

4. SCIENCE

(Code No. 086 / 090)

The subject of science plays an important role in developing in children well-defined abilities in cognitive, affective and psychomotor domains. It augments the spirit of enquiry, creativity, objectivity and aesthetic sensibility.

Whereas the upper primary stage demands that plentiful opportunities should be provided to the students to engage them with the processes of science like observing, recording observations, drawing, tabulation, plotting graphs etc., the secondary stage expects abstraction and quantitative reasoning to occupy a more central place in the teaching and learning of science. Thus, the idea of atoms and molecules being the building blocks of matter makes its appearance, as does Newton's law of gravitation.

The present syllabus has been designed around six broad themes viz. Food, Materials, The World of The Living, How Things Work, Moving Things, People and Ideas, Natural Phenomenon and Natural Resources. Special care has been taken to avoid temptation of adding too many concepts than can be comfortably learnt in the given time frame. No attempt has been made to be comprehensive.

At this stage, while science is still a common subject, the disciplines of Physics, Chemistry and Biology begin to emerge. The students should be exposed to experiences as well as modes of reasoning that are typical of the subject.

General Instructions :

1. The units specified for each term shall be assessed through both *Formative and Summative assessments*.
2. In each term, there will be two formative assessments each carrying 10% weightage.
3. The summative assessment in each term will carry 30% weightage.
4. One Formative assessment carrying 10% weightage in each term would be based completely on hands on practicals.
5. Assessment of Practical Skills through MCQ will carry 20% weightage of term marks in each Summative Assessment.

COURSE STRUCTURE

CLASS IX

First Term	Marks : 90
Units	Marks
I. Food	13
II. Matter - Its Nature and Behaviour	29
III. Organisation in Living World	18
IV. Motion, Force and Work	30
Total	90

Theme : Food

(10 Periods)

Unit : Food

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

Theme : Materials

(22 Periods)

Unit : Matter - Nature and behaviour

Definition of matter; solid, liquid and gas; characteristics - shape, volume, density; change of state-melting (absorption of heat), freezing, evaporation (cooling by evaporation), condensation, sublimation.

Nature of matter : Elements, compounds and mixtures. Heterogenous and homogenous mixtures, colloids and suspensions.

Theme: The World of The Living

(22 Periods)

Unit: Organization in the living world.

Cell - Basic Unit of life : Cell as a basic unit of life; prokaryotic and eukaryotic cells, multicellular organisms; cell membrane and cell wall, cell organelles; chloroplast, mitochondria, vacuoles, endoplasmic reticulum, Golgi apparatus; nucleus, chromosomes - basic structure, number.

TISSUES, Organs, Organ System, Organism

Structure and functions of animal and plant tissues (four types in animals; meristematic and permanent tissues in plants).

Theme : Moving Things, People and Ideas

(36 Periods)

Unit : Motion, force and work

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

Force and Newton's laws: 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.

Gravitation : Gravitation; universal law of gravitation, force of gravitation of the earth (gravity), acceleration due to gravity; mass and weight; free fall.

PRACTICALS

Practical should be conducted alongside the concepts taught in theory classes.

List of Experiments



To test (a) the presence of starch in the given food sample (b) the presence of the adulterant metanil yellow in dal.

2. To prepare

- a) a true solution of common salt, sugar and alum
- b) a suspension of soil, chalk powder and fine sand in water
- c) a colloidal of starch in water and egg albumin in water and distinguish between these on the basis of
 - transparency
 - filtration criterion
 - stability

3. To prepare

- a) a mixture
- b) a compound

using iron filings and sulphur powder and distinguish between these on the basis of:

- i. appearance i.e., homogeneity and heterogeneity
- ii. behaviour towards a magnet
- iii. behaviour towards carbon disulphide as a solvent.
- iv. effect of heat.

4. To carry out the following reactions and classify them as physical or chemical changes.

- a. Iron with copper sulphate solution in water.
- b. Burning of magnesium in air.
- c. Zinc with dilute sulphuric acid
- d. Heating of copper sulphate
- e. Sodium sulphate with barium chloride in the form of their solutions in water.

