

# COURSE STRUCTURE

## CLASS IX

### (THEORY)

One Paper	Time : Three Hours	Marks:60
Unit		Marks
Matter-Nature and Behaviour		16
Motion, Force and work		19
Organisation in the Living World		13
Natural Resources		07
Our Environment		05
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	Total:	60

THEME :

MATTER

#### UNIT 1: MATTER-NATURE AND BEHAVIOUR

(45 Periods)

**Measurement in Science and Technology:** Historical developments (in brief), International system of units, maintenance of standards.

**Nature of Matter :** Classification of matter based on chemical constitution-elements, compounds and mixtures, types of mixtures-homogenous and heterogeneous solution, suspension and concentration of solution (percentage only).

Atoms and Molecules, atomic and molecular masses, the mole, law of constant proportion, calculation of percentage composition of elements in simple compounds, determination of empirical and molecular formulae of simple substances.

**Structure of Atom:** Constituents of an atom-electrons, nucleus (neutrons and protons), atomic number and mass number, Isotopes, distribution of electrons in shells (upto atomic number 20), valence electrons and valency. Radioactivity radio-isotopes and their applications.

**Periodic Classification of Elements:** Modern periodic law, modern periodic table of 18 columns, variation in properties across a period and along a group-metallic and non-metallic, atomic size.

**Chemical Bonding :** Formation of a chemical bond, types of bonds- ionic and covalent, electronegativity and a polar covalent bond, properties of ionic and covalent compounds.

**Chemical Reactions:** Formulae of simple compounds, equation of simple chemical reactions and their balancing. Types of chemical reactions-combination, decomposition, displacement (single and double displacement), oxidation and reduction (in terms of gain/loss of electrons).

**THEME :**

## **ENERGY**

### **UNIT 2: MOTION, FORCE AND WORK**

**(55 Periods)**

**Motion :** Motion-in living and non-living. Uniform and non-uniform motion(one direction)-distance and displacement, velocity and acceleration; distance-time and velocity-time graphs for uniform and uniformly accelerated motion, derivation of equations of motion by graphical method, uniform circular motion (qualitative idea only).

**Force :** Force and motion: Newton's laws of motion-inertia of a body, inertia and mass, momentum, force and acceleration, conservation of momentum, action and reaction forces, Friction-factors affecting friction, sliding and rolling friction, examples of advantages and disadvantages of friction, control of friction (qualitative idea only). Thrust and Pressure-Archimedes' principle and its applications, relative density.

**Gravitation:** Universal law of gravitation-force of gravitation of the earth (gravity). Effect of gravity on plants, (in brief), acceleration due to gravity, mass and weight, motion of a projectile with initial horizontal velocity (qualitative idea only).

**Work and Energy :** Work done by a force-power and energy, kinetic and potential energy, specific heat capacity-computation of heat lost or gained by method of mixtures. Thermal expansion linear and volume expansion and its applications ; change of state; latent heat; cooling due to evaporation; humidity and relative humidity.

**Wave Motion :** Motion of a simple pendulum,oscillation and waves. Types of waves-longitudinal and transverse, amplitude, wavelength, frequency and velocity of a wave.

**THEME :**

## **LIVING WORLD**

### **UNIT 3 : ORGANISATION IN THE LIVING WORLD**

**(40 Periods)**

**Cell and Cell Structure:** Cell structure, difference between prokaryotic and eukaryotic cells, functions of cell organelles (brief account), cell division-mitosis (different stages), elementary idea of meiosis.

**Tissues :** Plant tissues-Structure and functions (meristematic and permanent-protective only); animal tissues-structure and functions (epithelial, connective, muscular and nervous).

**Diversity in the Living World:** General idea of classification of living organisms and their importance, nomenclature, classification (two kingdoms) with characteristics and examples up to phylum in plants and invertebrate animals and class levels in chordate animals.

**Food, Nutrition and Health :** Health and its importance (WHO definition), community and personal health; conditions essential for good health (nutrition, proper habits, exercise and relaxation), components of food (nutrients in food, their sources and functions), balanced diet, under-nutrition and malnutrition food adulteration (definition, common food adulterants, their tests and harmful effects); quality of drinking water.

**Human Diseases :** Diseases-definition, source and types of diseases (communicable and non-communicable diseases, symptoms, prevention and control of some diseases (malaria, influenza, cholera, diarrhoea, jaundice, typhoid, rabies, AIDS, tuberculosis).

Deficiency Diseases : protein energy malnutrition (marasmus and kwashiorkor), vitamin deficiency (scurvy, rickets, beriberi, pellagra, xerophthalmia), mineral deficiency (anaemia, goitre).

**THEME :** **NATURAL RESOURCES**

**(30 Periods)**

**UNIT 4: NATURAL RESOURCES**

**Our Natural Resources:** Air, water, soil, minerals, energy, flora and fauna, management and replenishment of natural resources.

