SCIENCE CLASS IX

Theme/ Sub-theme	Questions	Key concepts	Resources	Activities/ Processes
1. Food				
Higher yields	What do we do to get higher yields in our farms?	Plant and animal breeding and selection for quality improvement, use of fertilizers, manures; protection from pests and diseases; organic farming.	Visit to any fish/ bee/dairy/pig etc farms; data showing harmful effects of insecticides; process for the preparation of compost, vermi-compost.	Collection of weeds found in fields of different crops; collection of diseased crops; discussion and studying composting/vermi-composting **(Periods 8)**
2. Materials				
Material in our clothing	What kinds of clothes help us keep cool? Why do wet clothes feel cool?	Cooling by evaporation. Absorption of heat.	Work done in Class VII; glassware, heat source, black paper, thermometers.	Experiments to show cooling by evaporation. Experiments to show that the white objects get less hot. **(Periods 5)**
Different kinds of materials	In what way are materials different from each other? Is there some similarity in materials?	All things occupy space, possess mass. Definition of matter.	Everyday substances like wood, salt, paper, ice, steel, water, etc.	To feel the texture, observe the colour and lustre, effect of air, water and heat, etc. on each of the materials **(Periods 4)**
	In how many ways can you group the different materials you see around? How do solids, liquids and gases	Solid, liquid and gas; characteristics – shape, volume, density; change of state – melting, freezing,	Wax, water, ice, oil, sugar, camphor/ ammonium chloride/ naphthalene.	Sorting out a medley of materials, in various ways. Observe shape and physical state of different materials.

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	differ from each other? Can materials exist in all the three states?	evaporation, condensation, sublimation.		Observe effect of heat on each of the resources. (Teacher to perform the experiment for camphor, ammonium chloride and naphthalene.) **(Periods 4)**
What are things made of?	What are things around you made of? What are the various types of chemical substances?	Elements, compounds and mixtures. Heterogeneous and homogeneous mixtures. Colloids and suspensions.	Samples of commonly available elements, compounds and mixtures. Samples of solution, suspension and colloid.	Discussion on claims 'Air is a mixture' (Mixture of what? How can these be separated?), 'Water is compound' and 'Oxygen is an element'.
	Do substances combine in a definite manner?	Equivalence – that x grams of A is chemically not equal to x grams of B.	Historical accounts. Glassware, chemicals (oxalic acid, sodium hydroxide, magnesium ribbon).	Titration using droppers or syringes, quantitative experiments.
	How do things combine with each other?	Particle nature, basic units: atoms and molecules.	Kits for making molecular models.	
	Are there any patterns which can help us guess how things will combine with each other?	Law of constant proportions. Atomic and molecular masses.	Historical account including experiments of Lavoisier and Priestley.	Discussion on the fact that elements combine in a fixed proportion through discussion on chemical formulae of familiar compounds.

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	How do chemists weigh and count particles of matter?	Mole concept. Relationship of mole to mass of the particles and numbers. Valency. Chemical formulae of common compounds.		Simple numericals to be done by the students. A game for writing formulae. e.g. criss crossing of valencies to be taught through dividing students into pairs. Each student to hold two placards: one with the symbol and the other with the valency. Keeping symbols in place, teacher to move only valencies to form the formula of a compound.
What is there inside an atom?	Can we see an atom or a molecule under a microscope or by some other means? What is there inside an atom?	Atoms are made up of smaller particles: electrons, protons, and neutrons. These smaller particles are present in all the atoms but their numbers vary in different atoms. Isotopes and isobars.	Charts, films etc.	Brief historical account of Rutherford's experiment. **(Periods 18)**
3. The World of the Living Biological Diversity	How do the various plants around us	Diversity of plants and animals – basic	Specimens of some animals, and plants	Discussion on diversity and the

