

**DIRECTORATE OF SCHOOL EDUCATION, GOVERNMENT OF TAMILNADU, CHENNAI - 600 006.**  
**SCIENCE SYLLABUS - BIOLOGY**

**Level of organisation**

**1.1. Unicellular level**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands that some plants are unicellular  2. Recognises that some plants exhibit locomotion  3. Recognises that even at unicellular level plants like this carry out asexual and sexual reproduction and other basic functions	<b>1.1. Unicellular level Chlamydomonas</b>  <b>1.1.1. Habitat</b>  <b>1.1.2. Structure of the cell</b>  <b>1.1.3. Asexual Reproduction</b>  <b>1.1.4. Sexual Reproduction</b>  <b>1.1.5. Life cycle</b>	1. Field trips to local fresh water ponds soon after the rain  2. Microscopic observation of chlamydomonas	1. Chart showing Chlamydomonas Life - History	1. Why does a pond look green few days after the rain?  2. Does the plant exhibit locomotion?  3. How does Chlamydomonas move from place to place  4. Are unicellular organisms capable of reproduction?	

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**Level of organisation**

**1.2. Multicellular level**

<b>STANDARD IX</b>					
<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows that most of the plants are multicellular  2. Compares unicellular plant with multicellular plant  3. Understands that multicellular plants exhibit high level of organisation	<b>1.2. Multicellular level</b> <i><b>Nephrolepis (Fern)</b></i> <b>1.2.1. Habitat</b> <b>1.2.2. Structure of the plant (sporophyte)</b> <b>1.2.3. Reproduction by spores (Developmental studies not needed)</b> <b>1.2.4. Structure of gametophyte</b> <b>1.2.5. Sex organs (Structure only)</b> <b>1.2.6. Fertilisation</b> <b>1.2.7. Alternation of generation</b> <b>1.2.8. Life cycle.</b>	1. Field trips to Parks to show the plant in its natural habitat.  2. Slides of gametophyte to show the sex organs  3. Fronds with sori may be exhibited  4. Herbarium of the frond may be prepared	1. Charts showing the life - cycle of <i>Nephrolepis</i>  2. Herbarium sheets may be shown	1. What is alternation of generation?  2. Which phase of the two generations is dominant?  3. Does water play a role in fertilisation?  4. Do the ferns bear flowers?	

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**1.3. Unicellular level - Euglena**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows levels of organisation in the living world  2. Understands that an organism can live as a single cell  3. Realises all life activities could be performed in a single cell.	<b>1.3. Euglena</b> <b>1.3.1. Systematic position and habitat</b> <b>structure, shape, size,</b>  <b>Locomotion - Flagellar and Euglenoid</b>  <b>Nutrition - Photosynthesis, Saprozoic</b>  <b>Respiration</b>  <b>Excretion</b>  <b>Behaviour</b>  <b>Reproduction</b>	1. Microscopic observation of drop of pond water having Euglena	1. Diagrams showing various parts.  2. Diagram showing Binary fission	1. What is the locomotor structure in Euglena?  2. What is the mode of nutrition in Euglena?  3. Compare Respiration and Excretion in Euglena?  4. Explain the behavioural pattern to environmental stimuli.  5. How does Euglena reproduce?	

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**1.4. Multicellular level - a Fish**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Recollects the systematic position of a fish  2. Knows that mullet is a bony fish  3. Explains the swimming movements of a fish	<b>1.4.1. Systematic position</b> <b>Metazoa</b> <b>Eumetazoa</b> <b>Triploblastic</b> <b>Eucoelomate (Mullet)</b>  <b>1.4.2. External morphology - Mullet Shape, form, fins, scales lateral line sense organ</b>  <b>1.4.3. Swimming movements</b>  <b>1.4.4. Organ systems and functions</b>	1. Showing various organ systems through dissection  2. Students to handle fish  3. Visit to an aquarium / market  4. Maintenance of a small aquarium	1. External morphology of a fish  2. Diagram of viscera	1. Why do fishes have scales?  2. What are the methods of respiration in fishes?  3. Can a fresh water fish live in marine water?  4. Can a fish live on land?	

