

## **SCIENCE** **(Code No. 086 / 090)**

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

Upper primary stage demands that a number of opportunities should be provided to the students to engage them with the processes of Science like observing, recording observations, drawing, tabulation, plotting graphs, etc., whereas the secondary stage also 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 seven 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 being to emerge. The students should be exposed to experiences based on hands on activities as well as modes of reasoning that are typical of the subject.

### **General Instructions :**

1. There will be an Annual examination based on entire syllabus
2. The annual examination will be of 80 marks and 20 marks weightage shall be for internal assessment
3. Out of 80 marks annual examination, 68 marks weightage shall be for theory and 12 marks weightage shall be for practical based questions.
4. For internal assessment
  - a. There will be three periodic tests conducted by the school. Average of the best two tests to be taken that will have a weightage of 10 marks towards the final result.
  - b. Practical / Laboratory work should be done throughout the year and the student should maintain record of the same. Practical Assessment should be continuous. There will be weightage of 5 marks towards the final result. All practicals listed in the syllabus must be completed.
  - c. Regularity, class work and home assignment completion along with neatness and upkeep of notebook will carry a weightage of 5 marks towards the final result.

## Course Structure Class - IX (Annual Examination)

Marks : 80

Unit No.	Unit	Marks
I	Matter - Its Nature and Behaviour	23
II	Organisation in the Living World	20
III	Motion, Force and Work	27
IV	Our Environment	06
V	Food; Food Production	04
	Total	80
	Internal assessment	20
	Grand Total	100

Note : Above weightage includes the weightage of questions based on practical skills.

### Theme : Materials

#### Unit I : Matter-Nature and Behaviour (50 Periods)

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. Heterogeneous and homogenous mixtures, colloids and suspensions.

**Particle nature, basic units** : Atoms and molecules, Law of constant proportions, Atomic and molecular masses. Mole concept : Relationship of mole to mass of the particles and numbers.

**Structure of atoms** : Electrons, protons and neutrons, valency, chemical formula of common compounds. Isotopes and Isobars.

### Theme : The World of the Living

#### Unit II : Organization in the Living World (45 Periods)

**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 and cell inclusions; 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 (only four types of tissues in animals; Meristematic and Permanent tissues in plants).

**Biological Diversity** : 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).

**Health and Diseases :** Health and its failure. Infectious and Non-infectious diseases, their causes and manifestation. Diseases caused by microbes (Virus, Bacteria and Protozoans) and their prevention; Principles of treatment and prevention. Pulse Polio programmes.

## Theme : Moving Things, People and Ideas

### Unit III : Motion, Force and Work

(60 Periods)

**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, derivation of 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, Action and reaction forces, Inertia of a body, Inertia and mass, Momentum, Force and Acceleration. Elementary idea of conservation of Momentum.

**Gravitation :** Gravitation; Universal Law of Gravitation, Force of Gravitation of the earth (gravity), Acceleration due to Gravity; Mass and Weight; Free fall.

**Floatation :** Thrust and Pressure. Archimedes' Principle; Buoyancy; Elementary Idea of Relative Density.

**Work, energy and power :** Work done by a Force, Energy, Power; Kinetic and Potential energy; Law of conservation of energy.

**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).

## Theme : Natural Resources : Balance in Nature

### Unit IV : Our Environment

(15 Periods)

**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-geo chemical cycles in nature :** Water, Oxygen, Carbon and Nitrogen.

Theme : Food

Unit V : Food Production

(10 Periods)

Plant and animal breeding and selection for quality improvement and management; Use of fertilizers and manures; Protection from pests and diseases; Organic farming.

### PRACTICALS

(30 Periods)

Practicals should be conducted alongside the concepts taught in theory classes.  
(LIST OF EXPERIMENTS)

1. Preparation of :
  - 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 solution of starch in water and egg albumin/milk in water and distinction between these on the basis of
    - transparency
    - filtration criterion
    - stability
2. Preparation of
  - a) a mixture
  - b) a compoundusing iron filings and sulphur powder and distinction 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
3. Separation of the components of a mixture of sand, common salt and ammonium chloride (or camphor).
4. Performing the following reactions and classifying them as physical or chemical changes :
  - a) Iron with copper sulphate solution in water
  - b) Burning of magnesium ribbon in air
  - c) Zinc with dilute sulphuric acid
  - d) Heating of copper sulphate crystals
  - e) Sodium sulphate with barium chloride in the form of their solutions in water.