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	differ from each other? How are they similar? What about animals? How are they similar to and different from each other?	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 up to phyla and Chordates up to classes).	not easily observable around you.	characteristics associated with any group. **(Periods 14)**
What is the living being made up of?	What are we made up of? What are the different parts of our body? What is the smallest living unit?	Cell as a basic unit of life; Prokaryotic and eukaryotic cells, multicellular organisms; cell membrane and cell wall, cell organelles: chloroplast, mitochondria, vacuoles, ER, Golgi Apparatus; nucleus, chromosomes – basic structure, number. Tissues, organs, organ systems, organism.	Permanent slides, model of the human body.	Observation of model of human body to learn about levels of organization – tissue, organ, system, and organism, observe blood smears (frog and human), cheek cells, onion peel cell, Spirogyra, Hydrilla leaves (cyclosis). **(Periods 12)**

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		Structure and functions of animal and plant tissues (four types in animals; meristematic and permanent tissues in plants).		
How do we fall sick?	What are the various causes of diseases? How can diseases be prevented? How can we remain healthy?	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.	Newspaper articles, information from health centres, photographs of various causal organisms. Photographs, permanent slides of bacteria.	Surveying neighbourhood to collect information on disease occurrence pattern. Studying the life cycle of the mosquito and malarial parasite. Discussion on how malaria is spread, how to prevent mosquito breeding. **(Periods 10)**
How do substances move from cell to cell?	How do food and water move from cell to cell? How do gases get into the cells? What are the substances that living organisms exchange with the external world? How do they obtain these substances?	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.	Egg membrane, *Rhoeo* leaves, sugar, microscope, slides.	Looking at closed and open stomata, plasmolysis in *Rhoeo* leaf peels. **(Periods 15)**

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4. Moving Things, People and Ideas				
Motion	How do we describe 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.		Analysis of motion of different common objects. Drawing distance-time and velocity-time graphs for uniform motion and for uniformly accelerated motion. **(Periods 12)**
Force and Newton's laws	What makes things change their state of motion?	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.	Historical accounts; Experiences from daily life; wooden and glass boards, sand, balls; wooden support, some coins (say of Rs. 2 or Rs. 5); tumbler; balloons etc.	Demonstrating the effect of force on the state of motion of objects in a variety of daily-life situations. Demonstrate the change in direction of motion of an object by applying force. **(Periods 10)**
Gravitation	What makes things fall?	Gravitation; universal law of gravitation,	Spring balance	Analysis of motion of ball falling down

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	Do all things fall in the same way?	force of gravitation of the earth (gravity), acceleration due to gravity; mass and weight; free fall.		and of ball thrown up. Measuring mass and weight by a spring balance. **(Periods 7)**
Work, energy and power	How do we measure work done in moving anything? How does falling water make a mill run?	Work done by a force, energy, power; kinetic and potential energy; law of conservation of energy.	Rope (or string), board or plank, wooden block, ball, arrow, bamboo stick, spring, etc.	Experiments on body rolling down inclined plane pushing another body. Experiments with pendulum. Experiments with spring. Discussion. **(Periods 6)**
Floating bodies	How does a boat float on water?	Thrust and pressure. Archimedes' principle, buoyancy, elementary idea of relative density.	Cycle pump; board pins, bulletin board, mug, bucket, water etc.	Experiments with floating and sinking objects. **(Periods 4)**
How do we hear from a distance?	How does sound travel? What kind of sounds can we hear? What is an echo? How do we hear?	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).	String, ball or stone as bob, water tank, stick, slinky, rope, echo tube, rubber pipe etc. Model or chart showing structure of the ear.	Experiment on reflection of sound. **(Periods 10)**

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5. How Things Work **6. Natural Phenomena** **7. Natural Resources** Balance in Nature	Why do air, water and soil seem not to be consumed? How does the presence of air support life on earth? How have human activities created disturbances in the atmosphere? How does nature work to maintain balance of its components?	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, nitrogen.	Daily newspapers, magazines and other reading materials. Weather reports over a few months and air quality reports over the same time period. Case study material.	Case studies of actual situation in India with more generalised overview of inter relationship of air, water, soils, forests. Debates on these issues using resources mentioned alongside, visit to/ from an environmental NGO; discussion. **(Periods 15)**