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**1.5. Plant anatomy**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<p>1. The organisation of different types of tissues in different organs of a plant</p> <p>2. Understands that there is a correlation between the internal organisation and function</p>	<p><b>1.5. Plant Anatomy</b></p> <p><b>1.5.1. Dicot stem (Sun flower)</b></p> <p><b>1.5.2. Dicot root (bean)</b></p> <p><b>1.5.3. Dicot leaf (sunflower)</b></p>	<p>1. Cross section of sunflower stem and leaf and Bean root to be observed under the microscope</p>	<p>1. Charts showing c.s. of stem, root and leaf.</p>	<p>1. What are the tissues observed in the stem, root and leaf?</p> <p>2. Do you see the presence of all types of tissues in all parts of the leaf?</p> <p>3. What is a stele?</p> <p>4. What is mesophyll?</p> <p>5. Why are some cells green?</p>	

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**1.6. Human Anatomy**

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<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows the importance of Human anatomy in medicine  2. Explains the organ systems in detail	<b>1.6.1. Brief history - Introduction</b>  <b>1.6.2. Anatomy of organ systems</b>  <b>- Digestive, respiratory, circulatory, muscular, nervous, sensory, (Eye, ear) and excretory.</b>	1. Explanation using Tarsus model and charts.	1. Diagrams of organ systems	1. Name atleast three well known skeletal muscles.  2. What is the light sensitive region in the eye.	

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**2. Cell Biology and Genetics**

**2.1. Introduction to Microscopy**

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<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Appreciates the importance of microscope in the study of living organisms.  2. Understands various parts of a compound microscope  3. Learns to examine materials under the microscope	<b>2.1. Introduction to microscopy</b>  <b>2.1.1 Invention of microscope</b>  <b>2.1.2. Light microscope, Dissection microscope and compound microscope.</b>  <b>2.1.3. Parts of a compound microscope</b>  <b>2.1.4. Electron microscope - Transmission Electron microscope (TEM) - Scanning Electron Microscope (SEM) - A simple Introduction</b>	1. Demonstration & handling by students of dissection and compound microscopes.  2. Photographs showing Electron microscopes.  3. Visit to the laboratory having electron - microscopes.	1. Charts showing dissection, compound and electron microscopes.  2. Photographs of cells. Seen under compound and electron microscopes - a comparison.	1. What is the role of microscope in the study living organisms?  2. How does a compound microscope differ from an electron microscope?  3. What are the units of measurement in microscopic studies?	

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**2. Cell Biology and Genetics**

**2.2. Ultrastructure of a living cell**

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<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the complex organisation of a living cell.  2. Appreciates the ultra structure of the living cell  3. Compares the ultra structure of a plant cell with that of an animal cell  4. Understands the similarities and differences among these cells.	<b>1. Ultrastructure of a living cell</b>  <b>2. Ultrastructure of a plant cell.</b>  <b>3. Differences between plant and animal cells.</b>	1. Electron micro graphs of plant and animal cells.	1. Charts showing ultra structure of plant and animal cells	1. What are the differences between plant and animal cells?  2. What are the contents which are common for both plant & animal cells?	



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**2. Cell Biology and Genetics**

**2.3. Components of a living cell**

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<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Recognises living and nonliving components of a cell  2. Understands the complex nature of cell  3. Appreciates the specific function of each kind of organelle	<b>2.3. Components of a living cell :</b>  <b>2.3.1. Cell wall, plasma membrane</b> <b>Nucleus</b>  <b>Mitochondrion</b>  <b>Plastids</b>  <b>Endoplasmic reticulum</b>  <b>Golgi bodies</b>  <b>Ribosomes</b>  <b>Lysosomes</b>  <b>Microtubules</b>  <b>Peroxisomes</b>  <b>Vacuole</b>  <b>2.3.2. Cell inclusions (reserve food materials waste products) (Brief account of the above)</b>	1. Microscopic examination of onion peeling to see the nucleus and the cell wall.  2. Microscopic examination of a young leaf of Hydrilla to see chloroplasts.  3. Microscopic examination of C.S. of banyan leaf to see the cystolith (all inclusion)	1. Charts showing various components of a living cell.  2. Charts showing detailed structures of various organelles	1. What are Cell organelles  2. What are cell inclusions?  3. Which organelle controls the activities of a cell?	