5. Preparation of stained temporary mounts of (a) onion peel, (b) human cheek cells & to record observations and draw their labeled diagrams.
6. Identification of Parenchyma, Collenchyma and Sclerenchyma tissues in plants, striped, smooth and cardiac muscle fibers and nerve cells in animals from prepared slides. Drawing of their labeled diagrams.
7. Determination of the melting point of ice and the boiling point of water.
8. Verification of the Laws of reflection of sound.
9. Determination of the density of solid (denser than water) by using a spring balance and a measuring cylinder.
10. Establishing the relation between the loss in weight of a solid when fully immersed in
  - a) tap water
  - b) strongly salty water, with the weight of water displaced by it by taking at least two different solids.
11. Determination of the speed of a pulse propagated through a stretched string / slinky.
12. Study of the characteristics of Spirogyra / Agaricus, Moss / Fern, Pinus (either with male or female cone) and an Angiospermic plant. Drawing and providing two identifying features of the groups they belong to.
13. Observing the given pictures / charts / models of earthworm, cockroach, bony fish and bird. For each organism, drawing of their picture and recording :
  - a) one specific feature of its phylum.
  - b) one adaptive feature with reference to its habitat.
14. Verification of the law of conservation of mass in a chemical reaction.
15. Study of the external features of root, stem, leaf and flower of monocot and dicot plants.

## Course Structure Class - X (Annual Examination)

Marks : 80

Unit No.	Unit	Marks
I	Chemical Substances - Nature and Behaviour	25
II	World of Living	23
III	Natural Phenomena	12
IV	Effects of Current	13
V	Natural Resources	07
	Total	80
	Internal assessment	20
	Grand Total	100

Note : Above weightage includes the weightage of questions based on practical skills.

**Theme : Materials**

**Unit I : Chemical Substances - Nature and Behaviour (55 Periods)**

**Chemical reactions :** Chemical equation, Balanced chemical equation, implication 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 nonmetals :** Properties of metals and non-metals; Reactivity series; Formation and properties of ionic compounds; Basic metallurgical processes; Corrosion and its prevention.

**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, Early attempts at classification of elements (Dobereiner's Triads, Newland's Law of Octaves, Mendeleev's Periodic Table), Modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties.

## Theme : The World of the Living

### Unit II : World of Living

(50 Periods)

**Life processes :** ‘Living Being’. Basic concept of nutrition, respiration, transport and excretion in plants and animals.

**Control and co-ordination in animals and plants :** Topic movements in plants; Introduction of plant hormones; Control and co-ordination in animals; Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: animal hormones.

**Reproduction :** Reproduction in animals and plants (asexual and sexual) reproductive health-need and methods of family planning. Safe sex vs HIV / AIDS. Child bearing and women’s health.

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

## Theme : Natural Phenomena

### Unit III : Natural Phenomena

(23 Periods)

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

Refraction; Laws of refraction, refractive index.

Refraction of light by spherical lens; Image formed by spherical lenses; Lens formula (Derivation not required); Magnification. Power of a lens.

Functioning of a lens in human eye, defects of vision and their corrections, applications of spherical mirrors and lenses.

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

## Theme : How Things Work

### Unit IV : Effects of Current

(32 Periods)

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, Interrelation 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, Electric Motor, Electromagnetic induction. Induced potential difference, Induced current. Fleming’s Right Hand Rule, Electric Generator, Direct Current. Alternating current : frequency of AC. Advantage of AC over DC. Domestic electric circuits.

## Theme : Natural Resources

### Unit V : Natural Resources

(20 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 of Energy.

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

**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. Big dams: advantages and limitations; alternatives, if any. Water harvesting. Sustainability of natural resources.