**Coal and Petroleum:** Coal and petroleum as natural resources of carbon and its compounds, Coal-its destructive distillation (in brief), Petroleum-its fractional distillation (in brief). Carbon-tetravalency and catenation. Hydrocarbons-classification (Saturated and unsaturated). Homologous series, isomerism; preparation and properties of methane, ethene and ethyne.

**Food Resource-Sustainable Agriculture :** Mixed farming, mixed cropping, crop rotations (biological and economic considerations), varietal improvement through breeding and selection.

**THEME :** **ENVIRONMENT**

**(10 Periods)**

**UNIT 5: OUR ENVIRONMENT**

**Our Environment:** Habitat and Adaptation- Habitat and its types, adaptation in plants and animals, causes and effects of alteration of habitats on organisms conservation of habitats.

Biosphere-ecosystem and biosphere, structure of an ecological system, food chain, food webs, trophic levels, function of an ecological system, flow of energy, biogeochemical cycles of materials (carbon and nitrogen), types of ecosystems, biomass, biodiversity and its importance.

**PRACTICALS**

**LIST OF EXPERIMENTS**

**Marks : 40 (20+20)**

**1. 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
  - i) transparency
  - ii) filtration criterion
  - iii) stability

**2. 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 (a solvent)
  - iv) effect of heat.
3. To carry out the following chemical reactions and record observations. Also to identify the type of reaction involved in each case.
    - i) Iron with copper sulphate solution in water.
    - ii) Burning of Magnesium in air.
    - iii) Zinc with dilute sulphuric acid
    - iv) Heating of Lead Nitrate.
    - v) Sodium sulphate with Barium chloride in the form of their solutions in water.
  4. To determine the density of a solid (denser than water) by using a spring balance and a measuring cylinder.
  5. To establish the relation between the loss in weight of a solid when fully immersed in (i) tap water (ii) strongly salty water, with the weight of water displaced by it by taking at least two different solids.
  6. To study the variation in limiting friction between blocks of different masses and surfaces of different nature.
  7. To measure the temperature of hot water as it cools and plot a temperature-time graph.
  8. To study the variation in the time period (T) of a simple pendulum with its length (L) and to plot  $L-T^2$  Graph.
  9. To prepare stained temporary mounts of (a) onion peel and (b) human cheek cells and to record observations and draw their labeled diagrams.
  10. 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.
  11. To prepare methane gas by heating sodium acetate and soda lime and study its physical properties i.e., colour, odour, solubility in water and its chemical properties like combustion and action on bromine water and alkaline potassium permanganate solution.
  12. To identify the saturated and unsaturated organic compounds out of the following :  
(a) Kerosene (b) Vegetable oil (c) Butter (d) Carbon tetrachloride
  13. To test (a) the presence of starch in the given food sample (b) the presence of the adulterant metanil yellow in dal.
  14. To study the adaptive features of xerophytes such as cactus and hydrophytes such as water lily/lotus. Draw and record observations.
  15. To observe and draw the given specimens—earthworm, cockroach, bony fish and bird. For each specimen record
    - (a) one specific feature of its phylum
    - (b) one adaptive feature with reference to its habitat.

### SCHEME OF EVALUATION

Multiple choice written test (school based)	:	20 marks
Hands-on practicals (school based)	:	20 marks

**CLASS X  
(THEORY)**

One paper

Time : Three Hours

Marks: 60

Unit		Marks
I.	Chemical Reactions and Some Important Chemical compounds	06
II	Energy	17
III	Life Processes	17
IV	Natural Resources	14
V	Our Environment	03
VI	Exploring Space	03
<b>Total:</b>		<b>60</b>

**THEME: MATTER**

**UNIT 1: CHEMICAL REACTIONS AND SOME IMPORTANT CHEMICAL COMPOUNDS** (20 Periods)

**Rate of Chemical Reaction and Chemical Equilibrium :** Elementary idea of rate of reactions, slow and fast reactions, reversible and irreversible reactions. Chemical equilibrium-dynamic nature only; acids and bases, pH scale (qualitative treatment only), Heat changes during chemical reactions.

**Some Important Chemical Compounds:** Preparation/manufacture (outline only), properties and uses of-washing soda, baking soda, bleaching powder and plaster of paris. Manufacture and properties of some important building materials-lime, cement, glass and steel.

**THEME :** ENERGY

**UNIT 2: ENERGY** (45 Periods)

**Light :** Nature of light, reflection of light-laws of reflection, reflection from plane and curved surfaces, mirror-plane, concave and convex, sign conventions, mirror formula (without derivation), magnification.

**Refraction of light :** Laws of refraction, refraction through a rectangular slab, image formation by concave and convex lenses, lens formula (without derivation), sign conventions, power of a lens, some optical phenomena in nature (twinkling of stars, mirage), defects of vision and their correction.

**Dispersion:** Dispersion of white light by a glass prism; composition of white light, colour of objects and pigments, superposition of light of primary colours.