5. To prepare stained temporary mounts of (a) onion peel and (b) human cheek cells and to record observations and draw their labeled diagrams.

6. To identify parenchyma and sclerenchyma tissues in plants, striped muscle fibers and nerve cells in animals, from prepared slides and to draw their labeled diagrams.

7. To separate the components of a mixture of sand, common salt and ammonium chloride (or camphor) by sublimation.

8. To determine the melting point of ice and the boiling point of water.

9. To establish relationship between weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance.

10. To determine the mass percentage of water imbibed by raisins.

COURSE STRUCTURE

CLASS X

First Term		Marks : 90
Units		Marks
I.	Chemical Substances	33
II.	World of Living	21
III.	Effects of Current	29
IV.	Natural Resources	07
Total		90

Theme : Materials

(30 Periods)

Unit : Chemical Substances - Nature and Behaviour

Chemical reactions : Chemical equation, Balanced chemical equation, implications of a balanced chemical equation, types of chemical reactions : combination, decomposition, displacement, double displacement, precipitation, neutralization, oxidation and reduction.

Acids, bases and salts : Their definitions in terms of furnishing of H^+ and OH^- ions, General properties, examples and uses, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of sodium hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.

Metals and non metals : Properties of metals and non-metals, reactivity series, formation and properties of ionic compounds, basic metallurgical processes, corrosion and its prevention.

Theme : The World of The Living

(20 Periods)

Unit : World of Living

Life processes : "living being". Basic concept of nutrition, respiration, transport and excretion in plants and animals.

Control and co-ordination in animals and plants : Tropic movements in plants; Introduction to plant hormones; control and co-ordination in animals : nervous system; voluntary, involuntary and reflex action, chemical co-ordination: animal hormones.

Theme : How things work.

(32 Periods)

Unit : Effects of Current

Electric current, potential difference and electric current. Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Inter relation between P, V, I and R.

Magnetic effects of current : Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's left hand rule. Electromagnetic induction. Induced potential difference, Induced current. Fleming's Right Hand Rule, Direct current. Alternating current : frequency of AC. Advantage of AC over DC. Domestic electric circuits.

Theme : Natural Resources

(08 periods)

Sources of energy : Different forms of energy, conventional and non-conventional sources of energy: fossil fuels, solar energy; biogas; wind, water and tidal energy; nuclear energy. Renewable versus non-renewable sources.

PRACTICALS

Practical should be conducted alongside the concepts taught in theory classes.

FIRST TERM

1. ✓ To find the pH of the following samples by using pH paper/universal indicator.
 - a. Dilute Hydrochloric acid
 - b. Dilute NaOH solution
 - c. Dilute ethanoic acid solution
 - d. Lemon juice
 - e. Water
 - f. Dilute sodium bicarbonate solution.
2. ✓ To study the properties of acids and bases HCl & NaOH by their reaction with
 - a. Litmus solution (Blue/Red)
 - b. Zinc metal
 - c. Solid sodium carbonate
3. To perform and observe the following reactions and classify them into:
 - i. Combination reaction
 - ii. Decomposition reaction
 - iii. Displacement reaction
 - iv. Double displacement reaction
 - 1) Action of water on quick lime.
 - 2) Action of heat on ferrous sulphate crystals.
 - 3) Iron nails kept in copper sulphate solution.
 - 4) Reaction between sodium sulphate and barium chloride solutions.

4. a) To observe the action of Zn, Fe, Cu and Al metals on the following salt solutions.
- ZnSO₄ (aq)
 - FeSO₄ (aq)
 - CuSO₄ (aq)
 - Al₂(SO₄)₃ (aq)
- b) Arrange Zn, Fe, Cu and Al metals in the decreasing order of reactivity based on the above result.
- To study the dependence of potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. Also plot a graph between V and I.
 - To determine the equivalent resistance of two resistors when connected in series.
 - To determine the equivalent resistance of two resistors when connected in parallel.
 - To prepare a temporary mount of a leaf peel to show stomata.
 - To show experimentally that light is necessary for photosynthesis.
 - To show experimentally that carbon dioxide is given out during respiration.