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**2.4. Cell division**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Realises the need for cell division  2. Knows the nuclear changes in cell division  3. Knows the significance of meiosis  4. Knows the place of occurrence of mitosis and meiosis	<b>2.4.1. Introduction to cell division</b>  <b>2.4.2. Amitosis</b>  <b>2.4.3. Mitosis - stages</b>  <b>2.4.4. Elementary idea of meiosis</b>	1. Models showing different stages in mitosis.  2. Section of the stained onion root tip squash to show the different stages.	1. Diagram showing stages of mitosis  2. Table showing differences between mitosis and meiosis.	1. Define Amitosis  2. List out the different stages in mitosis  3. What is cytokinesis and karyokinesis  4. Enumerate the major differences between mitosis and meiosis.	

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**2. Cell Biology and Genetics**

**2.5.Elements of Cancer biology**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Defines cancer  2. Explains the types of tumours  3. Compares normal cell and cancer cell.	<b>2.5.1. Introduction</b> <b>2.5.2. Tumour - Types</b> <b>2.5.3. Differences between normal cell and cancer cell</b> <b>2.5.4. Types of cancer</b> <b>2.5.5. Carcino - genic agents</b> <b>2.5.6. Treatment</b>	1. Models of Cencer cell  2. Collecting pictures from megazines	1. Diagram of cencer cell	1. What do you know about the term oncology  2. Why is smoking in public places banned.  3. Why is chewing of Tobacco products considered harmful?  4. Why is fibrous food advised?	

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**2. Cell Biology and Genetics**

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**2.6.Mendelism**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows Mendel's work  2. Understands mono - hybrid cross and dihybrid cross  3. Realises the importance of Mendel's work  4. Applies Mendelism in life situation	<b>2.6.1. Mendel and his work</b>  <b>2.6.2. Mendel's - Laws</b>  <b>2.6.3. Law of segregation</b>  <b>2.6.4. Law of Independent assortment</b>	1. Real specimens of entire plants with flowers of different colours  2. Artificial flowers  3. Charts and models  4. With bangles buttons seeds of different colours to explain different theories	1. Checker board method	1. What are the circumstances which led Mendel to formulate his laws?  2. Why did Mendel choose pea plant for his expt?  3. What is a Test cross?  4. What is back cross?	

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**3. Reproductive Biology**

**3.1. Reproduction - Introduction**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Realises that rate of reproduction and population strength are related  2. Understands that sexual reproduction has gentical advantage	<b>3.1. Reproduction introduction</b>  <b>3.1.2 Types of reproductions in plants and animals</b>  <b>3.1.3 Regeneration</b>	1. Charts and cutouts on flannel Board  2. Magnetic board  3. Table, chart showing asexual and sexual reproduction	1. Diagrams illustrating content  2. Regeneration in planaria	1. "Reproduction is meant for continuance of a speicies" - comment.  2. Write a note on regeneration.	

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**3. Reproductive Biology**

**3.2. Parts of a flower**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Recognises the parts of a flower  2. Understands the role of accessory whorls  3. Appreciates the role essential whorls	<b>3.2.0. Parts of a flower</b>  <b>3.2.1. Flower as a condensed shoot</b>  <b>3.2.2. Accessory whorls calyx and corolla</b>  <b>3.2.3. Essential whorls Androecium and Gynoeceium</b>	1. Dissection of a dicot flower (shoe-flowers)  2. Dissection of a monocot flower (Onion)	1. Charts showing the parts of a flower.	1. Why are calyx and corolla called as accessory whorls?  2. What is the male part of a flower?  3. What is the female part of a flower?	

