DEPARTMENT OF SCHOOL EDUCATION

RIGHT TO EDUCATION
SAMAGRA SHIKSHA - A.P.
EDUCATION FOR ALL

STRUCTURED LESSON PLANS FOR CBSE-AFFILIATED SCHOOLS

BIOLOGY

GRADE - 09

A Teacher Resource Book for
Competency Based Teaching-Learning

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING (SCERT)

Committee for Development of Structured Lesson Plans

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MESSAGE BY PRINCIPAL SECRETARY

It brings me a great joy to invite all the teachers of CBSE-affiliated government schools to this valuable resource book of structured lesson plans. Inspired by the vision of our honorable Chief Minister, we are committed to supporting the teachers in shaping a bright future for all the children in Andhra Pradesh. We envision our children transforming into global citizens, excelling in academics and being ready for the world of work. In order to aid the teachers in this pivotal task of preparing the students to emerge as global citizens, the School Education Department is committed to making available the best resources and training. This lesson plans resource book is a transformational step in that direction. Utilized appropriately, this resource books will transform the teaching-learning process and experience in the classroom and lead to deeply engaging the students.

I hope you make the best use of this resource, which has been put together by our own teachers trained by experts from Azim Premji University and facilitated by the Center for Research in Schemes and Policies (CRISP). They have taken into consideration the teaching-learning needs of all types of learners and created lesson plans that are rich in activities, examples, and assessments. They have followed the CBSE Learning Framework and NCERT Learning Outcomes for Secondary Stage, along with principles from the National Curriculum Framework: School Education 2023.

At the crucial juncture of secondary school, our children need spirited teachers like you to prepare them for the changing and dynamic world. You bear the power and responsibility to shape their minds and hearts and guide them to step out into the world and contribute to our state's growth and country's economy.

Your dedication and efforts in implementing these structured pedagogical approaches will not only enhance the learning experience of our students but also equip them with the necessary skills and knowledge to thrive in an ever-evolving global landscape. Together, let us embark on this journey of educational excellence and empower our students to become the leaders of tomorrow.

With great hope and appreciation,

Shri Praveen Prakash, IAS
Principal Secretary, Department of School Education
Government of Andhra Pradesh

MESSAGE BY COMMISSIONER

The United Nations Sustainable Development Goal 4 (SDG 4) underscores the pivotal role of education in unleashing human potential and fostering self-respect. As the Commissioner of School Education, I am privileged to champion a vision that empowers the children of Andhra Pradesh with boundless possibilities and opportunities. Through pioneering reforms in education, encompassing cutting-edge infrastructure, ongoing professional development for educators and administrators, innovative digital initiatives, and an unwavering commitment to providing top-tier educational resources, our state stands as a beacon of educational transformation.

Government of Andhra Pradesh is committed to implement best initiatives to enhance rthe quality of education in the State. Obtaining CBSE affiliation to 1000 schools is one of such key initiatives. This lesson plan resource book developed for the use of teachers working in CBSE schools represents yet another milestone in our journey. Recognizing teachers as the cornerstone of our education system, we have entrusted them to craft these lesson plans for your benefit. After undergoing rigorous training in pedagogy, subject matter, learning outcomes and competencies, our educators have infused these lesson plans with their profound knowledge of the subject, and understanding of our students and their diverse contexts. It is a labor of love and thought, an amalgamation of explorations and experiments, presented for you to embrace and utilize effectively.

These lesson plans are created with the aim of providing a rich repository of ideas to enhance classroom engagement and productivity, and provide yet another innovative resource that teachers can employ. Feel free to adapt and supplement these plans as you see fit. The teacher reflections section serves as a tool for self-assessment and improvement, allowing you to augment your lessons and address any gaps you may identify.

I am optimistic about our state's trajectory towards competency-based teaching, with a focus on measurable learning outcomes that can be continually evaluated and enhanced. The decision to affiliate 1000 schools with CBSE and implement a curriculum aligned with national standards is indeed a significant stride in the right direction. Together, let us embrace this transformative journey towards educational excellence and empower our students to thrive in an ever-evolving world.

I congratulate everyone who worked towards bringing this excellent resource book for the teachers. I thank Center for Research in Schemes and Policies (CRISP) for the innovative ideas they presented to the Government, including development of structured lesson plans. The support of SPD Samagra Shiksha, continuous facilitation by CRISP, expert technical advice of Azim Premji University faculty, hard work of our teachers, CBSE team in Commissionerate office and SCERT made it possible to bring out this resource book in time for the 2024-25 academic year.

With sincere optimism and appreciation,
Shri S Suresh Kumar, IAS
Commissioner,
Department of School Education,
Government of Andhra Pradesh

MESSAGE BY THE STATE PROJECT DIRECTOR

The National Education Policy 2020 highlights that the purpose of education is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution. To realize the NEP's vision, it is essential for educators to align with this goal and transition from curriculum-centric to competency-driven teaching methods.

The State's commitment to this shared vision is visible in the Strengthening Andhra's Learning Transformation (SALT) Project, where one of the pivotal focus areas is the professional development of teachers. This entails utilizing insights from self-assessments, academic performance data from school-based evaluations, and classroom observations to enhance pedagogical skills. With continuous support from the education department, teachers will refine their pedagogical approaches, ensuring effective delivery of lessons.

In the same vein, I am delighted to introduce this Lesson Plan resource book for our CBSE-affiliated schools, crafted by experts from both within our state and across the nation. These lesson plans signify a shift away from rote memorization and content accumulation towards a structured approach aimed at fostering values, dispositions, and competencies in students. Rooted in the vision of the NEP and operationalized by the National Curriculum Framework: School Education 2023, each plan corresponds to a 40-minute class targeting specific learning outcomes from NCERT's Secondary Stage. These outcomes collectively contribute to observable learning achievements and the development of competencies over time. Moreover, this resource book empowers teachers to tailor their content and assessments dynamically by monitoring and addressing students' learning needs continuously.

I hope the teachers will find these resources valuable and helpful in transforming classroom transactions. Together I hope we will reshape the educational landscape of Andhra Pradesh in the years ahead. Best wishes for your endeavors!

Shri B Srinivasa Rao, IAS
State Project Director, Samagra Shiksha
Government of Andhra Pradesh

MESSAGE BY JOINT DIRECTOR, CBSE

In a landmark decision, the Government of Andhra Pradesh affiliated 1000 Government schools with the Central Board of Secondary Education (CBSE). This transition marks a significant milestone in our efforts to provide standardized and high-quality education to our students. The CBSE curriculum is widely recognized for its comprehensive and contemporary approach to learning, offering students a competitive edge on a national scale. The Board emphasizes holistic development of learners by providing a stress-free learning environment that will develop competent, confident and enterprising citizens who will promote harmony and peace. It is committed to providing quality education to promote intellectual, social and cultural vivacity among its learners.

By aligning our schools with CBSE, we aim to ensure our students are well-prepared to compete on a national level and excel in today's dynamic world. In order to achieve this, our utmost efforts have gone into developing these structured lesson plans incorporating NCERT's Secondary Stage Learning Outcomes, the National Curricular Framework: School Education 2023, and CBSE Learning Framework document developed by Azim Premji University. 'Structured Pedagogy' is a scientific, evidence-based, learner-centric approach for teaching that equips every teacher with clearly defined objectives, proven methods, well-structured tools, and practical training. After many rounds of rigorous training, expert teachers from our CBSE schools integrated the conceptual and practical aspects of their subjects and condensed them into these easy-to-use lesson plans.

We thank the Center for Research in Schemes and Policies (CRISP) and Azim Premji University for their innovative ideas and tireless support.

I encourage each of you to fully utilize these plans and personalize them to fit your teaching style. May this invaluable resource serve as a valuable tool as you guide Grade 10 students through this critical stage of their education. Your dedication as teachers brings us immense joy and pride, as we entrust the future of our state's children to your capable hands. Wishing you all the best!

Mr Krishna Reddy
Joint Director, CBSE
Department of School Education
Government of Andhra Pradesh

MESSAGE BY CENTRE FOR RESEARCH IN SCHEMES AND POLICIES (CRISP)

Shri. **R. Subrahmanyam**
I.A.S.(Retd), Secratary of CRISP

Ms. K. Sandhya Rani
IPoS.(Retd), Founding member of CRISP

Mrs. P. Usha Kumari
I.A.S.(Retd), State Lead of AP Team CRISP

In October 2023, the Centre for Research in Schemes and Policies (CRISP) forged a significant partnership with the Government of Andhra Pradesh, to help bring about a transformation for the state's School Education system. Our inaugural initiative was designed to cultivate excellence within the 1000 CBSE-affiliated schools. CRISP's primary focus was to support both teachers and students during the transition from the State Board to the CBSE Board.

Research reveals that an average teacher grapples with approximately 1,500 decisions daily. While it may be impractical to intervene in every decision-making process, our aim was to alleviate the cognitive load associated with tasks such as lesson planning, question formulation, activity design, and assessment creation. Recognizing the novelty of transitioning from the State Syllabus to CBSE, our initiative encompassed the provision of essential resources alongside comprehensive training for all educators involved.

To enhance our efforts, we collaborated with Central Square Foundation, a renowned organization in the field of Education, to train our teachers in their Structured Pedagogy approach. This evidence-based, learner-centric methodology equips educators with clearly defined objectives, proven methods, well-structured tools, and practical training.

We are thankful to professors from Azim Premji University who provided invaluable support by mentoring the core group of teachers over a six-month period, guiding them through NCERT's Learning Outcomes for the Secondary Stage and the National Curriculum Framework: School Education 2023. The culmination of these efforts is the creation of this resource book, comprising structured lesson plans for the benefit of teachers, and vetted meticulously by the SCERT. We hope that the tremendous effort of our teachers serves as an inspiration to continue shaping the minds of our youth.

We extend our sincere gratitude to Dr. Emmanuel Joseph, Joint Commissioner (Academics) at CBSE, New Delhi, professors from Azim Premji University, experts from Central Square Foundation, the State CBSE team, SCERT, and the entire Department of School Education for their invaluable guidance and support throughout this endeavor. Their deep commitment to enhance the quality of education and to transform the teaching-learning process in the classrooms made it possible to bring this initiative to life within a remarkably short span of time.

We thank the Government of Andhra Pradesh for giving us this opportunity, for the trust they reposed in accepting the innovative idea and facilitating it to germinate and fructify.

Centre for Research in Schemes and Policies
February, 2024

FOREWORD BY DIRECTOR, SCERT

At the heart of quality education lie two indispensable pillars: the teacher and the student. While textbooks, digital resources, infrastructure, and curriculum play crucial roles in the educational landscape, it is the teacher who bears the primary responsibility of delivering lessons, facilitating comprehension of complex concepts, nurturing independent thinking, and molding individuals into responsible members of society. The Department of School Education, Government of Andhra Pradesh aspires to create citizens equipped with the skills and competencies to succeed and solve problems at a global scale, while remaining locally rooted and aware.

To achieve this goal, we have developed a comprehensive resource book to support teachers across the state, enhancing their planning and teaching processes with ease and creativity.

These meticulously crafted lesson plans have been curated by trained educators and thoroughly reviewed by SCERT experts. Each lesson plan is structured into distinct period plans, addressing specific topics within the lesson. Clear learning outcomes are outlined at the beginning of each lesson and progressively addressed throughout the class session. Furthermore, each period plan is divided into sections including Learning Outcomes, Teaching-Learning Process, Pointers for Assessment, and Material Required, offering teachers a flexible framework to tailor to their preferences. The provided questions to assess prior knowledge, suggested activities, and prompts for understanding checks serve as guides, encouraging teachers to adapt the plans to suit the unique needs of their classroom and students.

The SCERT extends its sincere appreciation to the dedicated members of its textbook committee, source material reviewers, lesson plan creators, and technical partners for their invaluable contributions in realizing this vision. We also express our gratitude to the Principal Secretary and Commissioner, Department of School Education, and State Project Director, Samagra Siksha, Department of School Education for their steadfast commitment to promoting quality education, consistently driving us toward excellence in all facets. We appreciate the steadfast support of Center for Research in Schemes and Policies (CRISP) and professors from Azim Premji University in developing the lesson plans.

Dr B Pratap Reddy
Director,
State Council of Educational, Research, and
Training Government of Andhra Pradesh

INTRODUCTION AND BACKGROUND TO THE STRUCTURED LESSON PLANS RESOURCE BOOK

The National Education Policy, 2020 (NEP) focuses strongly on a need for a well-defined Curriculum and a Structured Pedagogy in schools, to ensure holistic, integrated, enjoyable and engaging learning of the students.[1] In pursuance of the Memorandum of Understanding (MoU) signed between Government of Andhra Pradesh (GoAP) and Centre for Research in Schemes and Policies (CRISP), and the recommendation made by CRISP in the Action Plan for CBSE, GoAP agreed that *"Structured pedagogy should be adopted for Classes 8 and above in the newly converted CBSE schools. For this purpose, while using material already available, standard lesson plans should be prepared."* In furtherance of adapting structured pedagogy approach in Government CBSE Schools to improve the quality of teaching-learning, the GoAP organized the following:

1. Organised a Structured Pedagogy workshop was organized in collaboration with CRISP in Vijayawada from 11th to 13th July 2023. Experts from Central Square Foundation and Azim Premji University (APU) anchored the workshop, with additional sessions by Room to Read, Leadership for Equity, Ambitus World School, and SCERT Telangana. Sessions focused on the need for a structured way of teaching and learning, shifting from rote method to competency based curriculum, and delved into the NCERT Learning Outcome Framework for the Secondary Stage. A total of 60 subject teachers along with A.P SCERT subject experts participated in the workshop representing English, Mathematics, Social Science, Biology, Chemistry, and Physics. Each subject group consisted of 10 teachers, 1 SCERT expert, and 1 CBSE School Principal acting as a Coordinator. With guidance from CSF and APU, the subject groups prepared one sample lesson plan per subject by the end of the 3-day workshop.
2. Post the workshop, facilitated the expert subject teachers to work on lesson plan development, with virtual support from APU faculty virtually.
3. Organised a Capacity Building workshop from 11th to 14th October 2023 in Vijayawada with expert support of experts from APU. Sessions were held on mapping content to specific learning competencies, designing and using creative Teaching-Learning Materials, adding Check for Understanding questions, using interdisciplinary approach in the lessons, addressing student misconceptions, and

[1] Chapter 4 & 5, National Education Policy, 2020 (NEP, 2020)

creating a diverse range of assessments. The workshop enhanced the ability of the teachers to

a. understand the principles and practices underpinning competency-based curriculum as outlined in NEP 2020 and NCF-SE 2023;

b. equip the teachers to analyse the need to effectively align curriculum content, competencies, pedagogical practices, and assessment methods in the classroom;

c. helped them to learn to develop competency-based lesson plans that integrate NCF-SE 2023 guidelines, ensuring that learning outcomes are aligned to the desired competencies with the help of model lesson plans

d. trained them to gain practical insights into designing and implementing both formative and summative assessments that accurately measure students' progress toward achieving the competencies set forth in NCF-SE 2023

4. Held a physical camp for the core team of teachers to develop and quality check the lesson plans for all the subjects in Vijayawada for 12-days, from 20th November to 1st December 2023. APU teachers and Leadership for Equity team provided technical support.

5. In early February 2024 the lesson plans developed for Grade 9 and 10 were vetted and finalised by AP SCERT and sent to the Textbook Press for printing and distribution.

ELEMENTS OF THE STRUCTURED LESSON PLANS

All lesson plans are meticulously organized into detailed period plans, each focusing on a specific topic and its corresponding Learning Outcomes. These period plans are then subdivided into four essential sections:

1. Topic and Learning Outcomes, along with associated Indicators
2. Teaching-Learning Process, highlighting Pedagogical Strategies
3. Assessment Strategies to gauge student understanding and progress
4. Materials required, ensuring all necessary resources are readily available for effective instruction.

Within these sections, the following elements have been covered:

- **Higher order thinking questions** have been added to encourage critical thinking, problem-solving, creativity, and analysis. These questions usually move beyond 'What', and 'When', and focus on 'Why', or 'How'. Some examples of these are:
  "Explain the twinkling of stars." [Physics]
  "How does trade help connect the countries in the world?" [History]
  "Why can amphibians and reptiles tolerate mixing of blood to some extent?" [Biology]
  "Do you think it was right for the farmer to be angry with the postmaster? Why or why not? [English]
  "What should India do or achieve to become a developed country?" [Economics]
  "Why does a snail change its sex?" [Biology]
  "How did Gendhadhur, a backward village in Mysore, Karnataka, become rich in rain water?" [Geography]
  "Why can't astronauts see the rainbow from the surface of the moon?" [Physics]
- **Keywords and key concepts** are stated in the beginning of every chapter so that the teacher can be sure to cover them during the course of the lesson
- **Prior knowledge and skills are tested** at the beginning of every period to assess whether students have retained concepts covered in previous lessons, and to gauge the overall level of knowledge on the topic to be covered
- **Prompts and questions to address common misconceptions** about the topic have been given in the plans to clarify any incorrect ideas students may have. For example:
  "A woman in your neighborhood is blamed for giving birth to a baby girl. Is the sex of the baby determined by her? Remove the misconception through your argument." [Biology]
- **Discussion prompts** for class or group discussions have been given, especially for the humanities subjects. For example:
  "Why do you think men receive higher wages than women for the same job? Discuss." [Economics]
  "Human societies have steadily become more interlinked. Comment." [History]
  "Discuss the benefits and drawbacks of using chemical fertilizers." [Geography]
- **Assessment and remedial periods** have been allocated after every lesson plan to gauge student learning, and revise concepts that students need more clarity or practice in, before moving to the next lesson
- **Inter-disciplinary nature of subjects and topics** has been encouraged in the plans so that students recognize the value of all subjects equally. It also promotes a holistic understanding of the topic and opens them up to thinking about an issue from various lenses
- **Formative and summative assessments, check for understanding questions, and worksheets** are given for every lesson to assess student learning at every stage of the lesson
- **Space for teachers to reflect on every period** has been provided at the end of the plan. The prompts are designed to assist teachers in assessing the alignment of their plan with overarching curricular goals and competencies, evaluating student engagement levels, ensuring effectiveness of assessment strategies in measuring

student understanding, and gauging the efficacy of teaching materials, activities, and case studies utilized

HOW TO USE THESE LESSON PLANS

Teachers should have a comprehensive understanding of the curricular goals, competencies, and the nature of the subject they teach. It is essential to thoroughly review the section on "Pedagogical Practices" to gain deeper insight into teaching methodologies. With this groundwork, teachers can then delve into the lesson plans for their subject. It is highly recommended to study the entire lesson plan before initiating the lesson in class. Throughout the lesson, teachers can refer to each period plan and manage class time effectively to cover the elements outlined in the plan. Additionally, teachers are encouraged to modify the plan as needed, incorporating or removing content, questions, or activities to address the specific needs of their students and contextual requirements.

PEDAGOGICAL PRACTICES

Broad Aims of School Education

The Learning Standards are guided by certain widely agreed upon broad Aims of School Education that are articulated in this NCF. These aims have been arrived at from the vision and purpose of education as envisaged by NEP 2020:

1. **Rational Thought and Autonomy:** An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.
2. **Health and wellbeing**: School education should be a wholesome experience for students. Students should acquire Knowledge, Capacities, and Dispositions that promote mind-body wellness.
3. **Democratic participation:** This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.
4. **Economic participation:** Education should work as an enabler for a healthy democracy as well as a healthy economy.
5. **Cultural and social participation:** Along with democracy and economy, society, and culture also play an important role in the mode of associated living. An individual should acquire capacities and a disposition to contribute meaningfully to culture.

NATURE OF THE SUBJECT: SCIENCE

(Adapted from the CBSE Learning Standards document. Please refer to it here: https://cbseacademic.nic.in/cbe/documents/Learning_Standards_Science.pdf)

Among many ways in which the inquiring and imaginative human mind engages, expresses, and explains nature's wonder is through science. It is a human endeavour that observes the physical and biological environment carefully, looks for any meaningful patterns, processes, and relations, making and using new tools to interact with nature, and building conceptual models to understand the world. Also, the knowledge developed helps understand the evolutionary past, current state and predict the future of humanity and nature. It provides us with a way to present ideas that can be tested, repeated, and verified. Scientists gather evidence (as opposed to "proof") to support or falsify hypotheses. Theories, laws, and principles are supported, modified, or replaced as new evidence appears and are central to scientific thinking.

Despite many attempts to shrug it off in textbook chapters and a note to the teacher section, the prevailing perception on the nature of doing science is through the scientific method and not a scientific method. And that method is linear. This perception of the nature of doing science needs countering, for the art of doing science is a creative, iterative, and interconnected process built on curiosity, healthy scepticism, and questioning.

While science is at its best in understanding simple linear systems of nature, its predictive or explanatory power is limited when it comes to dealing with nonlinear complex systems of nature. Yet, with all its limitations and failings, science is unquestionably the most reliable and powerful knowledge system about the physical world known to humans, augmenting the spirit of enquiry, creativity, objectivity, and aesthetic sensibility leading towards the development of scientific temper. The school science curriculum across classes could gradually nurture scientific temper through appropriate learning opportunities.

NCF 2005 position paper on teaching of science at secondary stage emphasises the learning of science as a composite discipline, in doing so, it encourages the designing of advanced technological modules, analysing issues of health and the surrounding environment, and experimenting systematically to discover and verify theoretical principles.

In a progressive forward-looking society, science can play a truly liberating role, helping people out of the vicious circle of poverty, ignorance, and superstition. In a democratic

political framework, the possible aberrations and misuse of science can be checked by the people themselves. Science, tempered with wisdom, is the surest and the only way to human welfare. This conviction provides the basic rationale for science education.

The structured lesson plans in this book are rooted in the vision of the National Education Policy 2020, operationalized by the National Curriculum Framework: School Education 2023, and based on the Learning Outcomes from NCERT's Learning Outcomes at the Secondary Stage. The following content has been adapted from the original documents to provide context and explanation for the pedagogical practice behind the development of these lesson plans.

NCERT Curricular Expectations for the Secondary Stage:

For detailed Learning Outcomes and suggested Pedagogical Processes, please refer to the **NCERT Learning Outcomes at Secondary Stage**

SCIENCE Curricular Expectations

At this stage learners are expected to:

- develop understanding of concepts, principles, theories, and laws governing the physical world, consistent with the stage of cognitive development.
- develop the ability to acquire and use the methods and processes of science, such as observing, questioning, planning investigations, hypothesising, collecting, analysing and interpreting data, communicating explanations with evidence, justifying explanations, thinking critically to consider and evaluate alternative explanations, etc.
- conduct experiments, also involving quantitative measurements.
- appreciate how concepts of science evolve with time giving importance to its historical perspective.
- develop scientific temper (objectivity, critical thinking, freedom from fear and prejudice, etc.).
- nurture natural curiosity, aesthetic sense, and creativity.
- imbibe the values of honesty, integrity, cooperation, concern for life and preservation of the environment.
- develop respect for human dignity and rights, equity and equality.