**Electricity and its Effects :** Potential and potential difference, electric current, Ohm's Law, combination of resistances in series and parallel; heating effects of electric current and its applications. Power, commercial unit of electrical energy.

**Chemical Effects of Current :** Electrolysis-electroplating.

**Magnetic Effect of Current:** Magnetic field due to current carrying conductor-straight, coil, solenoid (qualitative idea only), electromagnetic induction, direct and alternating current (qualitative idea), domestic electric circuits, safety measures in using electricity.

**Sources of Energy:** Renewable and non-renewable sources, Renewable sources-solar energy (solar cooker, solar water heater, solar cell), wind energy-hydro energy (tidal, ocean, thermal, hydroelectric), geothermal, wood, biogas, hydrogen and alcohol. Nuclear fusion, nuclear fission, chain reaction, nuclear reactors (basic principle and safety measures), advantages and hazards of using nuclear energy. Judicious use of energy.

## **THEME : LIVING WORLD**

### **UNIT 3 : LIFE PROCESSES**

**(42 Periods)**

**Life Processes-I:** Nutrition-modes of nutrition-autotrophic, heterotrophic, saprophytic, holozoic and parasitic; nutrition in plants-photosynthesis (main steps), factors affecting photosynthesis; nutrition in animals (main steps)-in amoeba and grasshopper; human digestive system.

**Respiration:** Respiration and breathing, respiration in plants and animals, types of respiration (aerobic and anaerobic), respiration through skin, gills, air tube, lungs (earthworm, fish, grasshopper and humans); structure and functions of respiratory organs in humans (elementary idea).

**Transportation:** Transportation in plants and animals; transportation in plants (water and minerals, food) transportation in human-role and composition of blood, blood clotting, blood groups and blood transfusion; structure and function of heart and blood vessels (elementary idea), lymphatic system.

**Excretion:** Excretion in animals, (amoeba and earthworm); excretion in humans; osmoregulation.

**Life Process-II:** Control and Coordination-Coordination in plants and animals-nervous system and hormones in human beings, reflex action.

**Reproduction:** Types of reproduction-asexual (fission, budding, regeneration); vegetative propagation in plants-cutting, grafting and layering; parthenogenesis; sexual reproduction and its significance, reproductive parts in plants, pollination and fertilization, human reproductive system-sexual cycle in females, fertilisation, population control, reproductive health; sexually transmitted diseases.

**Heredity and Evolution:** Heredity and variation; physical basis of heredity-chromosomes, DNA (elementary idea only), genes; sex determination (elementary idea of organic evolution).

## **THEME : NATURAL RESOURCES**

### **UNIT 4: NATURAL RESOURCES**

**(42 Periods)**

**Metals and non-Metals :** Metals-Minerals and ores; metallurgy-enrichment of ores, extraction of metals from ores, their refinement and purification (with reference to iron and aluminium). Activity series of metals, general properties and corrosion of metals. Alloys-components, properties and uses of steel, stainless steel, brass and magnesium, Alloying of gold.

**Non-metals-** Importance and general properties; Manufacture of ammonia-reactions only, its properties and uses. Sulphur-occurrence, extraction, properties (allotropy and effect of heat) and uses. Properties and uses of sulphur dioxide. Manufacture of sulphuric acid (reactions only), its properties and uses.

**Carbon Compounds:** Functional groups (oxygen containing only); alcohols-preparation, properties and uses of formaldehyde and acetone. Carboxylic acids-preparation, properties and uses of acetic acid.

**THEME: ENVIRONMENT**

**UNIT 5 : OUR ENVIRONMENT**

**(16 Periods)**

**Environment and Environmental Problems:** Causes, prevention and control (soil erosion, pollution of air, water and accumulation of waste) of environmental problems. Biodegradable and non-biodegradable materials, ecological balance-sustainable development, inter-relationship of population, environment and development. Efforts for conservation and protection of the environment: environmental laws (mention only).

**THEME: THE UNIVERSE**

**UNIT 6: EXPLORING SPACE**

**(15 Periods)**

**Exploring Space:** Night sky, milky way, galaxy, structure of universe and its theories. Space Exploration-(a brief history): Elementary ideas about space launching vehicles; different types of artificial satellites and their orbits, applications of artificial satellites-in communication, weather monitoring, remote sensing; space science programmes in India (an overview)

## PRACTICALS

**Marks :40 (20+20)**

### LIST OF EXPERIMENTS

- To find the pH of the following samples by using pH paper/universal indicator.
  - Dilute Hydrochloric acid
  - Dilute NaOH solution
  - Dilute Ethanoic acid solution
  - Lemon juice
  - Water
  - Dilute Sodium Bicarbonate Solution.
- To study the properties of acids and bases (Dil. HCl & Dil. NaOH) by their reaction with
  - Litmus solution (Blue/Red)
  - Zinc metal
  - Solid Sodium Carbonate
- To determine the focal length of
  - Concave mirror
  - Convex lensby obtaining the image of a distant object.
- 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.

