health information.

**CHEMISTRY**

1. To prepare a solution of common salt/sugar of a given percentage composition by mass.
2. To prepare a colloidal solution of sulphur and differentiate it from (i) true solution and (ii) suspension, on the basis of transparency and filtration criterion respectively.
3. To differentiate between a mixture (containing two components) and pure compounds.
4. To carry out the following chemical reactions and record the observation
  - (i) Iron nail with copper sulphate solution in water.
  - (ii) Zinc with sulphuric acid.
  - (iii) sodium sulphate with Barium Chloride in the form of their aqueous solutions.
5. To distinguish between saturated and un-saturated organic compounds.
6. To prepare carbon dioxide gas and study its properties.
7. To study the sublimation of iodine or camphor or NH<sub>4</sub>Cl or Naphthalene.
8. To study the interconversion of three different states of water and to show that they are the three states of the same substance
9. To separate the constituents of mixture of two substances (anyone):

- (i) Iron and sand
  - (ii) Iodine and sand
  - (iii) Sand and salt or sugar
  - (iv) Salt and water
  - (v) Sugar and water
10. To prepare one homogeneous and one heterogeneous mixture (preferably one liquid) and distinguish them on the basis of atleast one common property of such solution like
- (i) Colour
  - (ii) Filtration
  - (iii) Settling or
  - (iv) Any other

**Textbook Prescribed: Tushar's Laboratory Manual**

- Published by Tushar Publications Pvt. Ltd., C-21, Jhandewalan F. F. Complex,  
Rani Jhansi Road, New Delhi - 110055.

\*\*\*\*\*