For a more detailed explanation, please refer to the National Curriculum Framework: School Education 2023 (p.45-51, p.88-92, p.101-102, p.116-121)

Aims of Science:

Science aims to develop an understanding of the natural and physical world through systematic inquiry. Learning Science also builds important capacities such as observation, analysis, and inference. This in turn enables the meaningful participation of individuals in

society and the world of work with scientific temper, critical and evidence-based thinking, asking relevant questions, analysing practices and norms, and acting for necessary change. Science Education aims to achieve:

a. **Scientific understanding of the natural and physical world:** Scientific understanding develops through scientific observations, questions, experiments, theories, laws, principles and concepts. An adequate knowledge of these is essential to build a systematic and verifiable understanding of the way the natural and physical world functions.
b. **Capacities for Scientific enquiry:** The abilities to put forth hypotheses, arguments, predictions and analyses, and to test hypotheses, evaluate situations, and draw logical conclusions, are fundamental to the learning of science. Science education must thus build these skills in students systematically over the stage in school.
c. **Understanding the evolution of scientific knowledge.** There are crucial historical moments in the development of Science and scientific knowledge that could not have occurred without the efforts of various individuals and organisations over thousands of years. Understanding these key moments and discoveries will develop students' understanding of how scientific knowledge and the methods of science evolved and still evolve over time.
d. **Interdisciplinary understanding between Science and other curricular areas:** Learning in science involves understanding interlinkages across disciplines. Students would learn to inquire and learn about the world through such an interdisciplinary approach.
e. **Understanding of relationship between science, technology and society:** Engaging with issues related to connections between Science, Technology and Society including the ethical aspects and implications, and appreciating the role of science in addressing the challenges and the world is undergoing, will add to the breadth of students' learning.
f. **Scientific temper:** Students will imbibe scientific values and dispositions such as honesty, integrity, scepticism, objectivity, tenacity, preservance, collaboration and cooperation, concern for life, and preservation of the environment.
g. **Creativity:** Asking good questions, formulating hypotheses and designing good experiments to test those hypotheses often require artistry and creativity. Developing such creativity and a sense of aesthetic in the pursuit of scientific understanding and exploration is very important.

For more details on the Aims of specific subjects please refer to the NCFSE following pages: English: p234-267; Mathematics: p268-293; Science: p294-319; Social Science: p320-352.

CLASS : IX

CHAPTER : THE FUNDAMENTAL UNIT OF LIFE

TOTAL NO. OF PERIODS: 11

Aims of Education:

1.Rational thought and Independent thinking

2.Health and wellbeing

3.Democratic and community participation

Aims of Science Education:

1. Scientific understanding of the natural and physical world:

- Student develops scientific understanding through specific observations, questions, experiments, principles and concepts.

2.Capacities for scientific inquiry:

- Students puts forth hypotheses, predictions and analyses and evaluate situations and draw logical conclusions fundamental to the learning of science.

3. Interdisciplinary understanding between science and other curricular areas:

- Students understand interlink ages across disciplines.

4.Creativity:

- Students develops creativity in designing good experiments and formulating hypothesis.

Curricular Goals and Competencies

Curricular Goal – 3 : Explore the structure and function of the living world at the cellular level.

Competency - 3.1 :Explain the role of cellular components (Nucleus, Mitochondria ,Endoplasmic Reticulum, Vacuoles, Chloroplast, Cell wall.

Competency - 3.2 :1) Analyses differences among Chloroplast, Chloroplast , and Leucoplast.

2) Analyse the differences between Autotrophic and Heterotrophic nutrition, Mitosis and Meiosis,Rough Endoplasmic reticulum and Smooth endoplasmic reticulum, Plant cell and Animal cell.

Competency - 3.3 :Describes the mechanism of Photosynthesis that occurs in chloroplast.

Curricular Goal – 4 : Explores interconnectedness between organisms and their environment

Competency - 4.1 : Illustrates the autotrophic and heterotrophic organisms.

Curricular Goal - 5: Draws linkages between scientific knowledge and knowledge across other curricular areas

Competency - 5.1: Applies the knowledge of chemistry for formulating equation forPhotosynthesis.

Competency - 5.2:Applies scientific principles to explain phenomenon in other subjects like Physics, and Chemistry, in the mechanism of Photosynthesis, making equation.

Curricular Goal - 6:Understands and appreciates the contribution of India through history and the present times to the overall fields of science, including the disciplines that constitute it.

Competency - 6.1:Explains the significant contribution of Camillo Golgi to the Biology (Structure of nervous system).

Curricular Goal -8: Explores the nature of science by doing science

Competency - 8.1: Develops accurate and appropriate models of plant cell, animal cell, chloroplast and Mitochondria.

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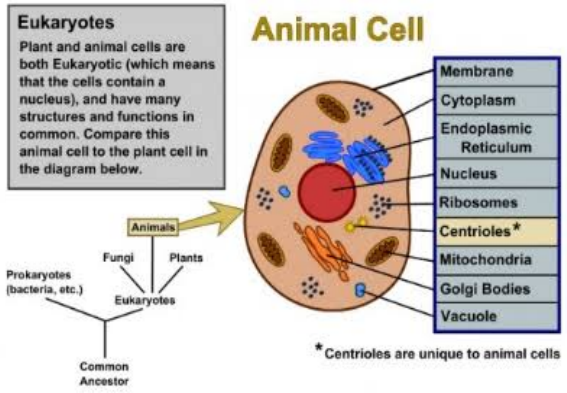
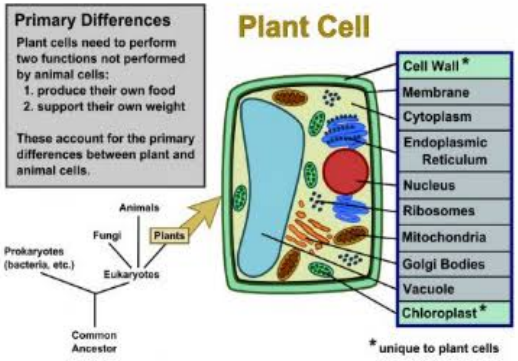
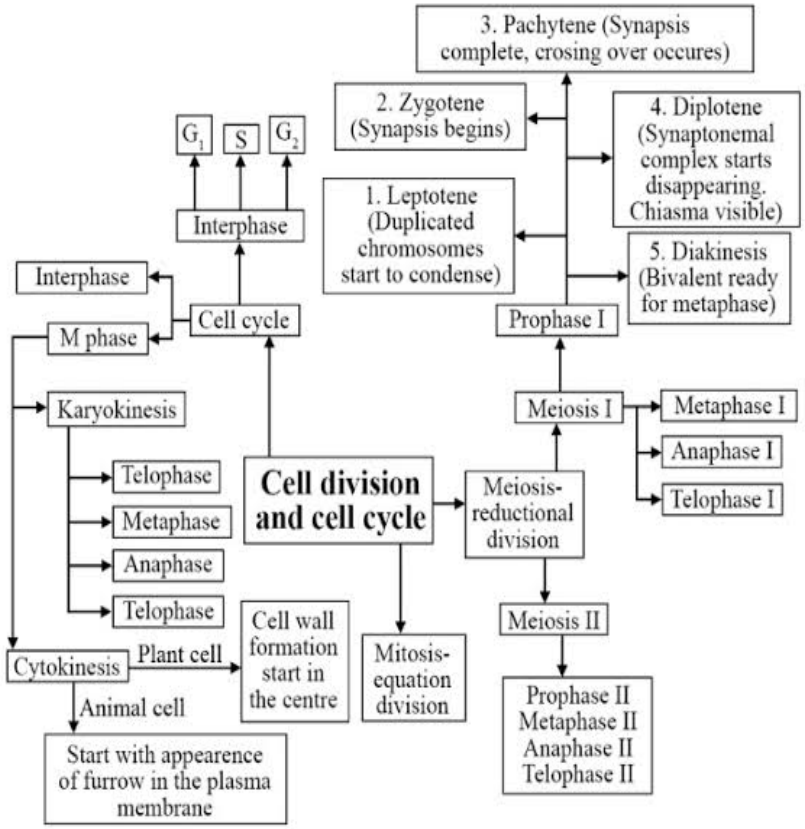
CONCEPT MAP


Eukaryotes
Plant and animal cells are both Eukaryotic (which means that the cells contain a nucleus), and have many structures and functions in common. Compare this animal cell to the plant cell in the diagram below.
Animal Cell
Membrane
Cytoplasm
Endoplasmic Reticulum
Nucleus
Ribosomes
Centrioles*
Mitochondria
Golgi Bodies
Vacuole
*Centrioles are unique to animal cells
Animals
Fungi
Plants
Prokaryotes (bacteria, etc.)
Eukaryotes
Common Ancestor


Primary Differences
Plant cells need to perform two functions not performed by animal cells:
1. produce their own food
2. support their own weight
These account for the primary differences between plant and animal cells.
Plant Cell
Cell Wall*
Membrane
Cytoplasm
Endoplasmic Reticulum
Nucleus
Ribosomes
Mitochondria
Golgi Bodies
Vacuole
Chloroplast*
*unique to plant cells
Animals
Fungi
Plants
Prokaryotes (bacteria, etc.)
Eukaryotes
Common Ancestor


3. Pachytene (Synapsis complete, crosing over occures)
2. Zygotene (Synapsis begins)
4. Diplotene (Synaptonemal complex starts disappearing. Chiasma visible)
G1
S
G2
Interphase
1. Leptotene (Duplicated chromosomes start to condense)
5. Diakinesis (Bivalent ready for metaphase)
Interphase
Cell cycle
Prophase I
M phase
Karyokinesis
Meiosis I
Metaphase I
Anaphase I
Telophase I
Telophase
Metaphase
Anaphase
Telophase
Cell division and cell cycle
Meiosis-reductional division
Meiosis II
Cytokinesis
Plant cell
Cell wall formation start in the centre
Mitosis-equation division
Animal cell
Start with appearence of furrow in the plasma membrane
Prophase II
Metaphase II
Anaphase II
Telophase II

PERIOD MAP


The fundamental unit of life
1. Living organisms
2. onion peel, celll shapes
3. plsama membrane
4. osmosis with egg
5. cell wall
6. Nucleus
7 .cytoplasm
8. ER & Golgi apparatus
9. Lysosomes & Mitochondria
10. plastids & vacuoles
11. Cell division

TOPIC WISE LEARNING OUTCOMES

Period No.	Topic	Learning outcomes
1	5.1What are the living organisms made up of?	LO: 1. Differentiates Living and Non-living organisms. LO: 2. Explains Cell as a Fundamental unit of life? LO: 3. Conducts experiment to observe onion peel under microscope. LO: 4. Explain the components of compound Microscope. LO: 5. Describes contribution of different scientists to biology. LO: 6. Differentiate unicellular and multi cellular organisms.
2	5.2. Preparing temporary mounts of leaf peel. Tip of roots of onion ,peels of onions of different sizes	LO: 1. Differentiates cork cells and onion peel cells LO: 2. Investigate variations in shapes of

		cells.
3	5.2. What is a cell made up of? What is the structural organization of a cells. 5.2.1 .Plasmamembrane or Cell membrane.	LO: 1. Describes the organization of a cell. LO: 2. Explain the structure and functions of plasma membrane.
4	5.2.1. Preparation of solutions of different concentrations. Activity-5.3(Osmosis with an egg) Activity-5.4(Dried raisins or apricots)	LO: 1. Classifies Hypotonic, Hypertonic, and Isotonic solutions. LO: 2. Differentiate Endosmosis and ex osmosis. LO: 3. Plans and conduct experiment of osmosis by using egg and dried raisins.
5	5.2.2: Cell Wall, Activity-5.6(Rhoeo leaf peel).	LO: 1. Differentiate cell wall and cell membrane. LO: 2. Observe the Rhoeo leaf peel under microscope.
6	5.2.3.Nucleus.Activity-5.7(Observation of cheek cells)	LO: 1. Plans and conduct an activity to Observe human cheek cells.

		LO: 2Explains the structure and functions of Nucleus.
7	5.2.4. Cytoplasm, 5.2.5-Introduction of Cell organelles.	LO:1. Describes the structure of Cytoplasm in the cell. LO:2. Analyses the role of different Cell organelles located in the cell.
8	5.2.5. I .Endoplasmic Reticulum. 5.2.5. II.Golgi apparatus.	LO: 1.Explains the structure and functions of Endoplasmic Reticulum. LO: 2.Differentiate RER and SER? LO: 3. Describes the contributions of Camillo Golgi to biology. LO: 4. Explains the structure and functions of Golgi apparatus.
9	5.2.5. III.Lysosomes. 5.2,5.IV.Mitochondria,	LO:1. Explains the structure and functions of Lysosomes. LO: 2. Describes the structure and functions of Mitochondria. LO: 3. Draw a labelled diagram of Mitochondria.
10	5.2.5. V.Plastids. 5.2.5. VI.Vacuoles.	LO: 1. Classifies plastids into Chromoplast, Leucoplast,and Chloroplast.

		LO: 2. Explains structure and functions of Chloroplast. LO: 3. Draws labelled diagram of Chloroplast. LO: 4. Describes the structure and functions of Vacuoles.
11	5.3. Cell division.	LO: 1. Analyses the significance of Cell division. LO: 2. Differentiate Mitosis and Meiosis. LO: 3. Describes the process of Mitosis. LO: 4. Describes the process of Meiosis.

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PERIOD PLAN 1

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

Total no. of periods : 11

Period plan : 01/11

Time : 40 min

Key Concepts :**Living cells, non-living cells, usage microscope, discoveries of different scientists, unicellular, multi cellular organisms.**

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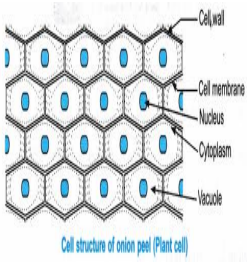
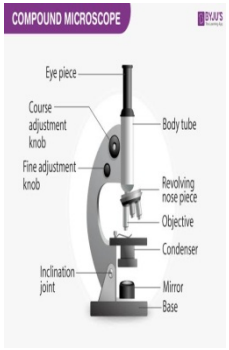
LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• *Testing previous knowledge* • *Teacher asks students to identify the living and non-living things in the classroom.* • *How can you differentiate living things from non living things?* • *What is the basic structure that is seen in living organisms?*		
	• *Have you ever seen the structure of honeycomb?* • *What do you find in a honeycomb?*		Images in IFP

Describes the discovery of cells by the scientist	• *Do you find small compartments in the honeycomb?* • *What is the shape of those compartments?*  • • *Teacher explains the discovery of cells by Robert Hooke in his own microscope in the cork who called those boxes as cells.* • *What is cork?* • *In which part of the plant body cork is seen?* • *The word cell is derived from which language?* 	*1. What do you observe in the honeycomb?* *2. Are all rectangular boxes similar in shape?* *3.Is cork a dead unit or a living unit?* *4.How does cork appears under the microscope?* *5. Cork is obtained from which part of the tree?* *6.Why Robert Hooke called those boxes as cells?* 7.Who discovered cells in the year 1665? 8.Do you find both dead and living cells in a living organism? 9.What are living organisms made up of?	

Plans and conducts the experiment to observe cellsin an onion peel	*Demonstration of the onion peel activity.*	*1.Can you compare cork cells and cells in the onion peel?* *2. What are the precautions to be taken in preparing a slide with an onion peel?* *3. What would happen if safranine is not used in preparing the slide?* *4. Why should we cover the onion peel with cover slip?* *5. How can you avoid air bubbles?*	*Microscope* *Slide* *Coverslip* *Safranin* *Water* *Onion peel*
	 Cell structure of onion peel (Plant cell)	*1. What do you observe in the peel?* *2. Do all cell looks similar in shape and size?* *3. Can you give a pictorial representation of your observation?* *4. Does It look like the picture mentioned above?* *5. Have you noticed any dot like structures in the cell?* *6.Do you know what those dot like structures are?*	
**Explains the components and uses*	**By showing teacher demonstrates its parts.*	*1. How can we use the compound microscope?*	https://www.youtube.com/watch?v=W7tHi

<table>
<tr>
<td>of compound microscope.</td>
<td> 
</td>
<td>2. How does a compound microscope differ from a simple microscope?
3. Which magnifying lenses are used in compound microscope?
4. What are the differences between course and fine adjustments?
5. What will be the magnification if 10X and 100 X lenses are used?</td>
<td>MaTuUs</td>
</tr>
<tr>
<td>Designs an experiment to observe cells in peels of onions of different sizes

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Describes scientific discoveries and inventions.</td>
<td>Explains that the small structures that we see in peels of onion bulbs of different sizes are the basic building units of the onion bulb and are called as cells

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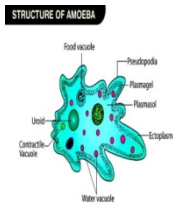
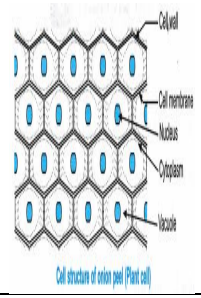
Teacher discusses about different scientists and their contributions.</td>
<td>1.Are the cells similar in size irrespective of the size of the onion bulb?
2.All living organisms are made up of cells.Justify

Match the following
<table>
<tr><td>Robert Hooke</td><td></td><td>A. Discovered free living cells in pond</td></tr>
<tr><td>Leeuwenhoek</td><td></td><td>B. Cells were first discovered by him</td></tr>
<tr><td>Robert Brown</td><td></td><td>C. Proposed the Cell Theory</td></tr>
<tr><td>Schleiden and Schwann</td><td></td><td>D. Discovered Nucleus</td></tr>
</table></td>
<td></td>
</tr>
</table>

**Differentiate unicellular and multi cellular organisms.*	 	1. What is the number of cells observed in case of Amoeba and Onion peel? 2. Do we see similar structures or different structures? 3. Every multicellular organism has come froma single cell.How? 4.Give examples for unicellular and multicellular organisms? 5.How are new cells formed in multicellular organisms?	Images of unicellular and multicellular organisms in IFP

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 2

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

Total no. of periods : 11

Period plan : 02/11

Time : 40 min

Key Concepts :**Observation of leaf peels, tip of onion roots, various cells from the human body.**

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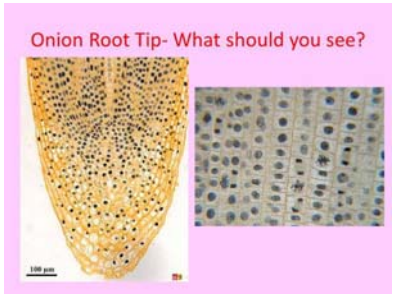
LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	CHECK FOR UNDERSTANDING	TLM
	• Teacher recalls previous learning by posing questions: • Did you find any difference in the cork cells and onion peel cells that you observed in the last class? • Which striking feature demarcates them into living and non-living? • Are all living organisms made up of cells? • Can you identify unicellular and multicellular organisms?		
Plans and conducts	*Teacher helps students perform Activity 5.2., both with leaf peels and root tips of onion. :*	*1.Do all cells look alike in terms of shape and size?*	*1.Microscope.* *2.glass slides.*

<table>
<tr>
<td>investigation to observe cell shapes and sizes under Microscope</td>
<td>
List out the various shapes found in both leaf peel cells and root tip cells.



Explains that shape and size of cells are related to the specific function they perform.
</td>
<td>
2.Do all cells look alike in structure?
3.Could we find differences among cells from different parts of a plant body?
4.What similarities could we find?

5. Observe the following pictures and identify shapes of these cells of the human body

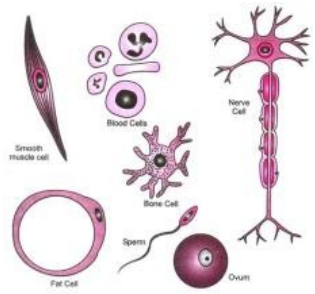
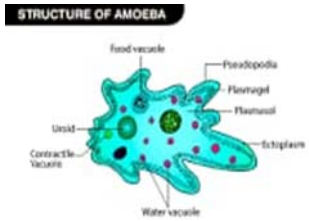
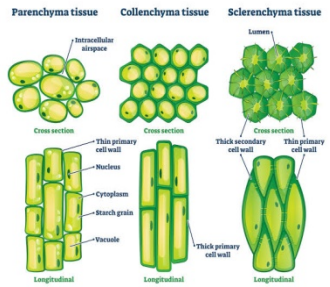


Figure : VARIOUS CELLS FROM THE HUMAN BODY

Do you find fixed shape of cells in unicellular and multicellular organisms?

Complete the table with necessary information
<table>
<tr><td>Cells</td><td>Shapes</td></tr>
</table>
</td>
<td>
3. Safranin.
4.Cover slip.
5.Watch glass.
6.Onion peel.
7.Root tip peel.
</td>
</tr>
</table>

		<table><tr><td>*Nerve cell*</td><td></td></tr><tr><td>*Muscle cell*</td><td></td></tr><tr><td>*Blood cells*</td><td></td></tr><tr><td>*Fat cell*</td><td></td></tr><tr><td>*Sperm cell*</td><td></td></tr><tr><td>*Egg cell*</td><td></td></tr></table>	
Explains cell as the structural and functional unit of life	*Can a single cell perform all the basic functions?*  What about multicellular organisms? Do they have different parts to perform different functions?	*1. What could be lacking in amoeba resulting in its indefinite shape?* *2. How does Amoeba acquires its food?* *3.Why Amoeba changes its shape frequently?* 4. Does Amoeba contain all the cellular components necessary to perform basic functions? 5.What is Division of labour in multicellular organisms? 6.Which organ pumps blood in the human body?	

		7.Where does food gets digested in human beings? 8.What is the function of lungs in human body? 9.Do you find Division of labour in a single cell also? 10.What do you call the specific components of cell? 11.A cell is able to live and perform all its functions because of cell organelles. Justify 12.Why is the cell called as structural and functional unit of life?	