SECOND TERM

CLASS X

Second Term	Marks : 90
Units	Marks
I. Chemical Substances -Nature and Behaviour	23
II. World of Living	30
III. Natural Phenomena	29
IV. Natural Resources	08
Total	90

Theme : Materials

(25 Periods)

Unit : Chemical Substances - Nature and Behaviour

Carbon compounds : Covalent bonding in carbon compounds. Versatile nature of carbon. Homologous series Nomenclature of carbon compounds containing functional groups (halogens, alcohol, ketones, aldehydes, alkanes and alkynes), difference between saturated hydrocarbons and unsaturated hydrocarbons. Chemical properties of carbon compounds (combustion, oxidation, addition and substitution reaction). Ethanol and Ethanoic acid (only properties and uses), soaps and detergents.

Periodic classification of elements : Need for classification, Modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.

- i) odour
- ii) solubility in water
- iii) effect on litmus
- iv) reaction with sodium bicarbonate

1. To study the following properties of acetic acid (ethanoic acid) :

SECOND TERM

Practical should be conducted alongside the concepts taught in theory classes.

PRACTICALS

Our environment : Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable, substances.

The Regional environment : Big dams : advantages and limitations; alternatives if any. Water harvesting. Sustainability of natural resources.

Management of natural resources. Conservation and judicious use of natural resources. Forest and wild life, coal and petroleum conservation. Examples of People's participation for conservation of natural resources.

Unit : Conservation of natural resources

Theme : Natural Resources

(12 Periods)

Refraction of light through a prism, dispersion of light, scattering of light, applications in daily life.

of spherical mirrors and lenses.

Magnification. Power of a lens; Functioning of a lens in human eye, defects of vision and their corrections, applications of light by spherical lens, Image formed by spherical lenses, Lens formula (Derivation not required), Refraction; laws of refraction, refractive index.

Unit : Reflection of light at curved surfaces, Images formed by spherical mirrors, centre of curvature, principal axis, principal focus, focal length, mirror formula (Derivation not required), magnification.

Theme : Natural Phenomena

(23 Periods)

Heridity and evolution : Heredity; Mendel's contribution - Laws for inheritance of traits: Sex determination: brief introduction; Basic concepts of evolution.

Reproduction : Reproduction in animal and plants (asexual and sexual) reproductive health-need for and methods of family planning. safe sex vs HIV/AIDS. Child bearing and women's health.

Unit : World of Living

Theme : The World of The Living

(30 Periods)

RECOMMENDED BOOKS :

2. To study saponification reaction for preparation of soap.
3. To study the comparative cleaning capacity of a sample of soap in soft and hard water.
4. To determine the focal length of
 - i. Concave mirror
 - ii. Convex lens
 by obtaining the image of a distant object.
5. To trace the path of a ray of light passing through a rectangular glass slab for different angles of incidence. Measure the angle of incidence, angle of refraction, angle of emergence and interpret the result.
6. To study (a) binary fission in Amoeba and (b) budding in yeast with the help of prepared slides.
7. To trace the path of the rays of light through a glass prism.
8. To find the image distance for varying object distances in case of a convex lens and draw corresponding ray diagrams to show the nature of image formed.
9. To study homology and analogy with the help of preserved / available specimens of either animals or plants.
10. To identify the different parts of an embryo of a dicot seed (Pea, gram or red kidney bean).

Science - Textbook for class IX - NCERT Publication

Science - Textbook for class X - NCERT Publication

Assessment of Practical Skills in Science - Class IX - CBSE Publication

Assessment of Practical Skills in Science - Class X - CBSE Publication

Laboratory Manual Science - Class IX, NCERT Publication

Laboratory Manual Science - Class X, NCERT Publication