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**3. Reproductive Biology**

**3.3. Fruits and Seeds**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands that the flower becomes a fruit after fertilization  2. Understands the types of fruits	<b>3.3.0. Fruits - fertilised flowers</b>  <b>3.3.1. Simple, Aggregate composite fruits.</b>  <b>3.3.2. Fleshy fruit</b>  <b>Dry fruits</b>  <b>3.3.3. Dry' dehiscent</b>  <b>Dry indehiscent fruit</b>  <b>3.3.4. Developed ovule is the seed</b>	1. Types of fleshy fruits and dry fruits to be shown.  2. Aggregate fruits (Annona) to be shown.  3. Jack, Pineapple fruits - shown for composite fruits	1. Diagrams of fruits	1. What is a fruit?  2. What is meant by fleshy and dry fruit?  3. What is a seed?	

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**3. Reproductive Biology**

**3.4. Parthenocarpy**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the formation of seedless fruits.  2. Understands that fertilization can be substituted by hormones for fruit formation.	<b>3.4.0 Development of fruits without fertilization</b>  <b>3.4.1. Parthenocarpic fruits</b>  <b>3.4.2 Role of hormones in parthenocarpy.</b>  <b>3.4.3. Seedless fruits</b>	1. Seedless fruits of grape, Guava, Sapota, Dates to be shown	1. Diagram showing the process of fertilization	1. Define parthenocarpy?  2. What are parthenocarpic fruits?  3. Define seedless fruits?	



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**3. Reproductive Biolody**

**3.5. Reproductive Biology**

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<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Realises various levels of sexual reproduction  2. Recognises primary and secondary sexual characters.	<b>3.5. Sexual reproduction in animals</b>  <b>3.5.1. In Unicellular organisms</b>  <b>3.5.2. Temporary reproductive organs</b>  <b>3.5.3. Permanent reproductive organs</b>  <b>3.5.4. Sexual dimorphism.</b>	1. Illustrations with charts  2. Pictures	1. Diagrams - Paramacoeium conjugation.  2. Earthworm copulation	1. "Sexual reproduction is an important physiological activity of any animal" - comments.  Write a note on sexual dimorphism.	

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**3. Reproductive Biology**

**STANDARD IX**

**3.6 Human Reproductive System**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows male and female reproductive systems.  2. Relises the criticality of the adolesence period.	<b>3.6.1. Male reproductive system - Structure and function</b>  <b>3.6.2. Female reproductive system - structure and function</b>  <b>3.6.3. Attainment of puberty - maturation</b>  <b>Adolesence and Behavioural changes.</b>	1. Models & Charts showing Male and Female reproductive systems.  2. Collection of paper clippings related to Adolescent problems	1. Labelled Diagrams	1. Enumerate Physical, Physiological and psychological changes between young adult males and females.  2. Sex education is a must why?	

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**4. Diseases and Immunology**

**STANDARD IX**

**4.1 Plant Diseases**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the common diseases of Plants caused by bacteria and fungi.	<b>4.1.1. Citrus Canker -</b> <b>Symptoms -</b> <b>Causative Organism -</b> <b>Control measures</b>  <b>4.1.2. White rust -</b> <b>Symptoms -</b> <b>Causative organism -</b> <b>Control measures .</b>	1. Fresh specimens of infected citrus fruits (citrus canker) and Amaranthus leaves  (Greens) White rust to be shown.	1. Charts showing the structure of Xanthomones infected fruit for citrus canker to be shown.  2. Charts showing the life cycle of Abbugo (for white rust to be shown)	1. What is citrus canker?  2. How will you identify white rust disease?	

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**4. Diseases and Immunology**

**STANDARD IX**

**4.2. Human Diseases**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Defines a healthy life  2. Understands that several diseases are communicable  3. Realises that Diseases can be endemic and epidemic  4. Understands the importance of sanitation and hygiene  5. Knows that diseases can be cured.	<b>4.2. Diseases - definition - types</b>  <b>4.2.1. Communicable diseases</b>  <b>A study of following diseases</b>  <b>Tuberculosis</b> <b>Cholera,</b> <b>Anthrax,</b> <b>Leprosy and</b> <b>Leptospirosis</b>  <b>AIDS -</b> <b>Signs, Causative organisms and incubation period.</b>  <b>4.2.2. Natural immunity - Human Immune system - basics</b>	1. Explanation through charts and pictures	1. Pictures showing symptoms  2. Picture of HIV Virus	1. What is the importance of health education  2. How to protect ourselves from diseases.  3. What are zoonotic diseases  4. Write short notes on communicable diseases	