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 3

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

Total no. of periods : 11

Period plan : 03/11

Time : 40 min

Key Concepts :**structure of plasma membrane, diffusion of gases through plasma Membrane, selective permeable nature of plasma membrane.**

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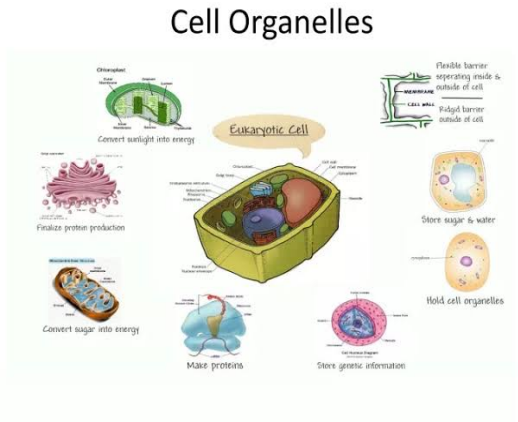
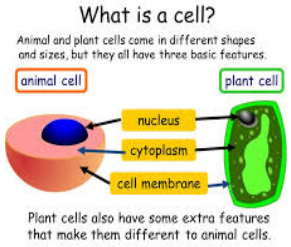
LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	CHECK FOR UNDERSTANDING	TLM
.	• **Testing previous knowledge* • *How are multicellular organisms different from unicellular organisms in performing various functions?* • *What are cell organelles? What is their significance?* • *What is the structural and functional unit of life?*		**Microscope,permanent slide ofT S of leaf andanimalcell.** ***P**lant cell-chart. ***A**nimal cell-chart.

Explains the structure and functions of plasma membrane	  • *Do you find the same type cell organelles in plant and animal cells?* • *Which membrane forms the outermost covering in plant and animal cells?* • *Teacher emphasizes that plasma membrane allows entry and exit of some materials in and out of the cell.* • *What affects the movement of substances into and out of the cell?*	**1.Where is the plasma Membrane located in plant cell?** **2.Why cell membrane is called selectively permeable membrane?** **3.How does the movement of substances takes place into and out of the cell?** **4.How does movement of gases like Co2 and O2 takes place across the plasma membrane?** **5.What is Diffusion?** **6,How diffusion plays an important role in gaseous exchange between the cells as well as the cell and its external environment?** **7.What happens when Co2 concentration is more in the atmosphere than inside the cell?** **8.What happens when O2**	

<table>
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- **Explains diffusion as movement of substances from a region of high concentration to a region of low concentration.**

</td>
<td>concentration is more inside the cell than external environment?</td>
<td></td>
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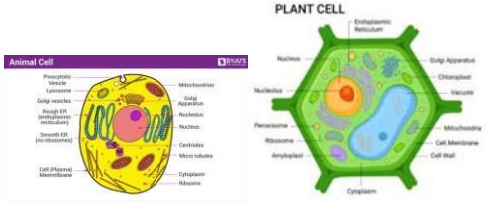
<tr>
<td></td>
<td>

- *.Do you think movement of water also obeys the law of diffusion?*
- *Movement of water across a selectively permeable membrane is called as Osmosis*
- *The movement of water is affected by the amount of substance dissolved in water(solute).*
- *Defines Osmosis as the movement of water from a lower solute concentration to a higher solute concentration.*



</td>
<td>

1.What about movement of water across the membrane?

2.What is osmosis?

3.How does osmosis affect the movement of water in plant cells across the membrane?

4.Can you give examples for osmosis taking place in daily life situations?

5.How does roots absorb water from the soil?

Identify the correct option by tick mark

<table>
<tr><th>Example</th><th>Diffusion</th><th>Osmosis</th></tr>
<tr><td>Spraying perfume</td><td></td><td></td></tr>
<tr><td>Burning incense stick</td><td></td><td></td></tr>
<tr><td>Exchange of gases</td><td></td><td></td></tr>
<tr><td>Absorption of water by roots</td><td></td><td></td></tr>
</table>

</td>
<td></td>
</tr>
</table>

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 4

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

Total no. of periods : 11

Period plan : 04/11

Time : 40 min

Key Concepts :**Properties of different solutions ,osmosis with an egg and dried raisins or apricots,**

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LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Classifies solutions into hypotonic, hypertonic and isotonic	• *Recall the previous knowledge* • *What is diffusion?* • *How osmosis help in absorption of water by root hairs?* • *How does exchange of gases takes place in plants?* • *The teacher guidesthe students toconduct a simpleactivity using waterand salt.* • *The teacher makesthe students to mixdifferent*	*1.How are isotonic, hypertonic and hypotonic solutions different from each other?* *2.Which one is a concentrated*	*1.salt or sugar.* *2.water.* *https://www.youtube.com/watch?v=bxU7GaPo1_k*

solutions	*proportionsof salt in water todifferentiateHypotonic,Hypertonic, Isotonicsolutions.* • *What happens if a plant cell is placed in hypotonic solution?* • *Discusses how osmosis plays an important role in movement of water into the cell*  • *What happens if you put a red blood cell in hypotonic solution?* • *What happens if a cell is placed in isotonic solution?* • *What happens if a cell is placed in hypertonic solution?* • *Discusses osmosis as special case of diffusion through a selectively permeable*	*solution and a dilute solution when compared to a cell?* *3.Which solution has the same concentration similar to that of cell?* *4. How does a hypotonic solution affect the water movement across a cell membrane?* *5.Does water moves into the cell or moves out of the cell?* *6.Why does the cell swells up?* *7.Why does an animal cell bursts when it is placed in*	

	membrane?	*hypotonic solution for a long time?* *8.Why there is no overall movement of water in isotonic solution?* *9.How does the cell retains the same size?* *10.What is the movement of water in hypertonic solution?* *11.Why does the cell shrinks in hypertonic solution?* *12.What happens if you keep a cell in hypertonic solution for a longer period?*	
Conducts experiment toverify the facts of osmosis	• **LABACTIVITY** • **The teacher guidesthe students toperform the labactivity by using HCL, raw egg ,saltsolutionandwater.** • **The teacher takesutmost**	**1.What happens if a deshelled egg is placed in pure water?** **2.What happens if a**	**Raw egg, DiluteHCL, Saltsolution, dish,water,** **https://www.youtube.com/watch?v=g0M9ND**

	care andinstructs thestudents to becautious whileworking with acid inthelab •  • **What happens when egg is placed in dilute HCL solution?**	**deshelled egg is placed in concentrated salt solution?** **3.What is the phenomenon responsible for movement of water in the experiment?** **4.Can you provide examples of real life situations where osmosis is a fundamental process?**	**EQjl8**
Conducts activity to verify theprocess ofendosmosis andexosmosis.	**The teacher guidesthe students toperform the activityof osmosis usingraisins ,water,sugarsolution or saltsolution.**	**1.What happens when raisins are placed in water?** **2.What happens when raisins are placed in salt solution?** **3.What is**	**Raisins,sugarsolution, saltsolution,water** **BYJUSTAB,IFP**

Explains the functions of plasma membrane	 **Can we study the structure of plasma membrane in compound microscope?** **Explains that the flexibility of the cell membrane also enables the cell to engulf in food and other material from its external environment and this is called as Endocytosis.**	**theimportance ofendosmosis andexosmosis in dailylife?** **4.Why ourhands appearwrinkled when keptinwaterforlo ng time?** **5.Why do wilted vegetables regain their shape when placed in water?** **1.Which microscope is used to study the structure of plasma membrane?** **2.What are the other functions of plasma membrane apart from diffusion and osmosis?** **3.What is plasma membrane made up of?** **4.Why plasma membrane is flexible?** **5.What is**	

		endocytosis? **6.Engulfing of food materials or foreign bodies in Amoeba is called as** **a)diffusion** **b)osmosis** **c)endocytosis** **d)plasmolysis**	

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 5

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

Total no. of periods : 11

Period plan : 05/11

Time : 40 min

Key Concepts :**Cell Wall, Plasmolysis, Conducting experiment with Rhoeo leaf.**

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	Teacher recalls previous learning by posing questions: • **How do cells behave in concentrations of different solutions?** • **What is endosmosis and exosmosis?** • **Why do animal cell bursts when placed in hypotonic solution?**		Chart showing plant cell

<table>
<tr>
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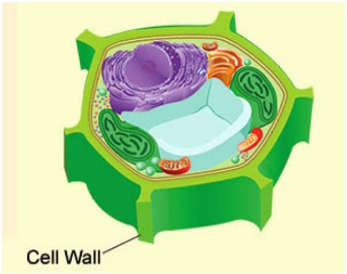
<td> 

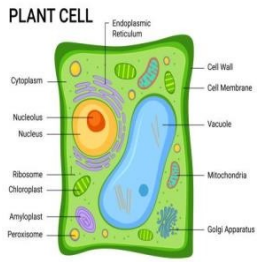
Do all cells have cell wall?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explains the functions of the cell wall.</td>
<td>

In which organisms cell wall is present?
Where do you find cell wall in plant cells?
Which substance is present in the cell walls of plants?
Student Activity:
Students are asked to discuss the functions of cell wall in groups.

</td>
<td>1.What is cellulose?
2.How is cell wall different from plasma membrane in its chemical composition?
3.Is cellulose digested in our body?
4.What is the chemical nature of cellulose?
5.Identify cell wall composition in the following organisms
<table>
<tr><th>Organism</th><th>Cell wall composition</th></tr>
<tr><td>Plant cells</td><td></td></tr>
<tr><td>Fungi</td><td></td></tr>
<tr><td>Bacteria</td><td></td></tr>
</table>
</td>
<td></td>
</tr>
<tr>
<td>Plans and conducts investigation to observe the phenomenon of plasmolysi</td>
<td>

What happens when a cell is placed in hypertonic solution?
Why do the contents of the cell shrink?
Explains that shrinkage of cell contents away from the cell wall is called as Plasmolysis.

Teacher demonstrates the activity with Rhoeo leaves
</td>
<td>1.When rhoeo leaf peel is observed under high power of a microscope, you will find small green granules. What are they called as?
2.Chloroplasts contain green coloured substance called _____
3.What happens when you put sugar or salt solution on the leaf peel?
4.What do you call the shrinkage of cell</td>
<td>Rhoeo leaves
Water
Salt or sugar solution
Microscope
Slides
coverslips</td>
</tr>
</table>

s Explains the functions of cell wall	 • What do you infer from this activity? • How can we preserve pickles and jams for longer periods? • Why do plant cells, fungi and bacterial cells can withstand surrounding media when compared to animal cells?	contents in the cell? 5.Do you find the same result when we use boiled rhoeo leaves? 6.What is the difference you could find before and after boiling the leaf? 7.Why plasmolysis is observed only in living cells and not in dead cells? 8.Can we find plasmolysis taking place in plants under natural conditions? 9.What are the practical applications of plasmolysis in our domestic life? 10.Why do animal cells burst when placed in hypotonic solution? 11.Which structure helps in withstanding greater changes in the surrounding medium? 12.What are the functions of cell wall other than protection in living organisms?	
			https://www.youtube.com/watch?v=oPrmpkIJUyE

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 6

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

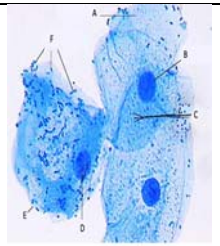
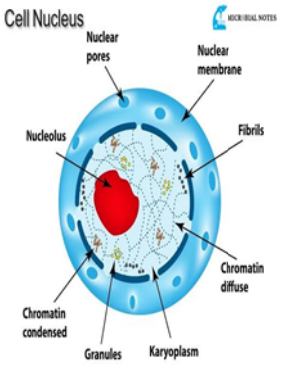
Total no. of periods : 11

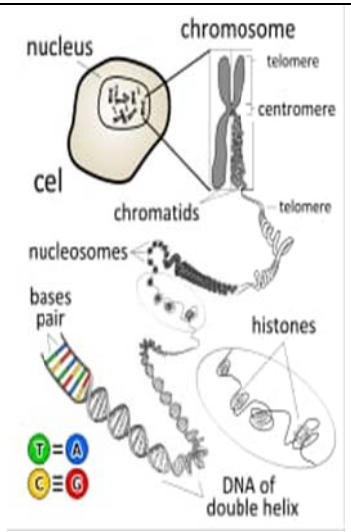
Period plan : 06/11

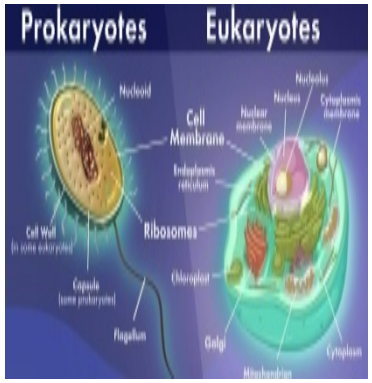
Time : 40 min

Key Concepts :**Observation of Nucleus by conducting cheek cell Activity, prokaryotes and eukaryotes**

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Plans and conducts investigation to observe nucleus in human cheek cells	Testing previous knowledge • In onion peel activity, we have observed dark coloured structures in the cells. • What are those dark coloured structures? • Which stain is used in onion peel activity? Teacher demonstrates the activity in human cheek cells	1.What are the stains that are used to observe nucleus in the cells? 2.What is the shape of the nucleus observed in the cells? 3.How many are there in each cell? 4.What do you call the cells which possess single nucleus?	Human cheek cells,methylene blue, spatula, watch glass, slide, coverslips, microscope

	 Figure 3.1 • Iodine, safranin or methylene blue are used to stain the cells • Do you observe dark coloured structures in the cells?	5.Do you find multinucleate cells in living organisms? 6.What is the function of nucleus in the cells?	
Explains the structure and function of nucleus in the cells	 When does chromatin changes into chromosomes inside the nucleus?	1.How many layers are present around the nucleus? 2.What do you call the double layered structure around the nucleus? 3.How are materials transported from nucleus to its outside? 4.What do you call the rod shaped structures inside the nucleus when the cell is dividing? 5.What does chromosomes contain which is necessary for inheritance of characters? 6.In which form genetic material is present inside the chromosomes? 7.What is the full form of DNA? 8.What are the functional segments of DNA called as? 9.What are the functional units of inheritance? 10.When a cell is not dividing, in which form DNA is present?	https://www.youtube.com/watch?v=S-Q0trle000

		1.Why is nucleus called as the brain of the cell? 2.How does it play an important role in cellular reproduction? 3.How the functions of growth, development and differentiation is regulated by the nucleus during the time of cell division? 4.Do you find nucleus in all the cells? 5.In which of the following mature cells, nucleus is absent. a)RBC b)WBC c)Sieve tubes d)Companion cells 6.Nucleus was discovered by_____	Images in IFP
Differentiate prokaryotes and eukaryotes.	• *By showing pictures of bacteria cell and animal cell,asking the children to observe differences among them • Do you find nuclear membrane in the bacterial cell? • Due to absence of nuclear membrane, the nuclear region is poorly defined.Such	1.What difference can be observed between bacterial cell and animal cell? 2.Can you observe any nuclear membrane around the genetic material of bacteria? 3.What is a prokaryotic cell? 5.How is a prokaryotic cell different from a eukaryotic cell? 6.Do you find any other cell organelles in	

	undefined nuclear region is called as Nucleoid. • Organisms which lack nuclear membrane are called as Prokaryotes • Organisms which contain nuclear membrane are called as Eukaryotes  	prokaryotic cells? 7.Give examples for prokaryotic cells and eukaryotic cells. 8.Identify prokaryotes from the following organisms: a)Bacteria b)Plants c)Animals d)Fungi	
Draws labelled diagrams of nucleus and prokaryotic cell	Showing the pictures on IFP .	Draw a neat labelled diagram of nucleus and a prokaryotic cell.	

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 7

Name of the Chapter: **The Fundamental Unit of Life.**
Class : 09

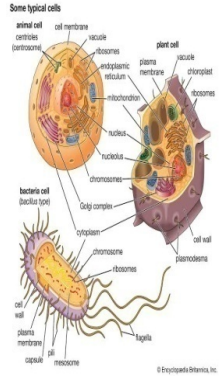
Total no. of periods : 11

Period plan : 07/11

Time : 40 min

Key Concepts : **Cytoplasm, Cell organelles**

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• Testing previous knowledge • What are the that are typically seen in a cell? • Which structure is called as the brain of the cell? • Name the structures which give protection to the cell?		
*Analyses the role of cytoplasm inside the cells	• *By showing pictures of different cells, or during observation of onion peel, and cheek cell asking the students what they have observed inside the cell other than nucleus.	1.What is the nature of cytoplasm? 2.What would happen if there is no cytoplasm inside the cell? 3.How does it supports the other structures in the cell?	

	• *What is the name of the fluid present in the cell? • *Have you observed any specialised structures in the cytoplasm? • *Why the region of cytoplasm takes little stain? • *Mention the organelles which are present in the cytoplasm?	4.Can you differentiate cytoplasm, protoplasm, and nucleoplasm? 5.What is the composition of cytoplasm? 6.What forms the major component of the cytoplasm? 7.Which structure is considered as cytoskeleton of the cell? 8.What do you call a cell without protoplasm or cytoplasm? 9.Give some examples of dead cells which are present in the plant body?	
Explains the significance of cell organelles in the cytoplasm	By showing pictures of plant cell and animal cell asks the students to observe cell organelles in the cytoplasm	1.What do you call the structures which are present in the cytoplasm? 2.Do you find membranes around the cell organelles? 3. Membrane bound cell organelles are absent in prokaryotes.Why? 4.Why the animal cells and plant cells are called as Eukaryotic cells? 5.What is the difference between prokaryotic cell and eukaryotic cell? 6.Why viruses are neither prokaryotic nor eukaryotic ? 7. Why viruses do not show any characteristics of living cells?	 Models of plant cell and animal cell

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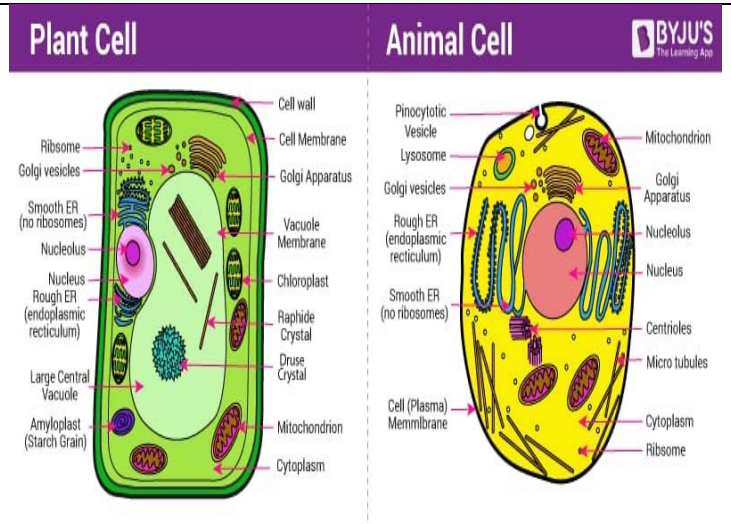
<td> 
</td>
<td>8.Mention the differences between prokaryotes and eukaryotes in the table
<table>
<tr><th>Prokaryotic cell</th><th>Eukaryotic cell</th></tr>
<tr><td></td><td></td></tr>
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</table>
9.Can we see all the cell organelles in the light microscope?
10.Which microscope is used to study the internal structure of cell organelles?</td>
<td></td>
</tr>
<tr>
<td>Draws neat labelled diagrams of plant cell and animal cell.</td>
<td>Showing images in IFP</td>
<td>Draw labelled diagrams of plant cell and animal cell?</td>
<td>Images in IFP</td>
</tr>
</table>

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 8

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

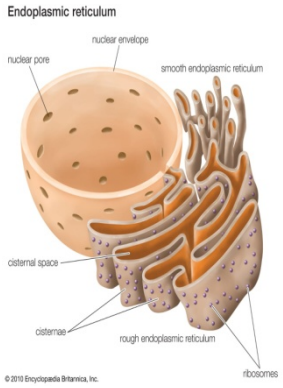
Total no. of periods : 11

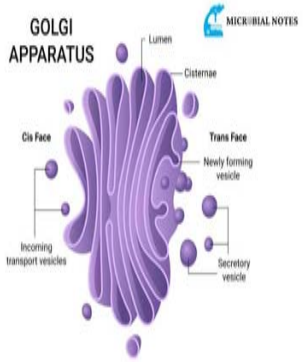
Period plan : 08/11

Time : 40 min

Key Concepts :**Endoplasmic reticulum, Golgi apparatus**

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• Testing previous knowledge • What are cell organelles? • Where do we find cell organelles in the cell? • Do you find membranes around the cell organelles? • What is their role in maintaining the cell structure and function?		
Explains the structure and function of Endoplasmic reticulum	By showing the picture of Endoplasmic reticulum, asks the students to observe the structure	• What is the shape of the ER? • Where is ER located in the cell? • Why the membrane of ER similar to that of plasmamembrane? • What happens if ER is absent in the	Images in IFP

	 • Endoplasmic reticulum is a network of membrane bound tubules. It is of two types.The one with Ribosomes is called as rough endoplasmic reticulum and the other one without ribosomes is called as smooth endoplasmic reticulum. • Teacher explains that the proteins and lipids synthesized help in building the cell membrane.This process is known as membrane biogenesis.	cell? • Is the function of ER same in plant cell as well as in animal cell? • What is membrane biogenesis? • Which cell organelle plays a crucial role in membrane biogenesis? • How can you say that ER gives mechanical support to the cell? • What are the two types of endoplasmic reticulum? • How can you differentiate RER and SER? • What is the function of RER and SER? • What will happen if rough and smooth ER are absent in the cell? • Why ER looks rough under microscope? • Which ER synthesizes proteins?Why? • How proteins are transported to various places in the cell? • What is the role of SER? • How does it acts as a cytoplasmic framework to support biochemical activities of the cell? • How SER plays a crucial role in detoxifying many poisons and drugs in the liver cells of vertebrates?	

*Describes the contributions of Camillo golgi in the field of biology.	By showing picture of Camillo Golgi,highlights his contributions in biology.	1.Why was Camillo Golgi awarded nobel prize? 2.How did he observe golgi apparatus under the microscope? 3.According to Golgi which method is referred as “Black reaction”?	
Explains the structure and functions of Golgi Apparatus.	By showing the picture , asks students to observe the structure  • What are the two faces of golgi apparatus? • What role do they play in the modification and packaging of materials? • How are complex sugars formed from simple sugars in the golgi apparatus?	1.What is golgi apparatus made up of? 2.What do you call the membrane bound flattened sacs which are arranged parallel to each other in stacks? 3.How is it connected with endoplasmic reticulum? 4.What are the functions of golgi apparatus? 5.How are lysosomes formed from golgi apparatus? 6.Does it play any role in the formation of cell wall during cell division?	https://www.youtube.com/watch?v=VG8sBry45DE&t=34s

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 9

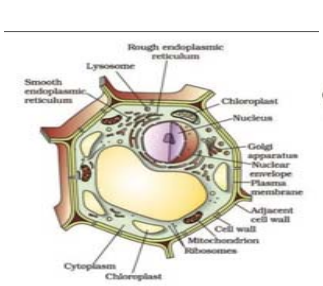
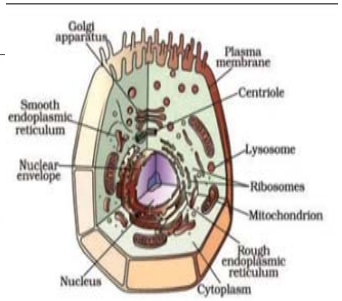
Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

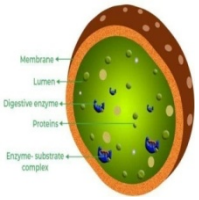
Total no. of periods : 11

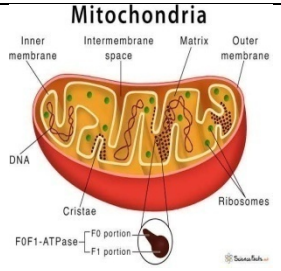
Period plan : 09/11

Time : 40 min

Key Concepts :**Lysosomes, Mitochondria.**

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	* Recalls previous knowledge. • By showing picture of animal cell and plant cell ask the children to identify cell organelles present in the cytoplasm. • Does all the cell organellesof same size appear in the cytoplasm? • *Do you think each cell organelle have a particular function?   		

