6 SCIENCE AND TECHNOLOGY

Introduction

The National curriculum Framework 2005(NCF 2005) is one of the most comprehensive documents published in the last decade. It suggests radical changes in curricula for the country and offers an excellent framework for preparing need based curricula. While revising the syllabi for Science and Technology, the position paper on science (NCF 2005) has selected "Learning without burden" as the main theme. It also recommends a pedagogy which is hands-on and inquiry based. The present syllabus of Science and Technology for Std. IX and X is based on the principles and themes suggested in NCF 2005. The Themes are cross-disciplinary in nature: Food, Materials, The world of the Living, How things work, Moving things; people and ideas; Natural Phenomena and Natural Resources. Some themes have been merged to consolidate content.As suggested in NCF 2005, unnecessary focus on enumeration has been avoided. More importance has been given to the processes in science rather than focusing on only factual information.

Since the themes are inter-linked to each other, the entire syllabus has been integrated into one paper . This will facilitate better understanding of the subject across disciplinary boundaries and at the same time expose students to many topics in Biology, Physics and Chemistry.

Objectives

1. To enable the students to "Learn without Burden".
2. To expose the students to a "hands-on way'' of learning science.
3. To correlate scientific principles to the student's experience.
4. To involve students in exploring topics through discussion and activity.
5. To imbibe the spirit of enquiry in students through valuable learning experiences through experiment.
6. To help the students become autonomous learners.

STD. IX

1. Food

1.1. Plant and animal breeding and selection for quality improvement.

1.2. Use of fertilizers, manures.

1.3. Protection from pests and diseases; organic farming.

2. Materials

2.1 Matter: All things occupy space, possess mass. Definition of matter, characteristics of solids, liquids and gases e.g. shape, volume, density. Change of state: freezing, melting, evaporation, condensation, sublimation. Cooling by evaporation. Absorption of heat.

2.2 Elements, mixtures and Compounds: elements, compounds and mixtures as types of chemical substances. Types of mixtures; Heterogeneous, homogeneous, colloids, suspensions.

2.3 Combination of substances: Law of constant proportion, atomic and molecular masses. Particle nature, basic units: Atoms and Molecules.

2.4 Mole Concept: Relationship of mole to mass of the particles and numbers.

Valency. Chemical formulae of common compounds.

2.5 Atomic Structure: Electrons, protons and neutrons. Atomic number and atomic mass number. Isotopes and Isobars.

3. The World of the Living

3.1 Biological Diversity

Diversity of plants and animals: Basic issues in scientific naming. Basis of classification, Hierarchy of categories/ groups.

Plant classification: Major Plant groups (salient features): Bacteria,

Thalophyta, Bryophyta, Pteridophyta, gymnosperms and Angiosperms. Animal Classification : Major groups of animals (salient features): Non-Chordates up to phyla and non chordates up to classes.

3.2 Smallest living unit of Life, Cell : Cell as a basic unit of life prokaryotic and eukaryotic cells, multicellular organisms;cell membrane and cell wall, cell organelles, chloroplast, mitochondria, vacuoles, ER, Golgli 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).

3.3. Health

* Failure of health leading to disease.
* Disease and its causes.
* Diseases caused by microbes and their prevention: Typhoid, diarrhoea, malaria,hepatitis, rabies, AIDS, TB, Polio.
* Pulse Polio program.

3.4. Exchange of substances by living organisms with the external world:

Diffusion/exchange of substances between cells and their environment and between the cell themselves in the living system; role in nutrition, water and food transport, excretion, gaseous exchange.

4. Moving Things. People and ideas. Motion.

4.1 Motion: displacement, velocity, Uniform and non-uniform motion along a straight line,acceleration, distance-time and velocity-time graphs for motion and uniformly accelerated motion. Equations of motion by graphical method . Elementary idea of uniform circular motion.

4.2. 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.

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

4.4. Work, Energy and Power: work done by a force, energy, power. Kinetic and Potential energy, Law of conservation of energy.

4.5 Floating Bodies: Thrust and Pressure, Archimedes' Principle, Buoyancy. Idea of relative density.

4.6. Sound; Nature of sound and its propagation through different media, speed of sound, range of hearing in humans; ultrasound; reflection of sound; echo and SONAR Structure of the

Human Ear. (Auditory aspect).

5. Natural Resources - Understanding Ecosystem -

5.1 Types of ecosystem - forest, grassland, desert, aquatic, costal, marine

5.2 Interaction between biotic and abiotic factors in an eco-system

5.3 Energy flow and its importance. Cycles of nutrients in terrestrial and aquatic

(fresh water and marine) ecosystems, nature's mechanism in maintaining balance.

6. Waste Generation and Management

6.1 Sources of waste - domestic, industrial, agricultural and commercial

6.2 Classification of waste : biodegradable non biodegradable, toxic, non- toxic biomedical.

6.3 Impact of waste accumulation - Spoilage of landscape, pollution, health hazards, effect on terrestrial and aquatic (fresh water and marine) life.

6.4 Need for management of waste.

6.5 Methods of safe disposal of waste segregation, dumping, composting,

drainage, treatment of effluents before discharge, incineration, use of scrubbers and electrostatic precipitators.

6.6 Need for reducing, reusing and recycling waste.

6.7 Legal provisions for handling and management of waste.

STD. IX

PRACTICALS

LIST OF EXPERIMENTS

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 as a solvent.

iv) Effect of heat.