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**5. Our Environment**

**5.1 Ecosystem**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the occurrence of different ecosystems  2. Compares the pond ecosystem with forest ecosystem	<b>5.1.1. Definition</b> <b>5.1.1. Types of Ecosystem</b> <b>5.1.2. Pond Ecosystem</b> <b>5.1.3. Forest Ecosystem</b> <b>5.1.4. Components of an Ecosystem (Pond Ecosystem)</b>	1. Visit to a pond and a nearby forest to study the components	1. Charts showing different ecosystems.	1. What is an ecosystem?  2. What is a producer?  3. What are the differences between pond ecosystem and forest ecosystem  4. What are the biotic components of a pond?	

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**5. Our Environment**

**STANDARD IX**

**5.2. Food chain and Food Web**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the existence of different types of food chains in nature  2. Understands the relationship between producers and consumers in a food chain	<b>5.2.0. Definition</b>  <b>5.2.1. Types and components of a food chain</b>  <b>5.2.3. Producers and Consumers in a food chain</b>  <b>5.2.4. Food web : Definition and description</b>	1. Visit to a farm to demonstrate food chain (Grass - Herbivore - man (producer) (Cow) (consumer)  2. Visit to a dairy	1. Diagrams showing the food chains (Grazing food chain and detritus food chain)	1. What is a food chain?  2. How is a producer important in a food chain?  3. Why are plants called producers?	

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**5. Our Environment**

**5.3. Ecological Phramids**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Defines Ecological Pyramids  2. Understands that producers are more in number than top level consumer  3. Knows that the pyramids are broad.	<b>5.3.0. Ecological pyramids</b>  <b>Representation of number, Biomass and energy of an ecosystem</b>  <b>5.3.1. Types of ecological pyramids</b>  <b>1. Pyramid of number</b>  <b>2. Pyramid of Biomass</b>  <b>3. Pyramid of energy.</b>	1. Charts and models showing different Ecological pyramids	1. Appropriate Diagrams	1. Define Ecological pyramids?  2. What are the types of Ecological pyramids?  3. Can a pyramid be inverted?	

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**5. Our Environment**

**5.4. Energy Flow**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows that the sun is the ultimate source of energy  2. Understands that photosynthesis is a basic energy conversion process in an ecosystem  3. Understands that energy levels decrease during energy flow.	<b>5.4.0. Transfer or flow of energy</b>  <b>Conversion of solar energy</b>  <b>5.4.1. Four components - abiotic, producers consumers and decomposers</b>  <b>5.4.2. Role of plants Herbivores Carnivores and Decomposers.</b>	1. Charts and cutouts showing energy flow.	1. Flow charts - diagram	1. What is meant by energy flow?  2. What is the main source of energy  3. What are the four components in energy flow?  4. Explain the role of plants Herbivores, carnivores in Energy flow?	



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**5. Our Environment**

**STANDARD IX**

**5.5. Bio-Geo Chemical cycles**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Defines Biogeochemical cycle.  2. Understands that there is interaction between abiotic and biotic components.	<b>5.5.0. Bio - geo chemical cycle</b>  <b>5.5.1. Types of Biogeo chemical cycles.</b>  <b>Carbon cycle</b>  <b>Nitrogen cycle</b>  <b>Oxygen cycle</b>  <b>Phosphorous cycle</b>  <b>Sulphur cycle</b>	1. Charts showing Biogeo chemical cycle	1. Diagramatic representation of Biogeo chemical cycle.	1. What are the types of Biogeo Chemical cycles?  2. What is the importance of Nitrogen cycle.  3. What is the source of Carbon?	