*Explains the structure and function of Lysosomes.	 • *How do they appear in their structure? • *What do they contain? • *Is the similar number of Lysosomes present in both plant and animal cells ? • *Where are Lysosomes located?	1.How are digestive enzymes formed in the lysosomes? 2.Why Lysosomes are Considered as a kind of waste disposal system of the cell? 3.In which conditions Lysosomes digest their own cell? 4.Why are lysosomes called as suicidal bags of the cell?	
*Explains the structure and functions of the	*Discusses the structure of Mitochondria by showing the picture	1.Why Mitochondria are called as power houses of the cell? 2. Where does cellular respiration takes place in the mitochondria? 3.What do you call the foldings of the inner membrane?	https://www.youtube.com/watch?v=pVWJz0jjFZo

mitochondria. Draws labelled diagram of Mitochondria	 • What is the shape of Mitochondria? • How many membranes are present in it? • What do you call the inner space? • What components are present in the matrix? *By showing the diagram of Mitochondria on IFP, asks the children to draw it.	4.Why Mitochondria is called as semiautonomous cell organelle? 5.In which form energy is stored in mitochondria? 6. What is the full form of ATP? 7.Why ATP is called as energy currency of the cell? 8.How do we get energy to do work or perform activities? 9.In which cells we find more number of mitochondria? 10.What is the function of DNA and ribosomes in the mitochondria? *Draw a neat labelled diagram of Mitochondria?	Images in IFP

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 10

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

Total no. of periods : 11

Period plan : 10/11

Time : 40 min

Key Concepts :Types of plastids, Vacuoles

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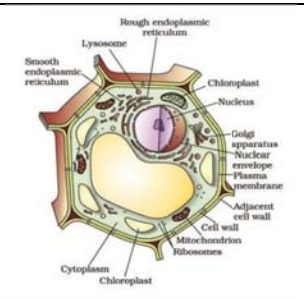
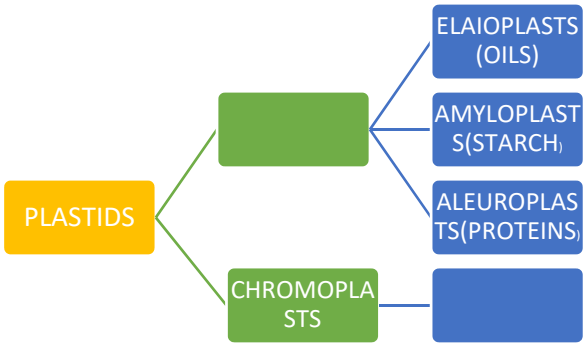
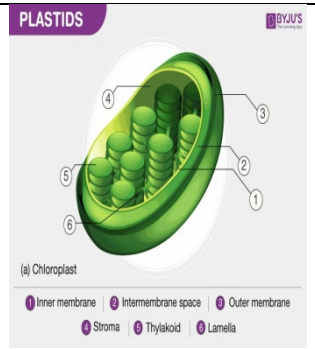
LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• Recalls previous knowledge. • By showing picture of plant cell ask the children to identify, cell organelles present in the cytoplasm. • *Do you observe any double- membrane bound cell organelle found only in the plant cell? • *How many cell organelles have double membrane around them?		https://www.youtube.com/watch?v=FuVw8VhXb9w

			
Classifies plastids into different types.	  • Students were asked to bring flowers and fruits of different colours • What could be the reason for the colours? • Which substances are responsible for producing colours? • Why leaves are green in colour? • In which cell organelle all these colour producing substances are present?	1.Mention pigments responsible for the colours of flowers and fruits? 2.Why do we find plastids only in plant cells? 3.How many types of plastids are present in plant cells? What are they? 4.What are chromoplasts? What do they contain? 5.What are chloroplasts? What do they contain? 6.What do you call the green coloured pigments? 7.Which pigments are responsible for yellow and orange colours? 8.What are leucoplasts? What do they store? 9.Fill the empty boxes in the flow chart:	



1.Why leucoplasts are colourless plastids?
2.In plants where do you find the leucoplasts?
3.What are the functions of Leucoplasts?
4.Compare Amyloplasts,Aleuroplasts,Elaioplasts in their functions

Explains the structure and function of chloroplasts.	 • *By showing the picture of chloroplast on IFP,asks the children to identify the picture. • *Why most of the leaves are green in colour? • *.Which pigment is responsible for green colour?	1. Why Chloroplasts are called kitchen of the cell? 2. Which pigment is present in the chloroplast? 3. Mention the name of semifluid matrix of chloroplast? 4.Mention the components present in the stroma? 5.How can you say that chloroplast is called as self replicating organ? 6.Differentiate Grana and Stroma? 7.How chlorophyll helps in the process of photosynthesis? *Mention the pigments in the chloroplasts in addition to chlorophyll? *Why only plants synthesize their own food? *How many membranes are there in chloroplasts? *What are the different shapes of chloroplasts in algae?	Images in IFP 
Draws neat labelled diagram of chloroplast	• *By showing picture of chloroplast on IFP asks the students to draw the diagram.	*1.Draw a neat labelled diagram of chloroplast?	
Explains the structure and function of vacuoles	• What are the storage sacs in a cell? • What do they contain? • Do you find both solid and liquid contents in the vacuole?	1.Why are vacuoles important in plant cells? 2.What is the size of vacuoles in plant and animal cells? 3.Why are they small in size in animals? 4.What do you call the fiuid present inside	

		the vacuole? 5.Membrane surrounding the vacuole is_____ 6.What is the role of food vacuole in Amoeba? 7.How vacuoles play an important role in unicellular organisms? 8.What is osmoregulation in plants?	

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 11

Name of the Chapter:**The Fundamental Unit of Life.**
Class : 09

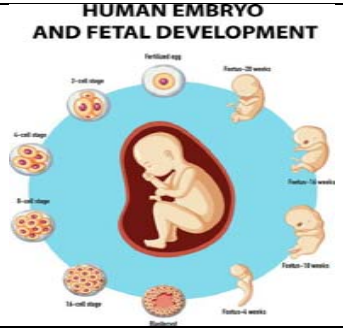
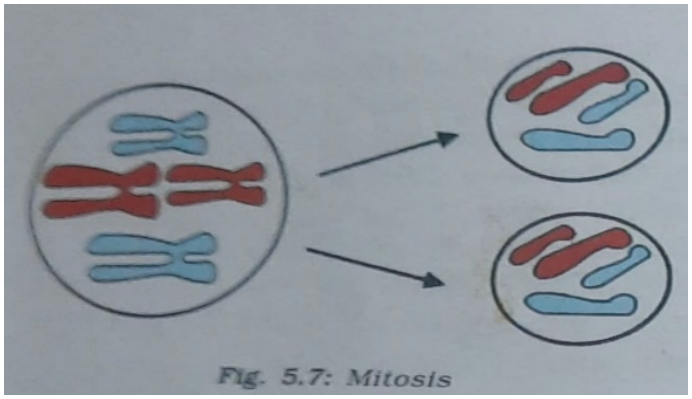
Total no. of periods : 11

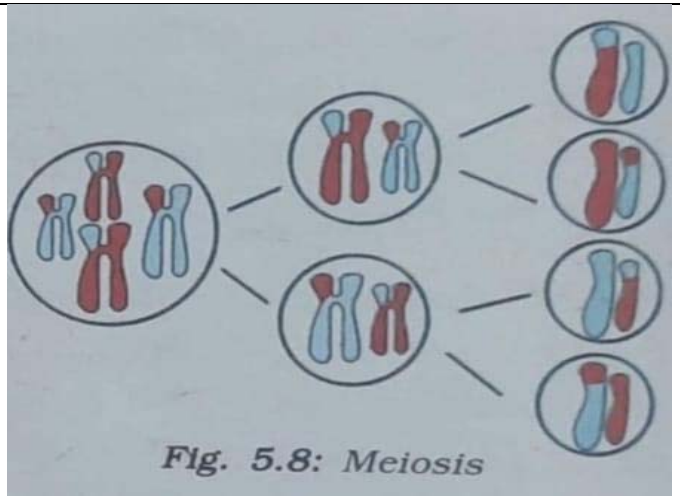
Period plan : 11/11

Time : 40 min

Key Concepts :**Mitosis, Meiosis-** cell division

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	Recalls previous knowledge. • How new cells are formed from pre existing cells? • How new organism develops from a single celled zygote? • How are injured cells are repaired in our body? • We shed millions of skin cells every day and are replaced by which process?		

			
Differentiates Mitosis and Meiosis	• Why is cell division essential for living organisms? • How are gametes produced during sexual reproduction? • How do organisms grow during their life time?	• What is cell division? • What are the two types of divisions in living organisms? • Which division occurs in body or somatic cells? • Which division occurs in reproductive cells?	Images in IFP Models of Mitosis and Meiosis
		• How many daughter cells are formed in mitosis? • Why the chromosome number remains same in daughter cells and mother cell? • How does mitosis help in growth and repair of tissues in living organisms? • What is the other name for Mitosis? • How many daughter cells are formed in Meiosis? • Why the chromosome number has reduced to half in daughter cells? • What is the other name for Meiosis? • How does the same chromosome number is maintained in body cells?	https://www.youtube.com/watch?v=4Afnb8RqLwk



- Which division is responsible for maintaining same chromosome number through generations?
- Fill the table with differences in mitosis and meiosis

MITOSIS	MEIOSIS
•	•
•	•
•	•
•	•

- If a cell has 46 chromosomes in it, how many chromosomes are seen in daughter cells if it divides by mitosis?
- If a cell with 46 chromosomes undergoes meiosis, how many chromosomes are seen in daughter cells?

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

FORMATIVE ASSESSMENT-I.

Class: IX.

Lesson: The Fundamental Unit of Life.

Time: 40 minutes. Marks: 20.

I. Match the following. (1.Mark)

Group-A Group-B

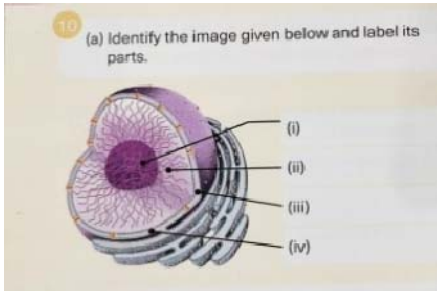
1.Robert hook. [ ] A. Discovered the Nucleus.

2.Leewen hoek [ ] B. Observe the cells in the cork slice.

3.robert Brown .[ ] C. Discovered the free living cells in pond water.

A).1.B 2.C 3.A B) 1.C 2.B 3.A C)1.A 2.B 3.C D)1.C 2.A 3.B.

2.Label the parts of given diagram? I.....II.....III.....IV.....?(1.Mark)



_____. 3.Identify true or false in the following statements, (2x1/2=1Mark.)

(a).Substances like CO_2 or O_2 can move across the cell membrane by a process called Diffusion.

(b).Spontaneous movement of a substance from a region of low concentration to a region of high concentration high.

4. Observe the following statements and choose the right option given bellow. (1Mark).

M Assertion(A): Cells are functional units of life.

Reason(R): A single cell can perform all the life processes

(a) A is true and R is the correct explanation of A.

(b) Ais true and R is not correct explanation of A.

(c) A is false and R is true.

(d) A is true and R is false.

. 5.Which of the following Scientists coined the term protoplasm for the fluid substance of the cell. (1Mark)

(a).Robert Hook (b). Leewen hoek. (c).Purkinje. (d) Virchow.

6.Plants cells in addition to the plasma membrane, have another rigid outer covering of plant is called the cell wall. The cell wall lies outside the plasma membrane. The plant cell wall is mainly composed of cellulose .Cellulose is a complex substance and provides structural strength to plants.....(2 Marks)

(a).Why do most plant cells have Cellulose cell walls?

(b).What is cell wall composed of?

7.Why is the cell called the structural and functional unit of life? (2 Marks)

8.Fill the gap (3 Marks)

(a).Chromosome in prokaryotic cell.(a) .....

(b).Chromosomes in eukaryotic cells(b).....

(c).Give example for Prokaryotic cell(c).....

9. Discuss, how substances like CO_2 and water move in and out of the cell? (3 Marks)

10. What are the consequences of the following conditions? (3 Marks)

(i). Cell having higher water concentration than surrounding medium.

(ii).A Cell having lower water concentration than surrounding medium.

(iii) A Cell having equal concentration to its surrounding medium.

FORMATIVE ASSESSMENT.II

Class: IX.

Time:40 Minutes. Marks:20.

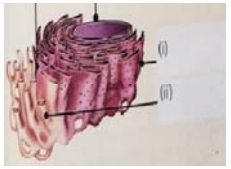
Match the following.

1.Match the following.(1.Mark)

1. Mitochondria. [ ] a. Storage sacs.
2. Lysosomes. [ ] b. Power houses of the cell.
3. Vacuoles. [ ] c. Suicidal bags of the cell.

1. b 2.c 3.a 2.1c 2.a 3.b 3.1b 2.a 3.c 4.1.a 2.c 3.b.

2. Identify the part-i and part-ii. In the following diagram.(1.Mark).



3.Identify true or false in the following sentences?(A

(a) Struma Semi fluid colloidal complex in the chloroplast in the chloroplast.

(b) Leucoplasts are responsible for different colours of flowers and fruits.

4 .Observe the following statements and choose the right option given below.

Assertion (A): Chloroplast and Mitochondria are self replicating organelles.

Reason(R):Chloroplast and Mitochondria also have their own DNA and ribosomes following.

1. A is true and R is the correct explanation of A.

2.Ais true and R is not correct explanation of A.

3.A is false and R is true.

4.A is true and R is false.

5.Which of the following organelle involved in the formation of Lysosomes.

(a).Golgi Apparatus. (b). Mitochondria. (c). Vacuoles. (d). Endoplasmic Reticulum.

6. Read the given passage and related study concepts answer the following questions.

Plastids are present only in plant cells. There are two types of plastids- Chromoplasts (coloured plastids),and Leucoplasts (colourless plastids). Chromoplasts containing the pigment Chlorophyll are known as chloroplast. Chloroplasts are important for photosynthesis. Chloroplasts also contain various yellow or orange pigments in addition to chlorophyll.

1.How Chromoplasts helps to plants in pollination?

2.Name pigment responsible for Yellow or Orange colour?

7. Why is it necessary for reproductive cells to have half the number of chromosomes of the original cell?

8. Identify the parts that correctly match with description given below.

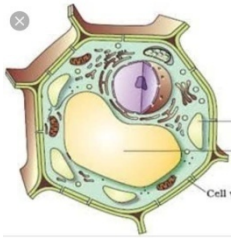
i) Cell division that helps in the formation of gametes.

ii) No. of Chromosomes in parents and off-springs remain same.

iii) Daughter cells have half the number of chromosomes.

9. How does the structure of Mitochondria relate to its function?

10. Observe the Eukaryotic cell: Identify the parts by the given statements.



A) Selectively permeable membrane:

B) Is control centre of the cell:

C) It is an aqueous material with variety of substances

D) These help in photosynthesis:

E) They carry hereditary characters of an organism from one generation to another

F) These are the sites of photosynthesis within the plant cells

e-Content.

1. *https://www.youtube.com/watch?v=MUSoB8y1uuM*
2. https://www.youtube.com/watch?v=W7tHiMaTuUs
3. https://www.youtube.com/watch?v=W7tHiMaTuUs
4. *https://www.youtube.com/watch?v=bxU7GaPo1_k*
5. https://www.youtube.com/watch?v=S-Q0trle000
6. **https://www.youtube.com/watch?v=g0M9NDEQjI8**
7. https://www.youtube.com/watch?v=FuVw8VhXb9w
8. https://www.youtube.com/watch?v=pVWJz0jjFZo
9. https://www.youtube.com/watch?v=FuVw8VhXb9w
10. https://www.youtube.com/watch?v=4Afnb8RqLwk

CLASS : IX

CHAPTER : TISSUES

TOTAL NO. OF PERIODS: 12

Aims of Education:

1. Rational thought and Independent thinking
2. Health and wellbeing
3. Democratic and community participation

Aims of Science Education:

1. Scientific understanding of the natural and physical world:
   - Student develops scientific understanding through specific observations, questions, experiments, principles and concepts.

2.Capacities for scientific inquiry:
   - Student develop abilities to put forth, hypotheses, evaluate situation and draw logical conclusion.

3. Interdisciplinary understanding between science and other curricular areas:
   - Students understanding involves understanding interlinkage across disciplines concepts and learn about the world through such an interdisciplinary approach.

4. Scientific temper :
   - Student will imbibe scientific values and disposition.

5. Creativity:
   - Student develop creativity in asking questions, observing patterns, designing good experiments.

Curricular Goals and Competencies

Curricular Goal – 1 : Explore the world of matter, its interactions and properties at the atomic level

Competency -1.3 : Describes and represents chemical interactions and changes using symbols and chemical equations

Curricular Goal – 3 : Explore the structure and function of the living world at the cellular level

Competency - 3.2 : Analyses similarities and differences between various plant tissues and animal tissues

Curricular Goal – 4 : Explores interconnectedness between organisms and their environment
Competency - 4.1 : Applies the knowledge of cellular diversity in organisms to classify them into different groups

Curricular Goal - 5: Draws linkages between scientific knowledge and knowledge across other curricular areas
Competency - 5.1 : Explores how mathematics is applied in science

Curricular Goal - 8: Explores the nature of science by doing science
Competency - 8.1: Develops accurate and appropriate models to represent real life events.
Competency - 8.2 : Designs experiments formulates hypothesis and represent data.

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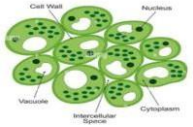
CONCEPT MAP

TISSUES

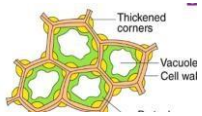
PLANT TISSUE

SIMPLE TISSUE

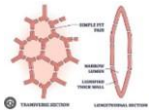
PARENCHYMA



COLLENCHYMA

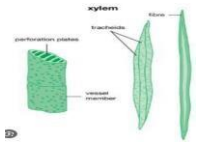


SCLERENCHYMA

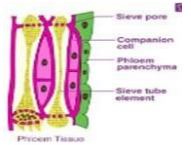


COMPLEX TISSUE

XYLEM

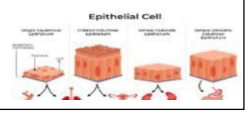


PHOLEM

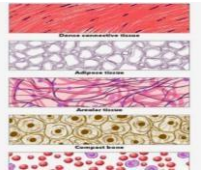


ANIMAL TISSUE

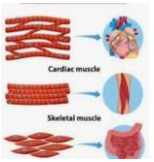
EPITHELIAL



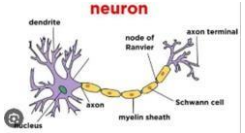
CONNECTIVE



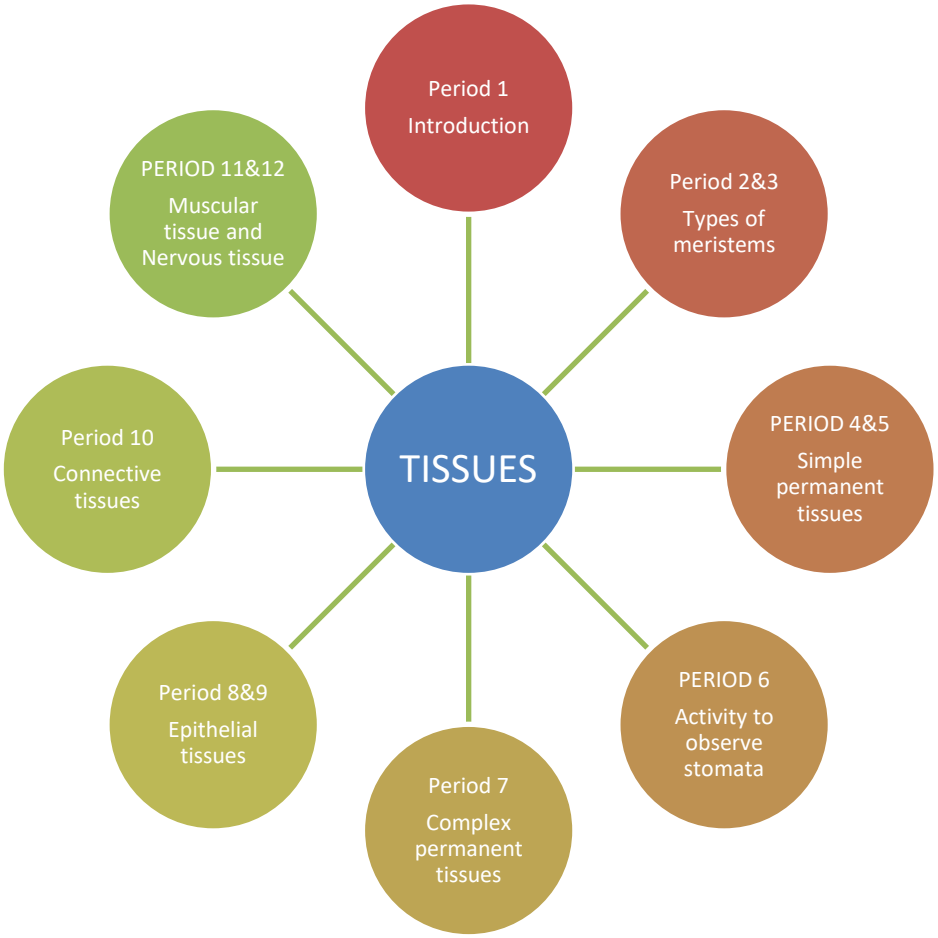
MUSCULAR



NERVOUS



PERIOD MAP


TISSUES
Period 1
Introduction
Period 2&3
Types of meristems
PERIOD 4&5
Simple permanent tissues
PERIOD 6
Activity to observe stomata
Period 7
Complex permanent tissues
Period 8&9
Epithelial tissues
Period 10
Connective tissues
PERIOD 11&12
Muscular tissue and Nervous tissue

TOPIC WISE LEARNING OUTCOMES

Period No.	Topic	Learning outcomes
1	Tissues: Introduction, 6.1 Are Plants andAnimals made of same type of tissues.	Differentiates plant tissues and animal tissues.
2	6.2 plant tissues : 6.2.1 meristematic tissues.	Classifies meristematic tissues into different types
3	Activity 6.1 growth of roots in Onion bulb.	Plans and conducts investigation to observe meristematic tissue.
4	6.2.2 permanent tissues (simple permanent tissue).	Classifies simple tissues into PARENCHYMA,COLLENCHYMA, SCLERENCHYMA
5	Activity 6.2 Simple permanent tissues in transverse section of stem.	Design an experiment to observe simple permanent tissues
6	Activity 6 observing stomata under microscope.	Plans and conducts investigation to observe stomata.
7	6.2.2 (ii) complex permanent tissues	Classifies Complex permanent tissues into XYLEM, PHLOEM

8	6.3 Animal tissues,6.3.1 Epithelial tissue and types.	Analyses and interprets the role and types of Epithelial tissues.
9	6.3.2 connective tissues, activity 6.4, & blood tissue.	Explain blood as the fluid connective tissue.
10	6.3.2 Bone, ligament, areolar tissue, adipose tissue	Analyses role of different types of connective tissues
11	MUSCULAR tissues, activity 6.5	Relates Muscular tissues to their functions Classifies muscular tissues into different types.
12	NERVOUS tissue.	Analyses the role of nervous tissue in transmitting the stimulus from one place to another within the body

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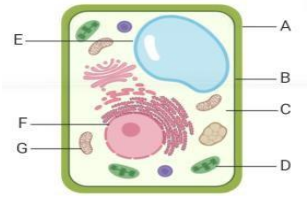
PERIOD PLAN 1

Name of the Chapter : TISSES
Class 09
Total no. of periods 12
Period plan : 01/12
Time : 40 min
Key Concepts : Tissues, Meristematic vs permanent tissues, complexity of structural organization in plants and animals.