3. To carry out the following chemical reactions and record observations. Also 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 verify laws of reflection of sound.

5. To determine the density of solid. (denser than water) by using a spring balance and a measuring cylinder.

6. 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.

7. To measure the temperature of hot water as it cools and plot a temperature-time graph.

8. To determine the velocity of a pulse propagated through stretched string/ slinky.

9. To prepare stained temporary mounts of onion peel and to record observations and draw labeled diagram.

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

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

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 characteristic of spirogyra/ Agaricus, Moss/Fern, Pinus (either with male or female cone) and an Angiospermic plant. Draw and give two identifying features of groups they belong to.

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.

STD. X

1. Materials

1.1 Acids and Bases: Acids, Bases and Salts: General properties, examples and uses.

1.2 Chemical Reactions: Types of chemical reactions: combination, decomposition, displacement double decomposition, precipitation, and neutralization.

1.3 Oxidation and Reduction: Oxidation and Reduction in terms of gain and loss of oxygen and hydrogen.

1.4 Metals and Non-Metals: Brief discussion on basic metallurgical processes. Properties of common metals. Elementary idea about bonding.

1.5 Carbon Compounds: Elementary idea about bonding. Saturated hydrocarbons, alcohols, carboxylic acids (properties only)

1.6 Common chemicals used in daily life: Soap, common salt, Washing soda, Baking soda, bleaching powder, Plaster of Paris.

1.7 Classification of Elements: Brief historical account, Mendeleev's periodic table, gradation in properties.

2. The World of the Living

2.1. Life Processes: Definition of "Living things". Basic concept of nutrition, respiration, transport and excretion in plants and animals.

2.2. Control in the Living: Tropic movements in plants .Introduction to plant hormones; control and coordination in animals; voluntary, involuntary and reflex action, nervous system, chemical coordination, animal hormones.

2.3. Reproduction in the Living: Reproduction in plants and animals. Need for and methods of family planning. Safe Sex vs-. HIV/AIDS. Child bearing and women's health.

2.4. Heredity and Evolution: Heredity, origin of life- brief introduction, Basic concepts of evolution.

3. Moving things. People and Ideas

3.1. Electric Circuits: Potential and potential difference. Ohm's Law, Resistances in series and parallel. Power dissipated due to current. Inter relation between P, V, I and R.

3.2. Magnets: Magnetic field, field lines. Field due to a current carrying wire, coil, solenoid. Force on current carrying conductor. Fleming's Left Hand Rule. Electric motor, electromagnetic induction. Induced potential differences, induced current. Electric generator, principle and working.

Direct and Alternating current. Frequency of AC. Advantages of AC over DC. Domestic Electric Circuits.

4. Natural Phenomena

4.1. Light : Convergence and Divergence of Light.

4.2 Spherical Mirrors: Images formed by a concave mirror. Related concepts: centre of curvature, principal axis, optical centre, focus, focal length.

4.3 Refraction: appreciation of the concept of refraction. Laws of refraction. Velocity of light. Refractive index; twinkling of stars; dispersion of light. Scattering of light.

4.4. Lenses: Images formed by a convex lens; functioning of the lens in the human problems of vision and their remedies. Application of spherical mirrors and lenses.

5. Pollution

5.1 Types of pollution - air, water, (fresh and marine), soil, radiation, and noise.

5.2 Sources of pollution and major pollutants, oil spills

5.3 Effect of pollution on -environment, human health and other organisms

5.4 Abatement of pollution

6. Striving for a Better Environment

6.1 Use of efficient and eco-friendly technology

6.2 Sustainable use of resources.

6.3 Enforcement of acts, laws and policies

STD. X

PRACTICALS

LIST OF EXPERIMENTS

1. To find the pH of the following samples by using pH paper universal indicator.
   i) Dilute Hydrochloric acid
   ii) Dilute NaOH solution
   iii) Dilute Ethanoic acid solution
   iv) Lemon juice .
   v) Water
   vi) Dilute Sodium Bicarbonate Solution.
2. To study, the properties of acids and bases HCl & NaOH by their reaction with
   i) Litmus solution (Blue/Red)
   ii) Zinc metal
   iii) Solid Sodium Carbonate
3. To determine the focal length of
   a) Concave mirror

b) Convex lens by obtaining the image of a distant object.

4. 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.

5. To study the dependence of current (I) on the potential difference

   (V) across a resistor and determine its resistance. Also plot a graph between V and I.

6. To determine the equivalent resistance of two resistors when connected in series.

7. To determine the equivalent resistance of two resistors when connected in parallel.

8. To prepare a temporary mount of a leaf peel to show stomata.

9. To show experimentally that light is necessary for photosynthesis.

10. To show experimentally that carbon dioxide is given out during respiration.

11. To study (a) binary fission in Amoeba and (b) budding in yeast with the help of prepared slides.

12. To determine the percentage of water absorbed by raisins.

13. 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.

14. a) To observe the action of Zn, Fe, Cu and Al metals on the following salt solutions.

   i) $ZnS0_4$ (aq.)

   ii) $FeS0_4$ (aq.)

   iii) $CuS0_4$ (aq.)

   iv) $Al2(S0)_3$ (aq.)

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

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

   i) odour

   ii) solubility in water

   iii) effect on litmus

   iv) reaction with sodium bicarbonate