### PRACTICALS

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

#### LIST OF EXPERIMENTS

1. Finding 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 Hydrogen Carbonate solutionStudying the properties of acids and bases (HCl & NaOH) by their reaction with:
  - a) Litmus solution (Blue/Red)
  - b) Zinc metal
  - c) Solid sodium carbonate
2. Performing and observing the following reactions and classifying them into :
  - a) Combination reaction
  - b) Decomposition reaction
  - c) Displacement reaction
  - d) Double displacement reaction
    - (i) Action of water on quick lime
    - (ii) Action of heat on ferrous sulphate crystals



(iii) Iron nails kept in copper sulphate solution

(iv) Reaction between sodium sulphate and barium chloride solutions

OR

3. Observing the action of Zn, Fe, Cu and Al metals on the following salt solutions :

a)  $\text{ZnSO}_4$  (aq)

b)  $\text{FeSO}_4$  (aq)

c)  $\text{CuSO}_4$  (aq)

d)  $\text{Al}_2(\text{SO}_4)_3$  (aq)

Arranging Zn, Fe, Cu and Al (metals) in the decreasing order of reactivity based on the above result.

4. Studying the dependence of potential difference (V) across a resistor on the current (I) passing through it and determine its resistance. Also plotting a graph between V and I.

5. Determination of the equivalent resistance of two resistors when connected in series and parallel.

6. Preparing a temporary mount of a leaf peel to show stomata.

7. Experimentally show that carbon dioxide is given out during respiration.

8. Study of the following properties of acetic acid (ethanoic acid) :

i) odour

ii) solubility in water

iii) effect on litmus

iv) reaction with sodium Hydrogen Carbonate

9. Study of the comparative cleaning capacity of a sample of soap in soft and hard water.

10. Determination of the focal length of :

i) Concave mirror

ii) Convex lens

by obtaining the image of a distant object.

11. Tracing 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.

12. Studying (a) binary fission in Amoeba, and (b) budding in yeast with the help of prepared slides.

13. Tracing the path of the rays of light through a glass prism.

14. Finding the image distance for varying object distances in case of a convex lens and drawing corresponding ray diagrams to show the nature of image formed.
15. Identification of the different parts of an embryo of a dicot seed (Pea, gram or red kidney bean).

#### **Prescribed Books**

- 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
- Exemplar Problems - Class IX - NCERT Publication
- Exemplar Problems Class X - NCERT Publication

**QUESTION PAER DESIGN FOR SCIENCE (CODE NO. 086/090)**  
**Class - IX & X (2017-18)**

Time : 3 Hours

Max. Marks : 80

S. No.	Typology of Questions	Very Short Answer (VSA) 1 Mark	Short Answer - I (SAI) 2 Marks	Short Answer - II (SAII) 3 Marks	Long Answer (LA) 5 Marks	Total Marks	% Weightage
1	Remembering (Knowledge based simple recall questions, to know specific facts, terms, concepts, principles, or theories, Identify, define or recite, information)	2	-	1	1	10	15%
2	Understanding (Comprehension - to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	-	1	4	2	24	35%
3	Application (Use abstract information in concrete situation, to apply knowledge to new situations, use given content to interpret a situation, provide an example or solve a problem)	-	1	2	2	18	26%
4	High Order Thinking Skills (Analysis & Synthesis - Classify, compare, contrast or differentiate between different pieces of information, organize and / or integrate unique pieces of information from a variety of sources)	-	-	1	1	8	12%
5	Inferential and Evaluative (Appraise, judge and / or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	-	1	1+1*	-	8	12%
	Total (Theory Based Questions)	2x1=2	3x2=6	10x3=30	6x5=30	68(21)	100%
	Practical Based Questions (PBQs)		6x2=12	-	-	12(6)	
	Total	2x1=2	9x2=18	10x3=30	6x5=30	80(27)	

1. Question paper will consist of 27 questions.
2. All questions would be compulsory. However, an internal choice will be provided in two questions of 3 marks each and one question of five marks.

\*One question of 3 marks will be included to assess the values inherent in the texts.