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• Recalls previous knowledge about cell and cellular components by asking the students to match the labelled parts of the given cell to the functions they perform.  1. Photosynthesis 2. Inheritance 3. Storage sacs 4. Protection and shape Selective permeability Fluid content		Chart showing plant cell

<table>
<tr>
<td>Explains the term tissue as group of cells that are similar in structure and perform a particular function</td>
<td>Questions for discussion:

• In what way are unicellular organismsdifferent from multi-cellular organisms?
• What are the structures involved in
• the process of nutrition in amoeba and in plants?
• Can you name some cells which perform particular functions in human beings?
• What are the cells which help in transport of water and food to different parts in the plant body?
• Do you find division of labour in multicellular organisms?
• Teacher explains that cells specialized in one function are often grouped together to perform a particular function and introduces the term Tissues.

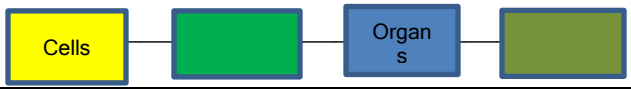
• Asking students to observe the structure of leaves, stem and root in a plant body.
• The teacher shows a plant to discuss about the functions carried out by the leaves, stems and the roots of a plant.</td>
<td>Match the following cells to the function they perform:

<table><tr><td>CELLS</td><td>FUNCTIONS</td></tr><tr><td>Blood</td><td>Messages</td></tr><tr><td>Muscle</td><td>Water</td></tr><tr><td>Nerves</td><td>Movement</td></tr><tr><td>Phloem</td><td>O2 & Nutrients</td></tr><tr><td>Xylem</td><td>Food</td></tr></table>
.</td>
<td>https://youtu.be/jKUAgwMDRy4?si=T5_y4Ic2GUHAUu0q

Pictures of variouscells on IFP.

Plant specimen</td>
</tr>
</table>

Differentiates plants and animals based on their functions	• Do plants and animals have the same structure? • Do they perform similar functions? • Group Activity: • Engage students in groups to discuss aboutthe basic differences in plants and animals (Growth, feeding pattern and mobility). • Questions to ponder: • Why does most of the tissue in plant body is a dead tissue? • Why animals require more energy as compared to plants? • Why most of the tissues in animal body are living? • Is there any difference in the feeding pattern of plants and animals?		

	• Teacher discusses about mobility in plants and animals to understand the concept of distribution of dead and living tissues in them. • Is there any connection between the mobilityand feeding pattern of the plant? • How do you justify unlimited growth in plants(some parts of the plant body}, but limited growth in the animals? • Explains that there are some tissues in the plant body that divide throughout their life in certain regions. • If you cut the stem and branches of a plant in your garden ,will it grow again?	• Why most of the tissues in animal body are living compared to plants? • Observe the growth pattern in at least 5 different plants and animals and record your observation. Add your reflections on the possible reasons for differences in the rate of growth among the organisms you have studied • Why do a gardener trims the stems and branches of plants occasionally in a garden? • What is the reason for bushy appearance in plants?	Permanent slides of various tissues
Classifies tissues into meristematic tissue and permanent tissue in plants Describes structural organization in plants and animals	• Can you name the specific parts of the plants that show unlimited growth? • Teacher emphasizes that based on the dividing capacity of the tissues, various plant tissues are classified • Introduces the terms meristematic tissue and permanent tissue • Are tissues grouped together to form different structures in plants and animals? • Teacher explains the difference in structural organization in plants and animals with reference to their	• Why do plants grow throughout their life where as animals cannot? • What is the reason for limited growth in animals? • How can you differentiate a permanent tissue from a meristematic tissue • Where do you find meristematic tissues in the plant body? Fill the boxes with correct answer 	

	feeding habits and mode of life.	• What are the various organs seen in the plant body? • What are the organ systems that form structure of the plant body? • How many types of tissues are basically found in plants to perform various functions? • Give some examples for the organ systems found in the animal body? • Why there is difference in the structural organization of plants and animals?	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

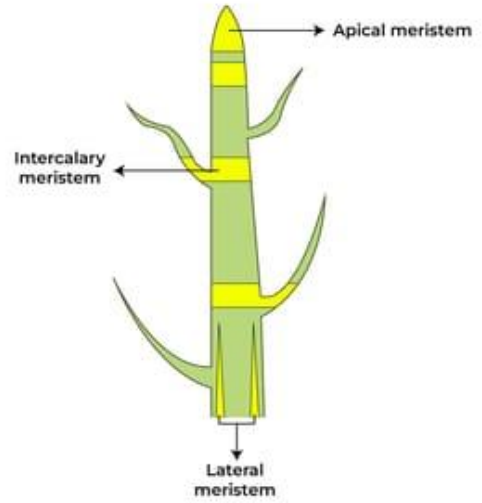
4. Areas of improvement

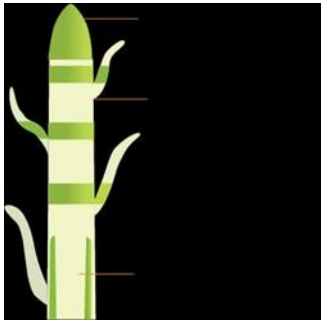
5. Measures taken to refine the teaching-learning process.

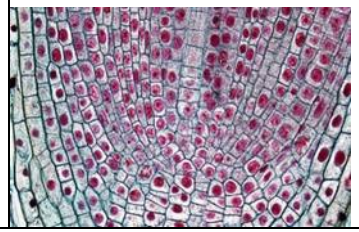
PERIOD PLAN 2

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 02/12
Time : 40 min
Key Concepts : **Meristematic tissue, Types of meristems**
.

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• **Testing previous knowledge** • **Which tissue is responsible for indefinitegrowth in certain regions of the plant body?** • **Where do we find meristematic tissue inthe plant body?** • **Where are growing tissues located in a plant?**		
Plans and conducts experiment to locate meristems in plants	• **Asking the students to observe a plant in the school garden**	• **From which place new leaves are formed onthe stem** • **Why do plants increase in their length?** • **Why some of the plants have thick stems and are woody in nature?**	
Classifies meristems into apical, intercalary and lateral meristems	• **Explores different types of meristems based on their location and function**	• **How do roots and stems grow longer?** • **Which tissue is present in the stem tips androot tips?** • **Why is it called as an Apical meristematictissue?**	**Images in IFP**

	 Apical meristem Intercalary meristem Lateral meristem		

Relates plant growth with meristems	• **Observe young stem and an old stem in the school garden** • **What difference you can make out between a young stem and an old stem?** • **Very often we see grasses eaten up by grazing animals.** • **How do they repair their damaged parts?** • **Which tissue is responsible for this kind of growth?**	• **Which tissue increases the girth/thickness of the plant body?** • **Why these tissues are called as lateral meristems?** • **When is lateral meristem formed in the plant body?** • **Why lateral meristem is called as secondary meristem?** • **Why intercalary meristem is seen mostly in grasses?** • **Why is it called as an intercalary meristem?** • **Identify the parts in the given picture** 	
Communicates his findings	**Discusses the structure of meristematic**		

about the structure of meristematic tissue	**tissue by showing permanent slide** 		**Permanent slide** **https://www.youtube.com/live/hYDbzZ39ydw?si=OPBKT6eKt5pjwEb3**

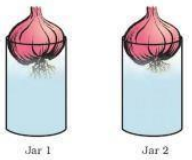
	• **What is the thickness of cell wall?** • **Could you identify prominent nucleus inthe cells?** • **Can we think why they would lack vacuoles?**	• **Why do they have thin cell walls?** • What are vacuoles ? • **What is the role of vacuole generally in plantcells?** • **What is the reason for absence of vacuoles in the meristematic tissue?**	

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 3

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 03/12
Time : 40 min
Key Concepts : **Meristematic tissue – Onion root tip activity**
.

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Plans and conducts activity and records the data	Testing previous knowledge *What is a meristematic tissue? *What are the types of meristems generally seen in a plant body? *Where do you find apical meristems in a plant body? *Which tissue is responsible for increasing the girth of plant body? *Why are intercalary meristems seen in grasses? Demonstrates the activity (this is done 3 days before)  Perform the activity and observes growth of roots in both the jars	Which of the two onions has longer roots	Onion bulbs glass jars Water blade

<table>
<tr>
<td>Analyses the growth of roots in both the Jars and Interprets the data and draws Inference

Relates plant growth with the meristematic tissue

Designs an experiment to observe meristematic tissue</td>
<td>Measures the length of roots each day for five more days
After 5 days records the observations in the form of table

<table>
<tr><td></td><td>Day1</td><td>Day2</td><td>Day3</td><td>Day4</td><td>Day5</td></tr>
<tr><td>Jar1</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Explains the relation between growth of roots and the meristematic tissue

Conducts an activity to observe meristematic tissue in the onion root tip</td>
<td>Do the roots continue growing even after we have removed their tips?

Why would the tips stop growing in jar2 after we cut them?

What might be the reason for difference in the growth of onion root tips in both the jars?

What is the function of Meristematic tissue?

Why do they have thin cell walls?

Do all cells look similar in the meristematic tissue?

What are the components of cells in meristematic tissue?

How does the cells look like in the meristematic tissue?

Are these cells look like a typical plant cell?</td>
<td>Microscope
Slides
Cover slip
Brush
Needle
Blotting paper</td>
</tr>
</table>

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 4

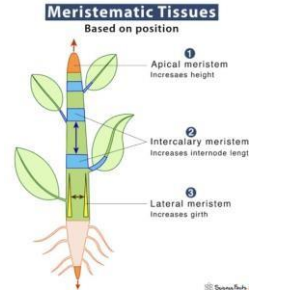
Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 04/12
Time : 40 min
Key Concepts : **Permanent tissues – simple permanent tissues**
.

<table>
<tr><th>LEARNING OUTCOMES</th><th>TEACHING - LEARNING PROCESS</th><th>ASSESSMENT STRATEGIES</th><th>TLM</th></tr>
<tr><td></td><td>• Which tissue of the plant plays vital role in growth?
• How many types of meristematic tissues are there?
• What impact do these tissues have on plant based on their structure?
• How do environmental factors influence the growth and development of meristematic tissue?</td><td></td><td></td></tr>
<tr><td></td><td>• Group activity :</td><td>• Name the functions carried out by permanenttissue
• What are the factors that regulate the growth and development of permanent tissue in plants?

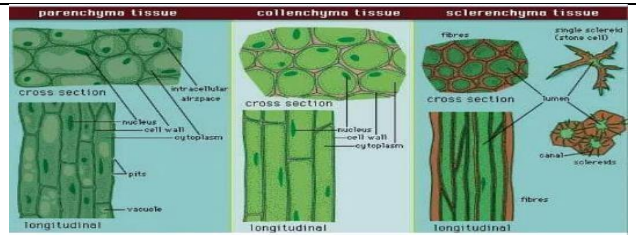
Fill the table with accurate answers:

<table><tr><td></td><td>Meristematic tissue</td><td>Permanent tissue</td></tr><tr><td>Cell division</td><td></td><td></td></tr></table></td><td>Pictures of meristematic & permanent tissue

Chart showing meristematic & permanent tissue</td></tr>
</table>

Differentiates meristematic tissue from permanent tissue	  Observe the given diagrams discuss on meristematic & permanent tissue and prepare a tabular form • What distinguish permanent tissues from meristematic tissue? • How do cells undergo transition from meristematic to permanent tissue? • Teacher explains that the cells of meristematic tissue lose the ability to divide and form a permanent tissue. • This process of taking up a permanent shape , size and form a function is called differentiation • Are there any specific examples how different types of tissues are adopted to their function in plants?	Inter cellular spaces Cell wall Nature cell *How differentiation leads to formation of various types of permanent tissues? *Why are permanent tissues are classified into simple and complex permanent tissues? *What are the simple permanent tissues found in the plant body?	

	Describes different types of simple permanent tissues in the plant body by observing the permanent slide of T.s. of stem		Permanent slide https://youtu.be/XWjlXYQNAFI?si=P 1vj9Nbud9mRHrJw

Classifies simple permanent tissues into different types	   • If you pour water on both materials which material can absorb water easily? • Why sponge absorbs more water than the clay? • Which tissue contains more intercellular spaces? • Why do they have intercellular spaces? • Which parenchyma cells have large cavities?	• Which tissue forms bulk of the plant body? • Why is it called as a fundamental or ground tissue? • Is parenchyma living or a dead tissue? • How can you differentiate a dead tissue from a living tissue? • What is the primary function of parenchyma cells • Does the parenchyma cell have vacuole in their cells?. • What is buoyancy? • State true or false for the following statement ✓ Aerenchym tissue contain air cavities and provides buoyancy ✓ Chlorenchyma tissue in the plants does not synthesize food ✓ Storage tissue will have large intercellular spaces • Which character makes the collenchyma tissue to be commonly found in the leaves and young Stems?	Pictures of simple parenchyma tissue, clay and sponge Plant showing tendrils

	• Does the parenchyma cells are capable of synthesizing food • How does the large cavities of parenchyma cells helps the plants to float on water?  • How does the Collenchyma tissue provides support to growing plants	*Why is aerenchyma tissue predominantly found in aquatic plants? *The thickness of cell walls in collenchyma tissue is due to deposition of_____ *Is collenchyma a dead tissue or a living tissue? *Why is it considered as a dead tissue?	
Relates sclerenchyma tissue with its function	Teacher provides coconut shell, husk and nuts and give a task to the student to observe and figure out characters  	• Which tissue is commercially exploited to make rope • Why can't we use other tissue for making rope? • What role does lignin play in sclerenchyma cells? • What is the location of sclerenchyma tissue in the plant body? • What is the main function carried out by sclerenchyma? Find the type of tissue for the given examples:	Specimens of Coconut shell, husk pear, flax , hemp, lotus Picture of hardwood trees, oak, maple,

<table>
<tr>
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<td>

What is the reason behind toughness of the coconut shel?l
What would be the primary function of sclerenchyma tissue?
How do you differentiate coconut shell from lotus leaf?

</td>
<td>Coconut husk ------
Lotus petiole --------
Stem tissue -- -------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Complete the worksheet and submit
<table>
<tr><th></th><th>parenchyma</th><th>collenchyma</th><th>Sclerenchyma</th></tr>
<tr><td>Cell wall</td><td></td><td></td><td></td></tr>
<tr><td>Definition</td><td></td><td></td><td></td></tr>
<tr><td>Shape</td><td></td><td></td><td></td></tr>
<tr><td>Function</td><td></td><td></td><td></td></tr>
</table>
</td>
<td></td>
</tr>
</table>

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

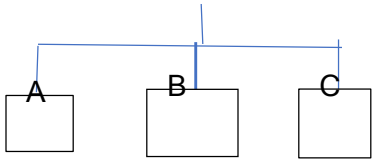
3. Were the students engaged?

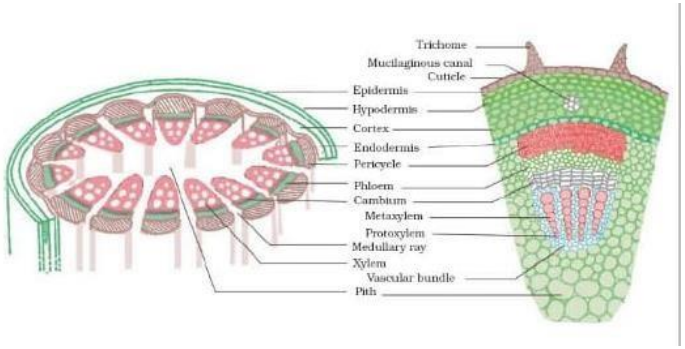
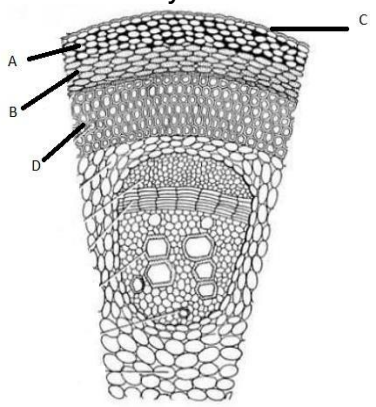
4. Areas of improvement

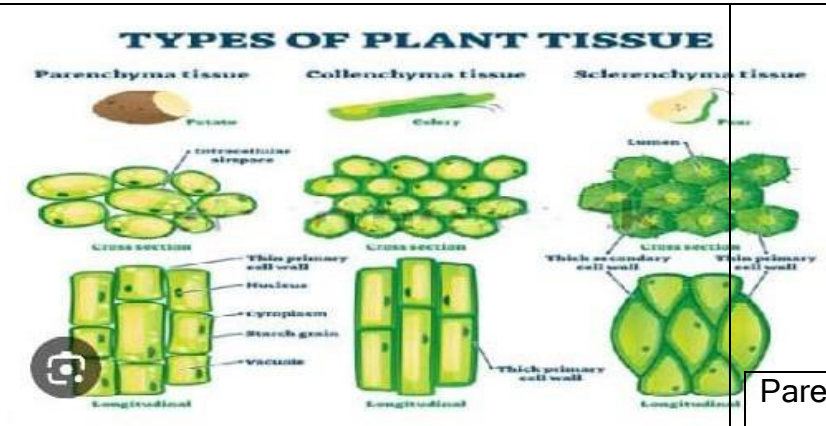
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 5

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 05/12
Time : 40 min
Key Concepts : Simple permanent tissues in transverse section of stem - Activity

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• What are simple permanent tissues? • How does sclerenchyma differ from collenchyma? • Find the A, B & C in the below flowchart Parenchyma  .		
Plans and conducts investigation to observe simple permanent tissues	**<u>Activity 6.2</u>** **Demonstrates transverse section of stem to observe simple permanent tissues**	• What type of plants do you suggest to perform section cutting in stems? • Can you mount the specimen without using glycerine?	stem specimen, safranin

	Students are engaged in doing section cutting and find out different types of tissues by discussion  • What is the purpose of performing crosssection of stem? • What specific feature can be identified in the stem under the microscope? • What materials are generally used to do this experiment? • What is the specific role of safranin stain while doing the section cutting?	• Did glycerine play any specific role while doing section mounting? • What precautions will you take while doing the experiment? • Did you find any other new things in the slide you have observed  • Identify the parts A,B,C & D given in the above given diagram and label parts , write specific features about the label parts A B C D	glycerin, zero brush , needle, Petri dish , cover slip , micro scope, slide, watch glass
Explains the structure of simple permanent tissues in plants using	Lab activity : Students are instructed to observe permanent slides of simple permanent tissues in the laboratory and note down the characters that you have identified	• Is there any difference in the shape of cells and components present?	Microscope , permanent slides of parenchyma ,

<table>
<tr>
<td>Permanent slides</td>
<td> 

What are the common characters used to distinguish different types of simple tissues?
How does the structure of parenchyma tissue differ from that of collenchyma tissue?
What features can aid in their identification during your observation?
What staining techniques are commonly employed to enhance the visibility of simple tissues?

</td>
<td>

How do the function of parenchyma, collenchyma & sclerenchyma differ within the plant body?