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**6. Applied Biology**

**6.1. Natural resources**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the uses of various natural resources for mankind  2. Emphasises the need to conserve our natural resources	<b>6.1.0. Types of Natural resources</b>  <b>6.1.1. Air</b>  <b>6.1.2. Water</b>  <b>6.1.3. Soil</b>  <b>6.1.4. Minerals</b>  <b>6.1.5. Energy</b>  <b>6.1.6. Flora and fauna</b>  <b>6.1.7. Management of Natural resources</b>	1. Collect and show different soil samples (Sand, clay, loam, garden soil) and water samples (Pond, Lake, Sea, Well, River)	1. Charts showing Biosphere reserves can be shown  2. Charts showing the different sources of energy may be shown  3. Charts showing wild life can be shown.	1. What are the different types of Natural resources?  2. What are the different types of soils found in your locality?	

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**6.2. Crop Production**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Appreciates the importance of crop plants in human welfare.  2. Understands the cultivation practices of one common food crop  3. Identifies different types of crops and their pests	<b>6.2.0. Importance of crops for man</b>  <b>6.2.1. Cultivation of crops (Cash and food crops)</b>  <b>6.2.2. Nutrients required for the crops (Organic &amp; Inorganic)</b>  <b>6.2.3. Water requirements</b>  <b>6.2.4. Crop protection</b>	1. Collection of some common cultivated crops.  2. Visit to an agricultural farm (or) an agricultural field.  3. Demonstration of wormicomposting  4. Different types of fertilizers can be shown with details of nutrients they contain	1. Charts showing different crop plants  2. Charts showing wormi composting	1. List out the common food crops grown in our villages  2. What are the fertilisers used for different types of food crops?	

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**6.3. Plant pests and control**

**STANDARD IX**

<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows that majority of pests are insects  2. Realises damage caused to plants  3. Understands economic loss	<b>6.3.0. Plant pests</b>  <b>6.3.1. Insect pests of Rice, Millets, Sugarcane, Oil seeds, coconut and vegetables</b>  <b>6.3.2. Pest control Natural and Artificial control</b>  <b>6.3.3. Pesticides types and applications</b>	1. Showing plant pests collected from the field  2. Charts	1. Pictures of pests  2. Pictures of damage to plants	1. Can you provide the Zoological names of atleast 2 rice pests?  2. What are the methods of pest control?	

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**Applied Biology**

**6.4. Food Storage**

<b>STANDARD</b> <b>X</b>					
<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Understands the differences between perishable and non-perishable foods.  2. Recognises the role of microbes in food spoilage	<b>6.4.1. Kinds of food (perishable and nonperishable foods)</b>  <b>6.4.2 Spoilage of food</b>  <b>6.4.3. Methods of storage</b>  <b>6.4.4. Advantages of storages</b>	1. Short trip to cold storage houses.  2. Visit to food grain godowns  3. Visit to nearby Food Corporation of India godowns	1. Charts and photographs showing organisms involved in food spoilage  2. Collection of different kinds of food.	1. What are perishable foods? Give examples?  2. How are different kinds of foods stored?  3. What is food - spoilage?	

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<b>STANDARD X</b>	<b>6.5. Livestock, Poultry, Apiculture and Sericulture</b>				
<b>Expected Specific Outcomes of Learning</b>	<b>Content in terms of Concepts</b>	<b>Curriculum Transactional Strategies</b>	<b>Illustrations</b>	<b>Evaluation</b>	<b>Suggested No. of Periods</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
1. Knows that culturing of various animals enhances our economy  2. Knows that hybrid varieties one high yielding  3. Learns the techniques of Apiculture and poultry maintenance	<b>6.5. Livestock - Varieties Indian and exotic Milk yield Diseases</b> <b>6.5.1. Poultry Techniques Breeds Layers and Broilers Diseases</b> <b>6.5.2. Apiculture - Honey bee varieties Culture technique Bee hive Uses of honey Bombyx mori</b> <b>6.5.1. Sericulture Method - Mulberry Bombyx mori Other varieties Silk fibres Uses Diseases</b>	1. Visit to a poultry farm  2. Adopting sericulture in the school	1. Pictures of cows, chicken  2. Pictures of members of a honey bee colony  3. Life cycle of Bombyx mori - Diagram	1. What are the native varieties of cattle?  2. Name a few exotic variety of cattle.  3. What are the breeds of poultry available?  4. What is the nutritive value of an egg?	