Tabulate the characters of simple permanent tissue based on the components present in them and draw the diagrams.
<table>
<tr><th>Parenchyma</th><th>Collenchyma</th><th>Sclerenchyma</th></tr>
<tr><td></td><td></td><td></td></tr>
</table>
</td>
<td>collenchyma, sclerenchyma</td>
</tr>
<tr>
<td>Draws labelled diagrams of simple</td>
<td></td>
<td>Draw neat labelled diagram of transverse section of stem and parenchyma, collenchyma and sclerenchyma.</td>
<td></td>
</tr>
</table>

permanent tissues and T.S. of stem			

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

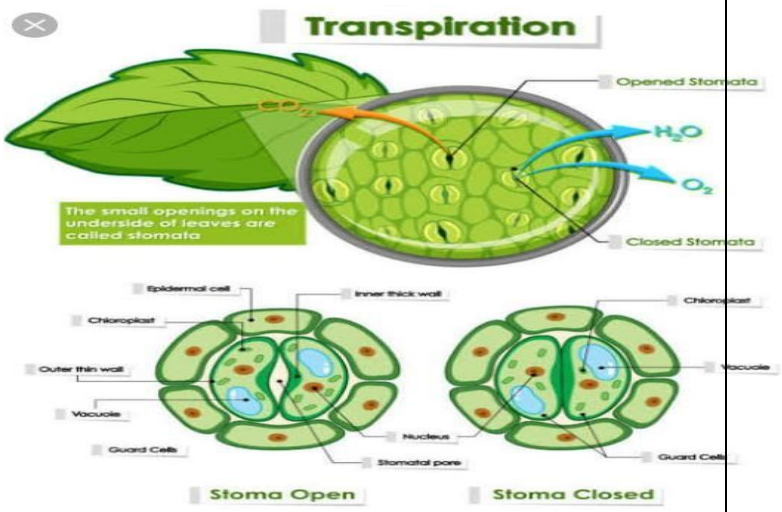
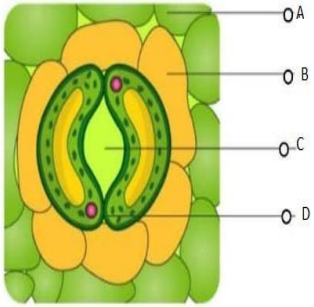
4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

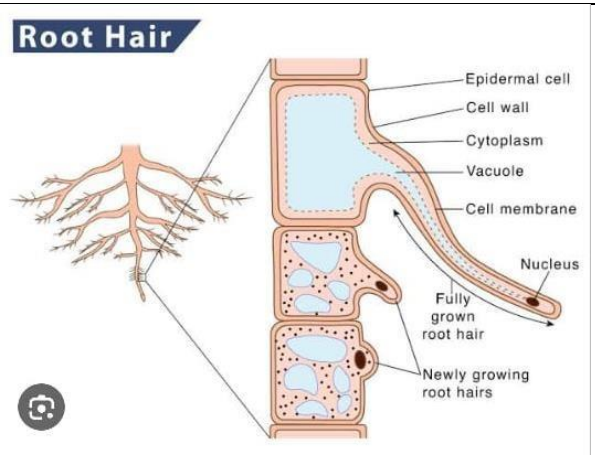
PERIOD PLAN 6

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 06/12
Time : 40 min
Key Concepts : Stomata in epidermal cells – Activity, cork tissue

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• Have you ever wondered how plants breathe (or)take in gases? • What do you think enables plants to exchange gases with the environment ? • Do you think plants have a systemic arrangement for exchange of material inside or outside ? • How do you think plants might have control on the water loss ? • Why do you think it is important for plants to regulate exchange of gases they take in and release ? • Have you ever noticed tiny openings on the surface of leaves ? what do you think they might be?		
	Activity 6.3:	• How can observing stomata in the rhoeo leaf help you to understand their role in exchange of gases?	Rhoeo leaf, safranin ,

Plans and conducts investigation to observe structure of stomata under microscope	Students will do the experiment and find out the arrangement of stomata in the leaves that are dissected  • What is the shape of guard cells in the stomata? • What is Transpiration? • Which structures help in loss of water in the form of water vapour in the leaves?	 • Observe the above diagram and label the parts. • Do you find any difference between the cells present in the stomata ? • Are there any structures which support photosynthesis in the guard cells? • What is the function of stomata other than exchange of gases?	slide, cover slip, microscope I find Chapter-6 Tissues Subtopic: Presence of stomata in the epidermis of leaf (Experiential learning video) really interesting and helpful on DIKSHA. https://diksha.gov.in/play/collection/do_3131034751962808321146 7?referrer=utm_source%3Dmobile%26utm_campaign%

			3Dshare_content&contentId=do_3130872384187432961300 5
Explains the structure and function of epidermis in stems ,roots and leaves	• What do you call the outer most layer in the leaf peel of rhoeo plant? • Can you imagine the location of epidermal cells on the plant parts ? • What is the crucial role played by epidermis in maintaining the integrity of various parts of the plant body? **Demonstration :** Teacher make the students observe root hairs on the roots of the plant body in the classroom. *What is the function of these root hairs? .	• How many layers of cells are present in the epidermis? • Why epidermis is thicker in plants living in dry habitats? • Does epidermis cover the entire surface of the plant body? • What is the role of stomata in the epidermis of leaf cells? • Root hairs develop from which part of the root cells? • Which structures increase the surface area of absorption in the epidermis of the root?	Two transparent glasses, thread, and water Images of root hair , xerophytes plant



Look at the given diagram and observe the structure of epidermis.

- Why the aerial parts of some kind of plants show thick waxy coating?
- What might be the reason for the presence of several layers of epidermis in the desert plants?

- Why the epidermis is covered by thick waxy coating in desert plants?
- What do you call that waxy coating and what it is made up of?

- Find the odd man out

Root hair – absorbs water and nutrients

Cuticle – increase the transpiration

Stomata – exchange of gases

<table>
<tr>
<td>Relates cork with its function</td>
<td>

Would you find any difference in the above pictures ?
Why there is change in the nature of the stem?
What happens when the stem becomes older?
What do you call the thick layer present on the outerside of old stems?

</td>
<td>

In which stems we can find cork?
How is cork formed in old stems?
Which meristem plays an important role in the formation of cork tissue?
How are cells arranged in the cork tissue?
Is it a dead tissue or a living tissue?
Which substance is deposited in the cork tissue?
Why cork tissue is impervious to gases and water?
What happens to the epidermis when cork tissue is formed in the old stems?
What is the function of cork tissue?
How does exchange of gases take place in older stems?
Are lenticels similar to stomata?
Is bark and cork similar in their terminology?

</td>
<td>https://youtu.be/QapM_HUWwpY?si=bavskwQJaqXSUWmt</td>
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<td></td>
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<td>Complete the given work sheet and submit
<table>
<tr><th></th><th>Root</th><th>Stem</th><th>leaf</th></tr>
<tr><td>Epidermis</td><td></td><td></td><td></td></tr>
<tr><td>Cork</td><td></td><td></td><td></td></tr>
</table>
</td>
<td></td>
</tr>
</table>

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

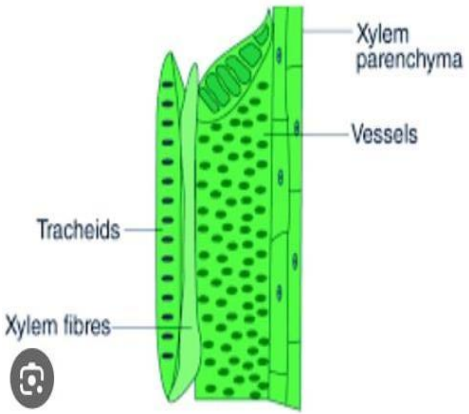
4. Areas of improvement

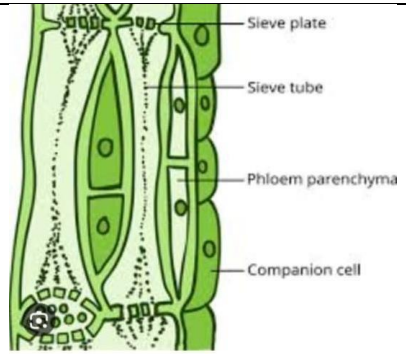
5. Measures taken to refine the teaching-learning process.

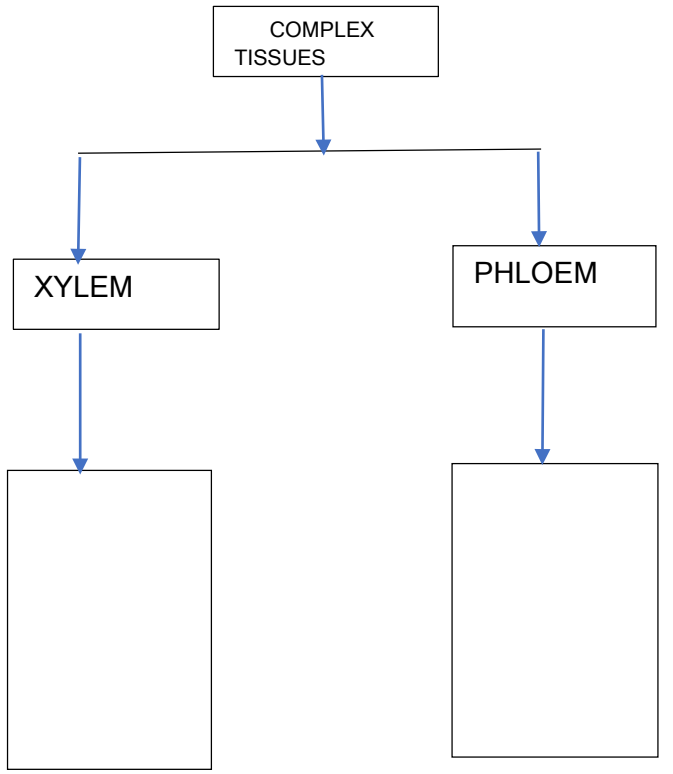
PERIOD PLAN 7

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 07/12
Time : 40 min
Key Concepts : Complex permanent tissues - xylem, phloem.

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	➢ Recalls previous knowledge • Why epidermis is always present as an outer covering of plant body? • How does cells in the simple tissues appear similar in their structure and function? • In the section cutting that you did in the previous class, did you find any type of tissue other than parenchyma, collenchyma and sclerenchyma?		
Differentiates xylem and phloem tissues	• Do all the tissues made up of same type of cells in the plant body? • Are food materials, water and minerals are transported by the same tissue in plants? • Why do plants need different tissues to serve different functions?	• What are complex permanent tissues? • Do all cells perform a common function in a complex tissue? • What are the two types of complex permanent tissues? • Are they living or dead tissues? • What do you call xylem and phloem tissues together? • What is a vascular bundle? • What is the function of vascular tissues in the plant body?	

	Permanent slides of xylem and phloem are shown and students are asked to record their observations:  • Can you identify elongated, tube like structures ? • Are there any visible pits or perforations in the cell walls? What function might they serve? • Do you notice any particular arrangement or pattern of cells within the xylem tissue?	• How do complex tissues differ from simple tissues? • Can you guess what makes complex permanent tissues vital for plant structure and function? • How can you say that xylem is a dead tissue? • How do xylem tissue transports water if it is a dead tissue? • Which cells transport water and minerals in the xylem tissue? • What is the difference between tracheids and vessels? • What are the components of xylem tissue? • Why are tracheids and vessels are considered as dead elements? • What is the function of xylem parenchyma? • What is the function of xylem fibres? • Which is the only living element in the xylem tissue? • What is the material deposited in the cell walls of dead elements?	https://www.youtube.com/live/w1W4XznG6Q0?si=TuN3nEjlA4Hvf6ME

	 • Can you identify the different cell types present in the phloem tissue? • How does the structure of phloem cells differ from that of xylem cells? .  Teacher throws light on the functions of xylem and phloem.	• What are the components of phloem tissue? • What happens to the nucleus in the mature sieve tube elements? • What are the food conducting elements in the phloem tissue? • What is the only dead element present in the phloem tissue? • Which function will be affected if the perforations in sieve tube of phloem tissue are blocked? • What are the functions carried out by Phloem parenchyma, phloem fibres and companion cells? • Which cells support sieve tubes in their function? • Why do sieve tubes need the support of companion cells? • What are Bast fibres? • Which fibres are used commercially in the preparation of ropes, gunny bags etc.?	
	Role play: Teacher guides the students to perform role play to compare and contrast transportation system in animals and plants. Group 1: Will play the role of Circulatory system in animals and present their argument	Identify the functions of xylem and phloem in the flow chart given below	

.	Group 2: Will play the role of vascular tissues and present their argument.		

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

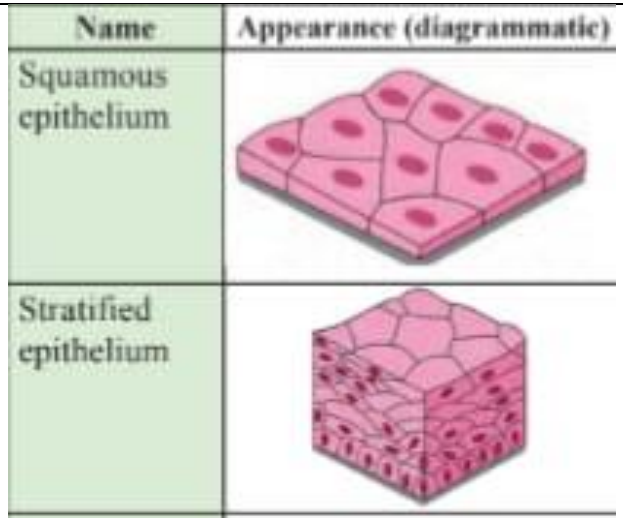
4. Areas of improvement

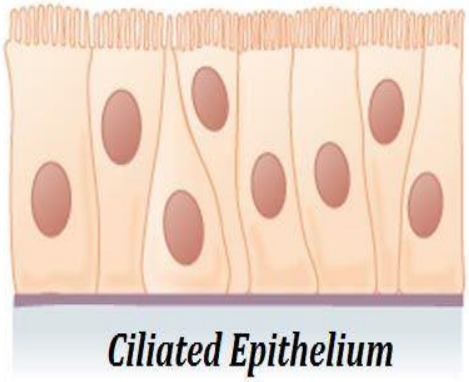
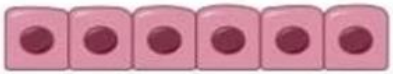
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 8

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 08/12
Time : 40 min
Key Concepts : EPITHERIAL TISSUE, SQUAMOUS, STRATIFIED SQUAMOUS, CUBOIDAL, COLUMNAR (CILIATED)

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	Testing previous knowledge • What are the different types of tissues Seen in plants? • Do you find the same kind of tissues in animals also?		
Classifies animal tissues into different types	• How our body is protected from the scorching heat of sun? • Who carries oxygen, waste materials and food material to all the cells in our body? • How are we able to show movements in our body? • What do you call these structures which help in performing various functions? • Can you name some tissues that you see in our body? • Teacher introduces different kinds of tissues in animal body like epithelial tissue connective tissue, muscular tissue and nervous tissue	**Do you find similar functions of tissues in plant and animal bodies?**	

Explains the structure and function of different types of epithelial tissues		• Which tissue covers the entire animal body? • What are the most organs and cavities in the body covered with? • What is the membrane that separates epithelium from the underlying tissue? • What kind of epithelial tissue is found in areas where transportation of substances occur? • How many layers are present in a simple squamous epithelial tissue?	Images in IFP
	• Is our skin thick or thin in its nature? • What happens if our skin is made up of single layer of epithelial tissue? • What do you observe in people whose skin is accidentally burnt?	• Why do you find several layers of epithelial tissue in the skin? • What is stratified squamous epithelium? • What makes skin prevent wear and tear? • Give examples for simple squamous epithelial tissue? • What is the primary function of epithelial tissue?	
	• What kind of epithelial tissue is seen in places where absorption and secretion occur?	• What is the shape of the cells in the inner lining of the intestine?	

	 • How is columnar epithelial tissue in the respiratory tract is different from intestine?  Simple cuboidal • How is glandular epithelium different from other epithelial tissues?	• What do you call the epithelium if it is made up of pillar like epithelial cells? • What is the function of columnar epithelial tissue in the intestine? • What is function of cilia in the respiratory tract? • Why do we call it as ciliated columnar epithelium? • What do you call the epithelium which is made up of cube shaped cells? • Where do you find cuboidal epithelium in the animal body? • What is the function of cuboidal epithelium tissue? • Which epithelial tissue provides mechanical support to the body parts? • What is the function of glandular epithelium? • How is it formed from epithelial cells? • Is it unicellular or multicellular? • What kind of substances are secreted by the glandular epithelium?	

Complete the table with appropriate answers

Tissues	Structure	Function	Location
Squamous epithelium			
Stratified squamous epithelium			
Columnar epithelium			
Cuboidal epithelium			
Ciliated columnar epithelium			
Glandular epithelium			

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

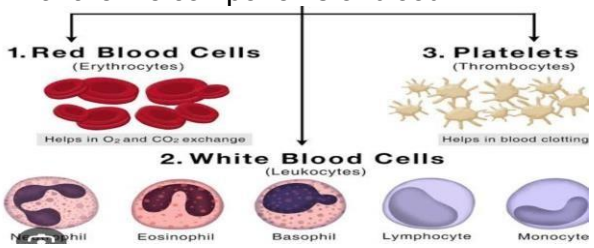
4. Areas of improvement

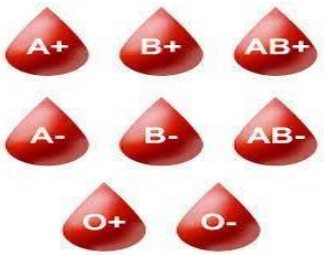
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 9

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 09/1
Time : 40 min
Key Concepts : Blood cells, Blood groups

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	• Which tissues give protection to the animal body? • Are all body parts connected with each other? • Do you find tissues and organs detached in you rbody? • How they remain connected with each other? • Teacher Defines the term connective tissue Connective tissue is one which connects different tissues in the body .It consists of cells which are loosely placed and embedded in an intercellular matrix. • Can we call blood as a connective tissue?	• What is the nature of matrix in connective tissue?	Chart of blood cells

Explains the structure and function of blood as connective tissue	• Elaborates that blood acts as a connective tissue by transporting materials to different tissues in our body What are the components of blood?  	• Why blood is called as a fluid connective tissue? • What do you call the fluid matrix of blood? • What are the different types of blood cells suspended in the matrix? • What are the other materials present in the plasma?	

	Activity 6.4 Preparing slide with a drop of blood and observing it under microscope	What is the lifespan of RBC and WBC? From which tissue RBC are formed? What happens when haemoglobin is deficient in theblood? Why is blood red in colour? RBC are enucleate.Justify.	
Classifies blood groups into different types	At times when you feel sick,which components in your blood fight with foreign bodies? What is your blood group? Is your blood group similar to your parents? Discusses different types of blood groups  	What are the different types of WBC? Which cells are called as microscopic policeman? In which diseases WBC number will decrease? Why do we find different blood groups in human beings? What are antigens and antibodies? People of which blood group can donate blood to allother persons? Who are called as universal recipients? Why are blood banks so important nowadays?	Demonstration of blood group activity https://youtu.be/g7SXPJHDJXc?si=Ttb8foRsUpf9hVEI

		Project Collect information about blood groups of your classmates, parents, neighbors and tabulate the data. Report the common and rarest blood groups from the data.	

<table>
<tr>
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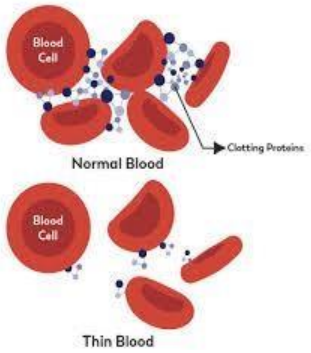
<td>


When your friend met with an accident and need blood immediately,what will you do under such circumstances?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analyses the role of platelets in coagulation of blood</td>
<td>When you are injured and bleed how you could stop, bleeding?

Explains the role of platelets in coagulation of blood.



</td>
<td>What happens if platelets are absent in the blood?

Is there any vitamin that supports coagulation of blood?

What are the cells that are reduced in number when a person is suffering from dengue fever?

Identify the mismatched pair

<table>
<tr><td>RBC</td><td>Haemoglobin</td></tr>
<tr><td>WBC</td><td>Antigens</td></tr>
<tr><td>Platelets</td><td>Clotting</td></tr>
</table>

Prepare a report on blood disorders and display it in the class</td>
<td></td>
</tr>
</table>

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

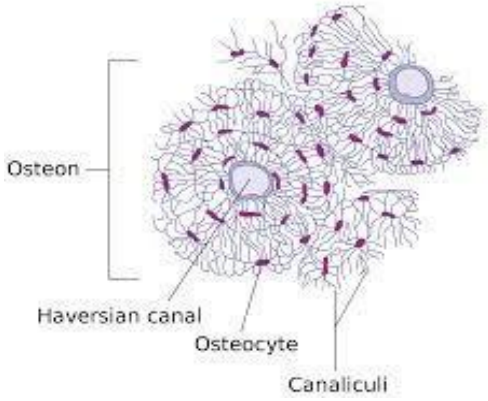
4. Areas of improvement

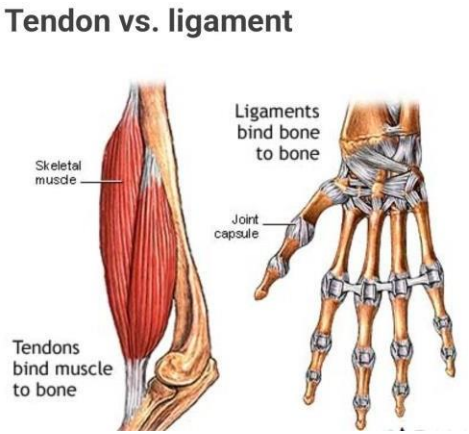
5. Measures taken to refine the teaching-learning process.

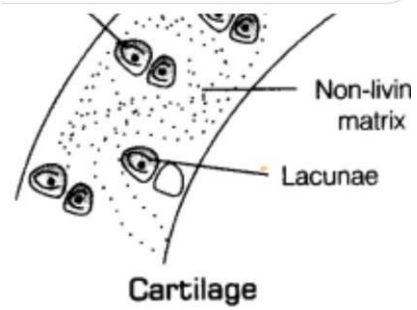
PERIOD PLAN 10

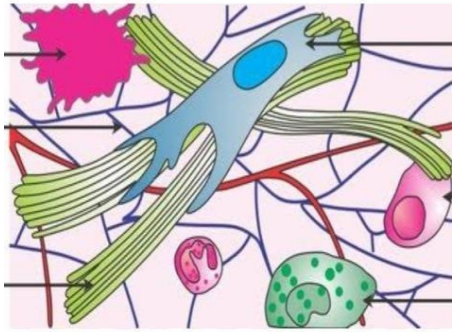
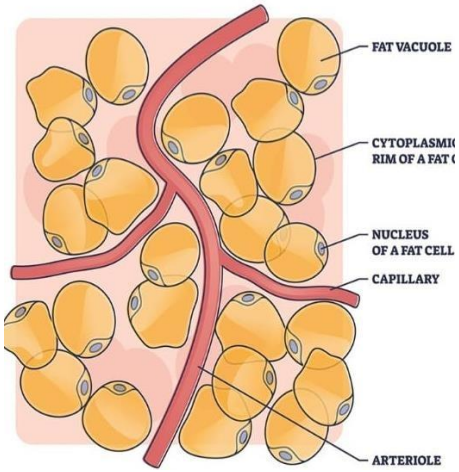
Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 10/12
Time : 40 min
Key Concepts : Bone, Cartilage, tendons and ligaments

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Explains the structure of bone	At times we hear about accidents, where people suffer from multiple fractures? What do you mean by a fracture? What is our skeleton made up off? Is bone a connective tissue? Which tissues are connected by bone? Discusses the structure and function of bones	Why bone is called as a connective tissues? What do you call bone cells? How many bones are present in the human body? What chemical components are present in bone? What is the function of bones in human body? Project Collect information about complications in bone structure and the surgical treatment given to them from hospitals and prepare a report.	Model of skeleton

	 	Student activity :Role play Students are divided into groups and are given the names of joints .Each group will share the function ofthose joints in the class	
Differentiates tendons from ligaments	What do you see when you go to a butcher? Do you find fibre like structures connecting bone and muscle? What do you call those fibre like structures?	What is a tendon? What is the nature of tendon?	

	What do you call the structures which connect bone to bone? Explains the function of tendons and ligaments which joins the muscles and bones. 	What do you call those structures which connect muscle to bone? What are ligaments? How is tendon different from a ligament?	Images in IFP
Differentiates Cartilage and bone in their structure and function	Did you see sharks in the sea? 	Why is Cartilage present between two bones? Give some examples where we find Cartilage in our body?	Images in IFP

	What is their skeleton mostly made up of? Which structure reduces the friction between two bones?  Is there any structure that is almost similar to bone? Discusses the structure and function of Cartilage  Cartilage	How is Cartilage different from a bone? What is cartilage made up of? Can you fold the cartilage in your ears?	
Analyses and Interprets the role of Areolar tissue in animals	Do you find any space between skin and muscles and in-between organs? Which tissue fills the gap between them? How our tissues are repaired when they are damaged internally?		Images in IFP

	Explains the structure and function of areolar tissue 	Which tissue supports internal organs and helps in repair of tissues? What are the components of areolar tissue? Where do you find areolar tissue in the body?	
Describes the role of adipose tissue in maintaining body temperature	Why do old people shiver more in winter season? What makes fat people tolerate low temperatures? How animals living in polar regions can tolerate low temperature? 	Which tissue stores fat in our body? Which tissue acts as an insulator in our body? In what way adipose tissue is different from areolar tissue? Fill the blanks with the functions of following connective tissues	https://youtu.be/Zu8LGwiXZXw?si=mL0eDjSJZFr1Z1G9

	 Explains the structure and function of adipose tissue	Cartilage Ligament Tendons Areolar tissue Adipose tissue	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

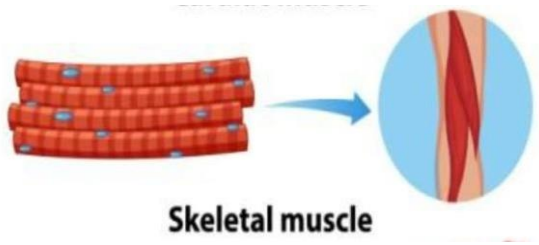
4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 11

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 11/12
Time : 40 min
Key Concepts : Muscular tissue-types of muscles.

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	➢ Teacher poses motivating questions: • What kind of movements are seen in our body while walking, running, playing, dancing, writing etc. • Which body parts are used to bring about these movements? • Are all the muscles present in the body are similar in their structure?		
Classifies muscle tissues into different types based on their structure and function	• Can you control your heartbeat? • Can you control the movement of your hand? • So, based on whether the muscles involved in the above two types of actions are under our control or not, can you classify them? Teacher explains the structure and function of different muscle tissues: • What is the name given to the special proteins responsible for contraction and relaxation of muscles?	• What is the need of having different kinds of muscles? • What are the different types of muscles seen in our body?	Permanent slides Charts of different muscle tissues

Explains the structure and function of voluntary muscle tissue	• Why do we call voluntary muscles as skeletal muscle? Teacher shows permanent slide of voluntary muscle:  • Observe the muscle tissue and note down your findings. • Describe the shape of the muscle cells. • Are the long, cylindrical muscle cells branched or unbranched? • How many nuclei are found in each cell?	• What helps in the movement of voluntary muscles? • Why are voluntary muscles called as striated muscles? • List out the activities which are controlled by voluntary muscles? • What is the medical condition called when voluntary muscles stop functioning?	
Explains the structure and function of involuntary muscle tissue	• Take a piece of cycle tube. Apply oil or a lubricant inside the tube. Now push a potato into the cycle tube by squeezing it down the tube. Compare this movement to the movement of food down the oesophagus. • What do you call this movement of food? • Is this movement under your control? • What type of muscles contribute to this movement? Students observe a permanent slide of involuntary muscles:	• Quote a few examples of involuntary muscle. • Ram and Shyam got into a fight and started hitting each other. With bare hands Ram hit Shyam at the back of the head. Shyam fell down dead instantly. Why did the blow to the back of the head kill Shyam? • So, which part of the brain controls involuntary muscles? • List out the various movements in the body controlled by involuntary muscles. • Why are involuntary muscles called as un striated muscles?	

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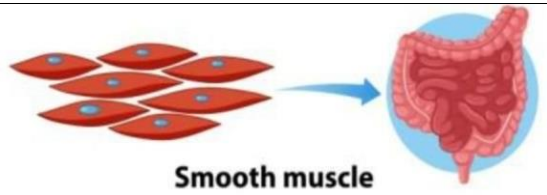

Describe the shape of the cells.
Can you find any branching?
How many nuclei are found in each cell?
Can you find striations or bands in these cells?

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Basing on their texture, what is the other name given to the involuntary muscle cells?

</td>
<td>https://youtu.be/oxoXXmJNEX8?si=RsQaFKt7nqQq2l7m</td>
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<td>Explains the structure and function of cardiac muscle</td>
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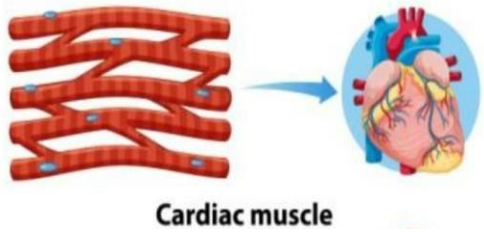
Can you describe heart beat?
What is the Greek word for heart?
So, what name can you give to the muscles associated with heart?



Students observe permanent slide of Cardiac muscle:

Cardiac muscles are involuntary in function but they resemble voluntary muscles in their structure. What is common in the structure of cardiac muscles and voluntary muscles?
What is the shape of cardiac muscles?
How are they distinct from the other two muscles?

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Which of the three muscles discussed today are branched?
What purpose is served by the branches in cardiac muscles?
What do you call when the cardiac muscles stop moving suddenly?
How can you revive the heart in such conditions?
What is CPR treatment?

Complete the following table:
<table>
<tr><th>Features</th><th>Striated</th><th>Smooth</th><th>Cardiac</th></tr>
<tr><td>Shape</td><td></td><td></td><td></td></tr>
<tr><td>No. of Nuclei</td><td></td><td></td><td></td></tr>
<tr><td>Position of nuclei</td><td></td><td></td><td></td></tr>
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Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

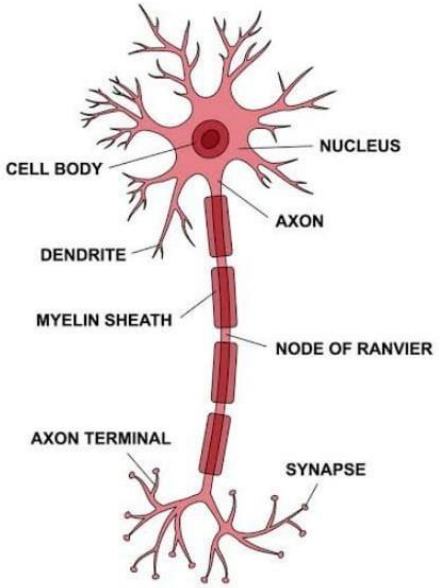
4. Areas of improvement

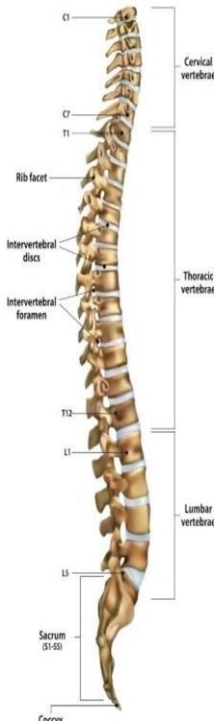
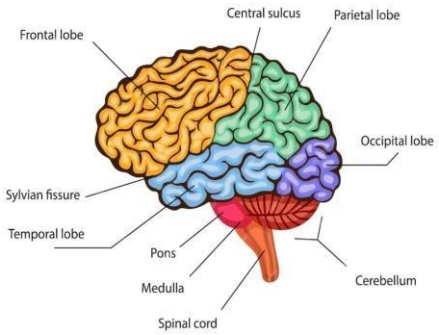
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 12

Name of the Chapter : TISSES
Class : 09
Total no. of periods : 12
Period plan : 12/12
Time : 40 min
Key Concepts : Nervous tissue- Neuron – structure and functions

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	➢ Teacher poses motivating questions: • When you touch a hot vessel what will be your response? • How do you respond to sudden blinding light? • Can you sneeze with your eyes open? • How do you respond to these stimuli? • Which organs in our body detect these stimuli? • How will the sense organs respond to the stimuli?		

Relates response to the stimulus in the nerve pathway. Analyses the structure and function of Neuron Draws neat labelled diagram of neuron	Teacher explains the components of nervous tissue: • How is the stimulus transmitted from detectors to the brain? • Which nerves carry the message from the brain to the muscles? • What is the structural and functional unit of nervous system? Teacher displays the chart of a neuron and explains it:  • What are the two parts that resemble root hairs? • Which is the largest and which is the longest part of a neuron?	• Why are sensory nerves called so? • What is the function of motor nerves? • How can you classify neurons on the basis of the presence of myelin sheath? • What do you call the electrical signals passing from the brain to the muscle? • How are messages carried from brain to muscle? • What do you call this pathway from detectors to effectors? • Response to Stimuli is a coordination between nerve and muscle tissue. Justify • Nerve damage is irreversible. Name a disease associated with such nerve damage • Which nerves are damaged in polio disease? • What is the difference between axon and dendrite? • What are myelinated nerve fibres?	Permanent slides Charts of different muscle tissues https://youtu.be/iloUchxMYCQ?si=ciPNY5n2gUfW3LQ3

	• Which structures help in the transmission of a nerve impulse? • What is the length of an average neuron? • Guess the longest neuron in the human body. Which parts does it connect? What could be its length?   	• Draw a neat labelled diagram of nerve cell. • What is a nerve impulse? • What is the function of nerve impulses? • What is a synapse? • What are the components of nervous tissue?	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

WORKSHEET

ASSESSMENT- 1 *(20*

Marks)

1. While preparing a temporary mount of T.S of the stem, teacher asked Rahul to pick up to stain. He had four bottles A, B, C and D containing Methylene blue, glycerin, distilled water and saffarin. Which one should he pick? ( ) 1 mark

a) D
b) A
c) B
d) C

2. State the true or false for the given statement. ( ) 1 mark

A) Husk of coconut is parenchyma
B) Cork cambium is the example of lateral meristem

3. Find out the incorrect sentence ( ) 1 mark

a) Parenchymatous tissue have intercellular spaces.
b) Collenchyma tissues are irregular thickened at corner
c) Apical and intercalary meristem are permanent tissue
d) Meristematic tissue in its storage ,lack vacuole.

4. Complete the analogy given below and choose the correct option
Cutin: Epidermis :: Suberin:

5. A Statement of Assertion is given by the corresponding ( ) 1 mark
Statement of reason R. Mark the correct answer

A: water hyacinth can float on water surface

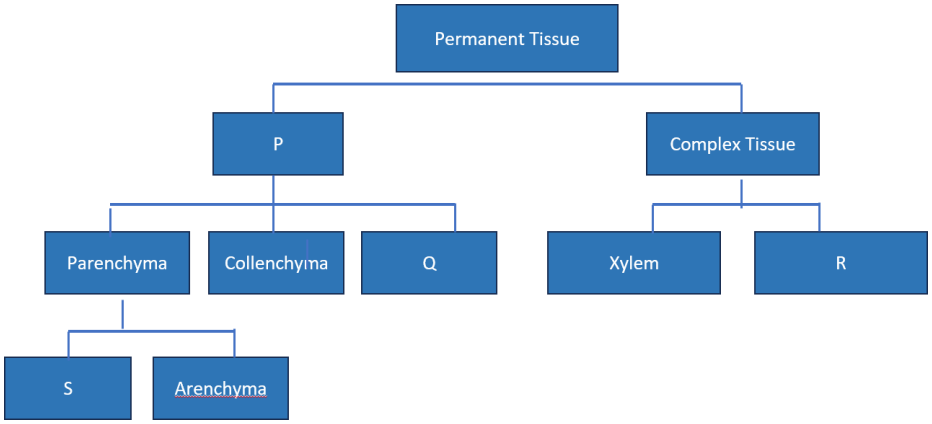
R: Aerenchyma tissue is present in water hyacinth

a) Both A and R is true and R is the correct explanation of A.
b) Both A and R is true but R is not the correct explanation of A.
c) A is true but R is false.
d) A is false but R is true.

6. Chloroplast may occur in ( ) 1 mark

a) Chlorenchyma and sieve tubes
b) Collenchyma and Sclerenchyma.
c) Parenchyma and Collenchyma
d) Xylem Parenchyma and Sclerenchyma.

7. Identify P, Q ,R ,S in the given flow chart 2 marks

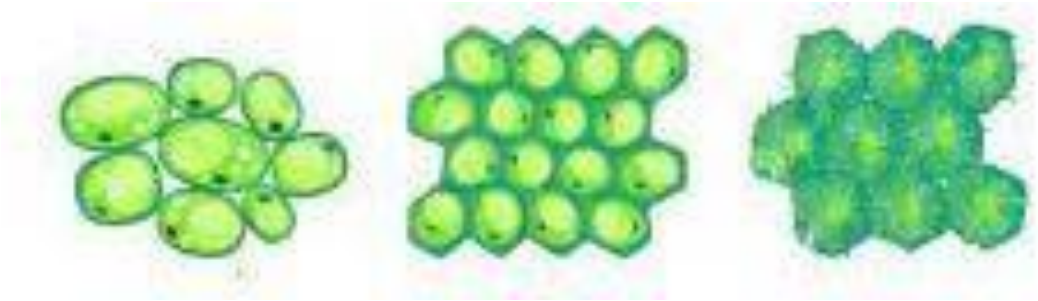


8. Answer the following : 2 marks

a) Which tissue is commercially explored to make ropes

b) Why can't we use other tissues for making ropes?

9. a) Identify the type of simple tissue 3 marks



b) Which among the above tissues have

A. Lignin deposition

B. Stores food and water

C. Dead cells

10. Differentiate between meristematic tissue and Permanent tissue 3 marks

11. Can you name the functions carried out by the statement given below: 5 marks

i) Which process of meristematic tissue converts it to permanent tissue?

ii) Which feature of meristematic tissue helps aquatic plants to maintain buoyancy in water?

iii) Which tissue makes plants flexible?

iv) Identify the following

A) Meristem responsible for increased grith of stem or root

B) Dead cells of simple permanent tissue.

v) What happens to the plants if their tips are removed?

WORKSHEET

ASSESSMENT- 2 *(20*

Marks)

1. Identifying the following ½ x 2 = 1 Mark

i) living component of xylem

ii) Dead element of phloem

2. Complete the analogy given below and choose the correct option 1 Mark

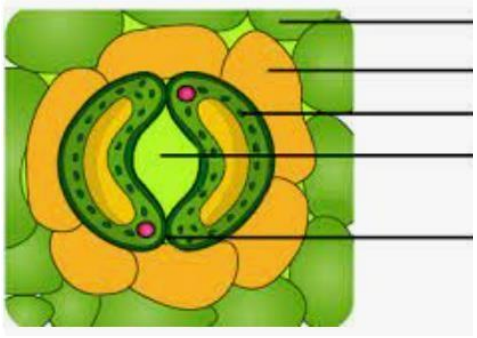
Cutin: Epidermis :: Suberin: …….

a) Cambium b)apical meristem c) Cork cell d) tracheid's

3. Choose the incorrectly matched pair from the options given below. 1 Mark

i. Companion cells –percolated walls
ii. Sieve tubes -thin layer of cytoplasm
iii. Vessels - lignified walls
iv. Xylem parenchyma - thin cell wall

4. Observe the given diagram and label the parts 1 Mark



A

B

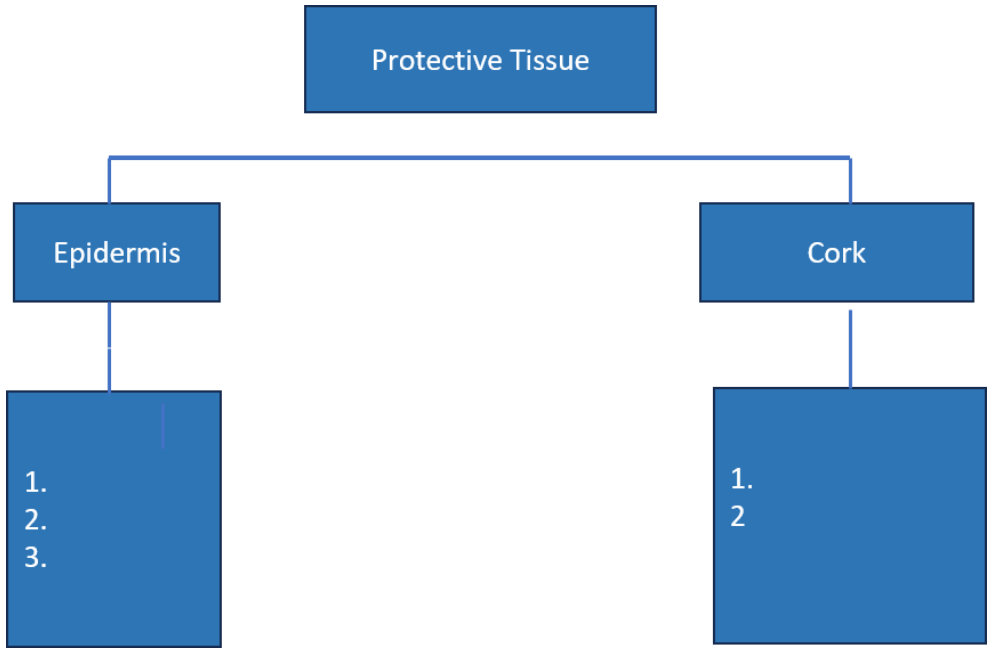
C

D

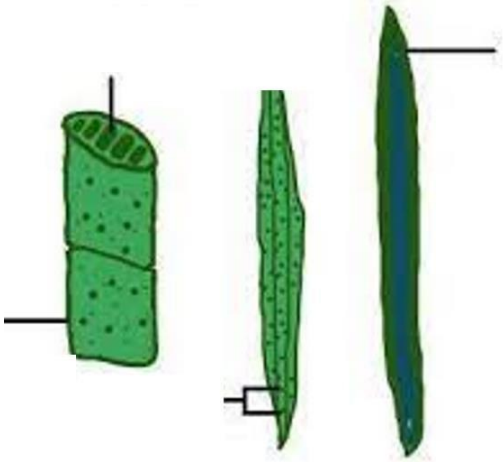
5. State the following true or false 1 Mark
    a. Epidermal cells on the aerial parts of the plant often secrete a waxy layer
    b. Cuticle in xerophyte act a water-resistant layer.

6. Xylem is involved in inorganic translocation and phloem is involved in organic translocation, differentiate these two based on that character along with the directions they move with the help of a diagram. 2 Marks

7. Epidermis and cork are protective in nature. Write the function of both – Epidermis and Cork and find out the part they are located in the given flow chart. 2 Marks



8. A) Identify the given figures and write their names 3 Marks



B) Give major differences between structures you identified.
C) Describe the role performed by these two in the plant body.

9. Explain the significanc . 3 Marks
   a) It prevents los poration in stem.
   b) Numerous layers of epidermis in cactus.
   c) Presence of a chemical suberin in cork cells.

10. Write the components of the given and differentiate between Xylem and Phloem by using given hints 5 Marks

	XYLEM	PHLOEM
Definition		
Essential Elements		
Associated Elements		
Non-living Components		
Functions		

WORKSHEET

ASSESSMENT- 3 *(20*

Marks)

1. A fat person is less affected by the cold because of the presence of more 1 Mark
   i) Areolar tissue
   ii) Adipose tissue
   iii) Insulator
   iv) Platelets

2. Match the following: 1 Mark
   a. Columnar epithelium ( ) 1. Insulator
   b. Cuboidal epithelium ( ) 2. Absorption and secretion
   c. Adipose tissue ( ) 3. Kidney tubules/ salivary glands

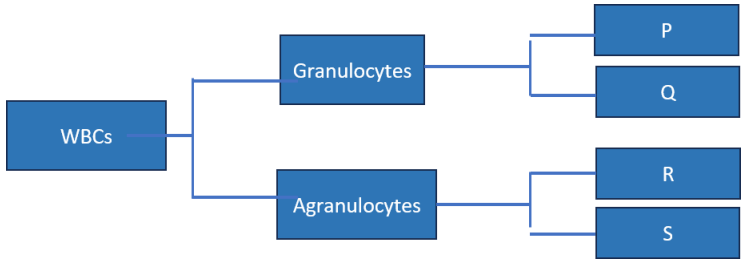
   i) 1,2,3
   ii) 2,3,1
   iii) 3,2,1
   iv) 1,3,2

3. Identifying the following tissue 2 Marks
   i) Skeletal tissue with unidirectional growth
   ii) Animal tissue with protective function

4. Complete the table given below 2 Marks

Types of epithelial cells	Location	Function
Squamous Epithelium		
Cuboidal Epithelium		

5. Find out P, Q, R, S 2 Marks



6. Observe the given chart and answer the following: 3 Marks

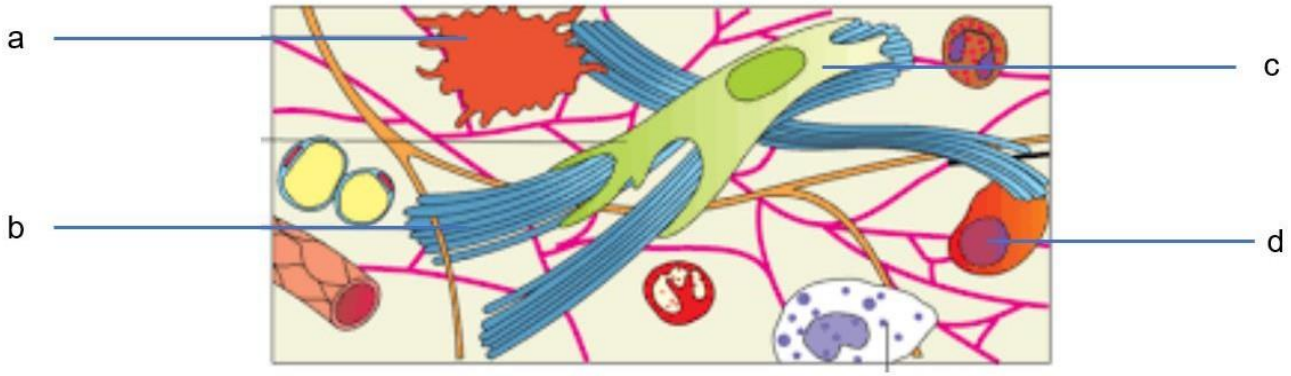
Recipient's blood type	Donor's blood type: O-	O+	B-	B+	A-	A+	AB-	AB+
AB+	✓	✓	✓	✓	✓	✓	✓	✓
AB-	✓		✓		✓		✓	
A+	✓	✓			✓	✓		
A-	✓				✓			
B+	✓	✓	✓	✓				
B-	✓		✓					
O+	✓	✓						
O-	✓							

AB+ is a universal recipient | O- is a universal donor

a) Is there a universal blood type that can be donated to anyone?
b) Can a person with blood type A+ donate blood to someone with blood type O-
c) Why is knowing your blood type important in medical emergencies

7. Read the passage carefully and answer the following questions:
   The cells that produce the bone are called osteoblasts. They secrete the matrix of calcium phosphate and collagen fibers that forms the rigid bone. Once mature and embedded with in matrix, the bone cells are called osteocytes. Dense bone has very strcture composed of repeating units called Haversain system. Each haversain system has concentric rings. Haversain canals running through the bone containing blood vessels and nerves. 4 Marks
   a. What is the bone matrix secreted by osteoblasts called?
   b. Name the repeating units of bone…….
   c. Bone is a strong and non-flexible tissue.
   d. Which bone farming cells secretes calcium and phosphate?

8. Observe the given diagram and answer the questions below: 5 Marks



8.1 Identify the above diagram
8.2 Label the parts a,b,c,d
8.3 Name the parts in which this type of tissue is present in your body
8.4 Write the functions of the part c
8.5 What is the main function carried out by the identified diagram

WORKSHEET

ASSESSMENT- 4 *(20*

Marks)

1. Rhythmic contraction and Relaxation through out, are shown by 1 Mark

   a) Epithelium of lungs b) Striated muscle of tongue
   c) Striated muscle d) Cardiac muscle

2. Which of the following are involuntary muscles? 1 Mark

   i) Striated muscles ii) Smooth muscles
   iii) Cardiac muscle iv).Skeletal muscles

   a) i and ii b) ii and iii c) iii and iv d) i and iv

3. Assertion (A): The Signals that process along the nerve fibre is called a nerve impulse 1 Mark
   Reason (R) : Nerve impulses allow us to move muscles when we want to

   a) Both A and R are true and R is the correct explanation of A
   b) Both A and R are true but R is not the correct explanation of A
   c) A is true and R is false
   d) A is false and R is true

4. Assertion (A) : Two bones are connected to each other by a type of connective tissue called Ligament.
   Reason (R) : Ligament is more elastic and considerable strength. 1 Mark
   a) Both A and R are true and R is the correct explanation of A
   b) Both A and R are true but R is not the correct explanation of A
   c) A is true and R is false
   d) A is false and R is true

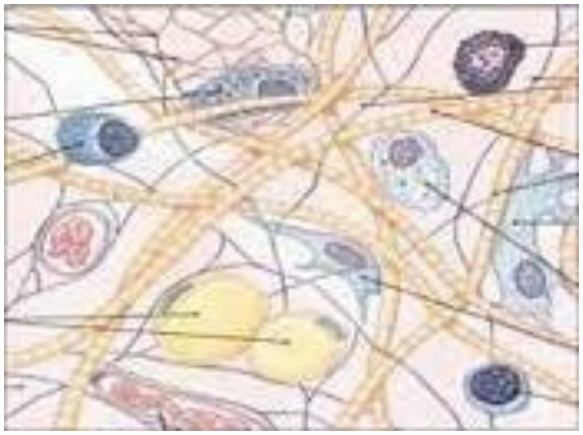
5. Which connective tissue supports and provides flexibility to the body parts 1 Marks

a) Tendon b) Bone c) Cartilage d) Ligament

6. What will happen if blood platelets are removed from blood? 2 Marks

7. Write the functions of fluid connective tissue? 2 Marks

8. Observe the given below image of the tissue and answer the following questions: 3 Marks



i) Identify the type of tissue given in the above diagram.
ii) Where is it found?
iii) Why this tissue acts as an insulator?

9. Differentiate three types of muscular tissues on the basis of their location 3 Marks

10. What is a nervous tissue? Give its function. Explain the structure of neuron with the help of a diagram. 5 Marks

CLASS : IX

CHAPTER : IMPROVEMENT IN FOOD RESORCES

TOTAL NO. OF PERIODS: 11

Aims of Education:

1. Rational thought and Independent thinking
2. Health and wellbeing
3. Democratic and community participation
4. Economic participation
5. Cultural participation

Aims of Science Education:

1. Scientific understanding of the natural and physical world:
2. Capacities for scientific inquiry:
3. Interdisciplinary understanding between science and other curricular areas:
4. Understanding the relationship between science , technology and society.
5. Scientific temper : The learners will imbibe scientific values and dispositions such as honesty, integrity, skepticism, objectivity, perseverance, collaboration and cooperation and concern for life and preservation of the environment.

Curricular Goals and Competencies

Curricular Goal – 4 : Explores interconnectedness between organisms and their environment

Competency - 4.2 : Illustrates different levels of organizations of living organisms.

Competency - 4.3 : Analyses different levels of biological organization from organisms to ecosystems and biomes along with interactions that take place at each level

Curricular Goal - 5: Draws linkages between scientific knowledge and knowledge across other curricular areas
Competency - 5.1 : Explores how literature and arts have influenced science.
Competency - 5.2 : Examines a case study related to the use of science in human life from the perspective of social science, chemistry.
Competency - 5.3 : Applies scientific principles to explain phenomena in other subjects.
Curricular Goal - 6: Understand and appreciates the contribution of India through history and the present times to the overall field of science including the discipline that constitute it.
Competency - 6.1 : close and explain the significant contributions of India to all matters that are studied within the curriculum in an integrated Manner.

Curricular Goal - 7: Develops awareness the most current discovery ideas and frontiers in all areas of scientific knowledge in order to appreciate that science is ever evolving and that there are still many unanswered questions.
Competency - 7.1 : States concepts that represent the most current understanding of the matter being studied changing from near familiarity to conceptual understanding of the matter as appropriate to the development and stage of the students.

Curricular Goal - 8: Explores the nature of science by doing science
Competency - 8.2 : designs end implements a plan for scientific enquiry.

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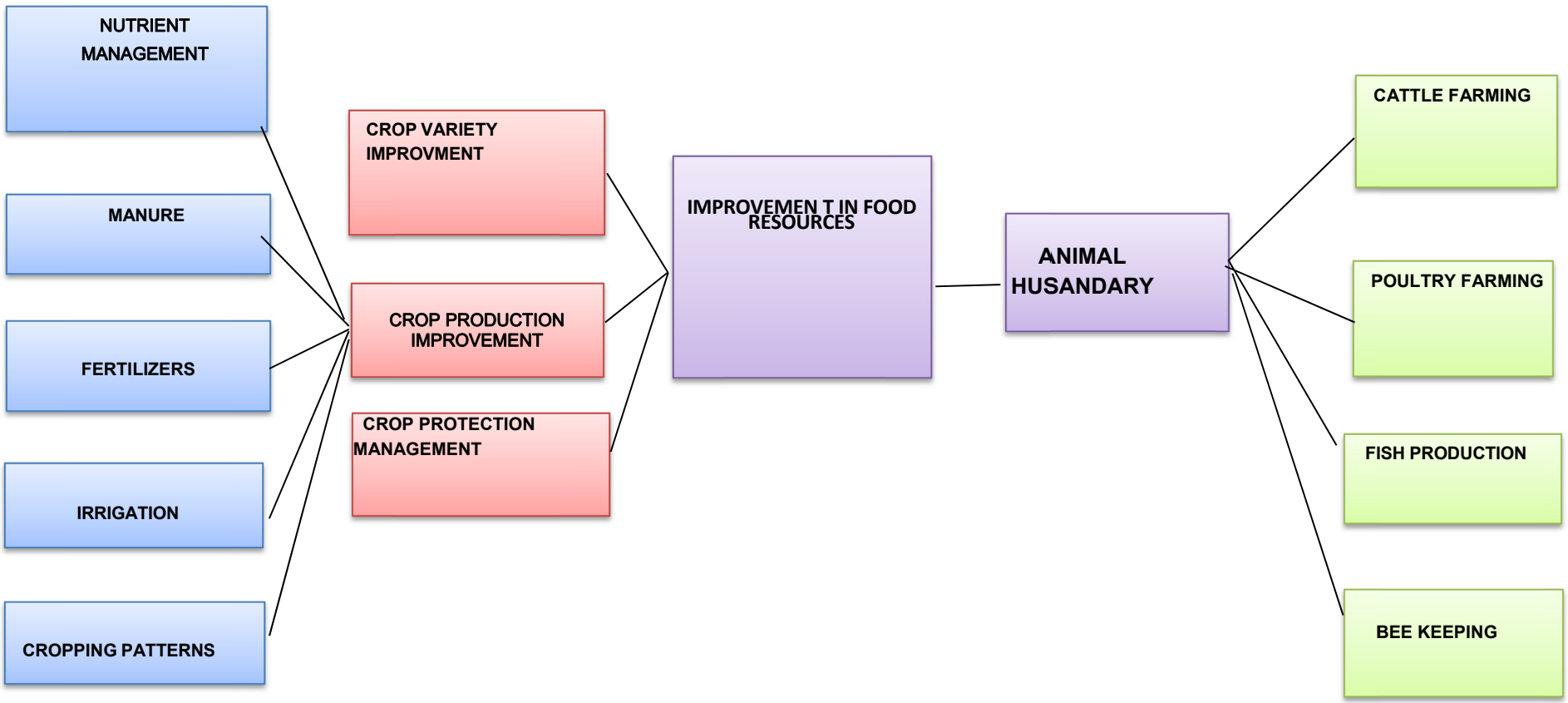
T

CONCEPT MAP



PERIOD MAP


IMPROVEMENT IN FOOD RESOURCES
Improvment in crop yields
2.Crop variety improvment
3.Crop production managemant 4.Nutient managemant
4. Manure fertilizers
5.Irrigation cropping patterns
6. Crop protection managemant
7. Animak husbandry cattle farming
8. Fountry farming egg & Boiler production
9. Fish Production Marine fisheries
10. Inland fisheries
11. Bee Keeping

TOPIC WISE LEARNING OUTCOMES

Period No.	Topic	Learning outcomes
1	Introduction improvement in crop yield	• Identifies the need to increase our production efficiency for both crops and livestock • Takes initiatives to know about the contributions of scientists in increasing the food production • Identifies the cause and effect relationship between the growing population and the need for sustainable practices in agriculture and animal husbandry
2	Crop variety improvement, : Rabi, Kharif	• Classify crops based on the component of food they provide • Differentiates Rabi and Kharif crops • Analyses and interprets the data about increase in the food production • Identify the stages involved improvement in crop varieties.

3	**: Crop Variety improvement**	• **Identify three factors for which crop variety improvement is done** • **Differentiates Inter varietal, Interspecific and Intergeneric hybridization** • **Relates the cultivation practices and crop yield to environmental conditions.** • **Explains the factors for which crop variety improvement is done**

4	**Crop production management-Manure and fertilizer**	• **Relates the farmer's purchasing capacity inputs and production practices** • **Analyses and interprets the role of various nutrients required by plants and their sources** • **Applies the knowledge of preparing the manure and its uses in daily life.** • **Classifies manure based on the kind of biological material used** • **Gives examples of fertilizers** • **Differentiates manure and fertilizers** • **Explains the benefits of organic farming**
5	**Crop production management-Irrigation and cropping Pattern**	• **Differentiates kinds of irrigation sources** • **Exhibits creativity in designing models of modern methods of irrigation** • **Applies learning of irrigation methods to hypothetical situations** • **Analyses and interprets the data related to various cropping methods.**
6	**Crop protection management, Storage of grains**	• **Relates weed control to crop yield** • **Gives examples of weeds** • **Applies knowledge to hypothetical situations** • **Gives examples of plant diseases** • **Applies scientific concept of using natural insecticides to solve problems** • **Explains the best practices of crop protection management**

7	**Animal husbandry, cattle farming**	• **Identifies the need to improve animal husbandry practices** • **Differentiates milch and draught animals** • **Identifies local and exotic breeds of cattle** • **Gives examples of local and exotic breeds of cattle** • **Explains the methods of cattle breeding and the livestock farm management practices** • **Communicates the findings and conclusions of project on cattle effective** • **Applies learning of animal diseases to hypothetical situations** • **Draws concept map to depict the various livestock farm management practices** • **Takes initiatives to know about the contributions of Veerghese Kurein in white revolution**

8	**Poultry farming, Egg and broiler production**	• **Distinguishes between indigenous and exotic species.** • **Gives examples of indigenous and exotic poultry breeds** • **Relates crossbreeding to obtaining improvement in fowl variety** • **Explains the desirable traits to be focused in developing new varieties** • **Differentiates broilers and layers** • **Communicates the findings and conclusions of the project on poultry farms effectively** • **Takes initiatives to know about the contributions of B. V. Rao, in silver revolution**
9	**Fish production, Marine fisheries**	• **Locates the marine fishery area in our country.** • **Explains about marine capture fisheries** • **Gives examples of popular marine capture fishes.** • **Differentiates between Capture Fishery and Culture Fishery** • **Classifies fish based on the structure** • **Differentiate capture fishery and culture fishery**
10	**Inland fisheries**	• **Identifies the major resources for fish production** • **Differentiates between the freshwater Capture and Culture fisheries.** • **Analyses and interprets the data related to Composite Fish Culture** • **Relates hypophysation in fishes to**

		ensured supply of pure seeds in desired quantities • **Takes initiatives to know about the contributions of Scientists, in blue revolution**

11	**Bee keeping**	• **Explains why honey is widely used** • **Applies knowledge of honey and its use in daily life to lead a healthy lifestyle** • **Gives examples of Bee varieties** • **Gives reasons why Italian bee is considered the best in honey production** • **Explains the measures to be taken to promote responsible bee production** • **Relates pasturage to honey production** • **Exhibits values of rational thinking and freedom from myth towards the need to protect and improve the bee population.** • **Takes initiatives to know about the contribution of scientists in improving apiculture.**

PERIOD PLAN 1

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES Class 09
Total no. of periods 11
Period plan : 01/11
Time : 40 min
Key Concepts : Introduction- improvement in crop yield

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	The teacher tests the previous knowledge: • What are our basic needs? • Can we live without food? • What does food supply us? • Why do we need food? • What are the sources of food for us? • What will your mother do when there is a sudden arrival of guests and the food is not sufficient for all? • Which is the most populous country in the world? • How do you think the country will meet the demands of food with increasing population?		
	The teacher elicits through simple questions. • What do we need for body development, growth and health? • Mention the various components present in the food we eat? • Where do we obtain most of our food from? • India being the most populous country and being already intensively cultivated, is there any scope for increasing the area of	• What do we get from agriculture? • Animal husbandry is the scientific management of (i)Animal breeding (ii) Culture of animals (iii)Meat production (iv) Egg production (a)i, ii, & iii (b) ii, iii,& iv (c)I, ii & iv (d) I, iii & iv	https://diksha.gov.in/play/collection/do_313103475196280832114467?referrer=utm_source%3Dmobile%26utm_campaign%3Dshare_content&contentId=do_313154466015666176181 0

<table>
<tr>
<td>Identifies the need to increase our production efficiency for both crops and livestock

Takes initiatives to know about the contributions of scientists in increasing the food production</td>
<td>land under cultivation?
• Is it enough if we grow only one type of crop in a large quantity?
• Will it meet the demands of the growing population?
• How can we improve the production of Crop yield with the limited resources available? (Brainstorming)
• The teacher elaborates the efforts taken to meet the food demand by increasing the food production

<table>
<tr><th>Aim</th><th>Revolution</th><th>Father of revolution</th></tr>
<tr><td>Food Grain Production</td><td>Green Revolution</td><td>M S Swaminathan</td></tr>
<tr><td>Milk Production</td><td>White Revolution</td><td>Verghese Kurien</td></tr>
<tr><td>Meat Production</td><td>Red Revolution</td><td>Vishal Tiwari</td></tr>
<tr><td>Fish Production</td><td>Blue Revolution</td><td>Dr. Arun Krishnan</td></tr>
<tr><td>Oilseed Production</td><td>Yellow Revolution</td><td>Sam Pitrada</td></tr>
</table>

• Though these revolutions have increased the production, how are the natural resources getting used?
• As these revolutions are degrading the environment how should we increase our food production?

• Can increasing grain production for storage in warehouse solve the problem of malnutrition and hunger?</td>
<td>• Why is it necessary to increase our production efficiency for both crops and livestock?

• What are the contributions of Green revolution?
• Who is the father of green revolution in India?
• What is meant by White revolution?
• Why is the measures to increase fish production called Blue revolution?
• What is Yellow revolution?

• Collect information and make a project on the contributions of M.S. Swaminathan in increasing the food production.

• Can increasing grain production alone solve the</td>
<td>Chart of various Food Revolutions

Chart showing sustainable practices in</td>
</tr>
</table>

Identifies the cause and effect relationship between the growing population and the need for sustainable practices in agriculture and animal husbandry	• As our country is an Agrarian country whose income is to be increased to combat the problem of hunger? • What should be undertaken to obtain high yields from farms? • What should one undertake for sustained livelihood? The teacher further introduces the practices that increase the yields of crops and livestock.	problem of malnutrition and hunger? • To solve the food problem of the country Which among the following is necessary? (a) Increased production and storage of food grains (b) Easy access of people to the food grains (c) People should have money to purchase the grains (d) All the above • What do you mean by sustainable practices in agriculture and animal husbandry? • Find out the wrong statement from the following: (a) White revolution is meant for increase in milk production (b) Blue revolution is meant for increase in fish production (c) Increasing food production without compromising with environmental quality is Sustainable agriculture (d) None of the above • What does food security depend on? • What are the scientific management practices to obtain high yields?	agriculture and animal husbandry

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 2

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

Total no. of periods : 11

Period plan : 02/11

Time : 40 min

Key Concepts : **Improvement in crop yields, Rabi, Kharif.**

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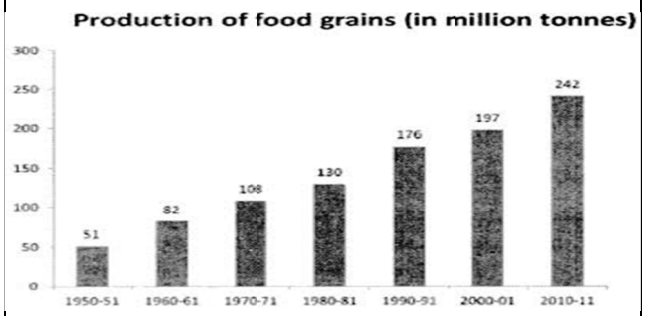
LEARNING OUTCOMES	**TEACHING - LEARNING PROCESS**	**ASSESSMENT STRATEGIES**	**TLM**
	The teacher tests the previous knowledge: • What are the components of our food? • Which component of food gives us energy? • Which component of food is known as body building food? • Which component of food provides energy to store for future use? • Why should we eat vegetables and fruits? • What are the sources of food for us? • Can we grow crops in any season or climatic condition? • How can we increase the yields of crops and livestock?		
Classify crops based on the component of food they provide	The teacher conducts a group activity, providing students pictures and names of various crops and the nutrient yielded from them. The students have to search their groupmates and express the nutrient provide by each group of crops. Group- 1: Carbohydrates Group- 2: Proteins Group- 3: Fats Group- 4: Vitamins and minerals Group- 5: Fodder • What are the different components of food we get from food crops?	• Find the odd man out: Rice, Millets, Gram, Sorghum • Pigeon gram is a source of _____. • Classify the following and tabulate them as energy yielding. Protein yielding, oil yielding and fodder crops: **Wheat, rice, berseem, maize, gram, oat, pigeon gram, sudan grass, lentil, soyabean, groundnut, castor and mustard** • _____ are rich in vitamins.	Flash cards consisting various picture of crops as sources of Carbohydrates, Proteins, Fats, Vitamins and minerals and Fodder

	• Which crops provide us carbohydrates? • Which food crops primarily provide proteins? • What do fruits and vegetables provide us? • What do we get from oil seeds? • In addition to food crops, why are fodder crops raised for?	• The following question below consists of two statements – Assertion (A) and Reason (R). Answer it selecting appropriate option given below: Assertion (A): Fodder crops like berseem, oats etc are grown along with cereals and pulses. Reason (R): Fodder crop is food for livestock. (a) Both A and R are true and R is the correct explanation of A. (b) Both A and R are true and R is not the correct explanation of A. (c) A is true but R is false. (d) A is false but R is true	
Differentiates Rabi and Kharif crops	• When do we get mangoes? • Where do apple trees grow? • Do all crops grow in all climatic condition and temperature? • Why do plants need light? • What do plants do in sunlight? • Photo means light and period means duration, what do you mean by Photoperiodism? • How does photoperiod affect the growth of crops. The teacher ask students to discuss in groups.  • When do we usually have rainy season? • If Kharif means rain, what would you call the crops grown in rainy season?	• What are photoperiod related to? • Photoperiod affects the _____. • The crops which are grown in rainy season are called _____ crops. • Kharif crops are grown from _____ to _____. • Name some Kharif crops? • _____ crops grows in winter season. • What is the duration of Rabi season? • Give examples of Radi crops? • Identify crops grown in Rabi season from the following crops given below: Paddy, soyabean, Maize, Cotton, Wheat, Mustard, Green gram • Cultivation practices and crop yield are related to environmental condition. Explain. • Differentiate rabi and kharif crops?	. Chart showing Kharif crops

	• Give examples of Kharif crops? • If Rabi means winter, what would you mean Rabi crops? • Name some crops grown in Rabi season?		
Analyses and interprets the data about increase in the food production Identify the stages involved improvement in crop varieties.	The teacher presents a graph for analysis  • How much has the production of food grains increased from 1952 to 2010? • How much increase in the cultivable land area has taken place? • What practices helped to increase the production? **STAGES IN CROP IMPROVEMENT** • Crop variety improvement • Crop production improvement • Crop protection management	• What does the graph indicates? • If only 25% increase in cultivable land area has taken place, how has this increase in food grain production been achieved? • How many stages are there in practices involved in farming? • Which stage deals with the choice of seeds for planting? • Which stage helps in the nurturing of the crop plants? • What is the stage – protection of the growing and harvested crops from loss	

Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 3

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

Total no. of periods : 11

Period plan : 03/11

Time : 40 min

Key Concepts : Crop Variety improvement, Hybridization, Genetically modified crops, biotic and abiotic resistance, desirable agronomic characteristics

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LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	The teacher tests the previous knowledge: • What do cereals provide? • Why should we eat vegetables and fruits? • Why are fodder crops raised? • Can we grow crops in any season or climatic condition? • Differentiate kharif and rabi crops? • How can we increase the yields of crops and livestock?		
Identify three factors for which crop variety improvement is done	The teacher introduces the approaches of Crop Variety Improvement: • Which crop variety do we need to grow? • Which characteristics do we need in our crops? • Suppose you have plants – prone to disease/ disease resistant, low yield/ high yield, Low product quality/ High product quality ,which desirable characteristics in plants would one should select? • What do you mean by the characteristics – Disease resistance, response to fertilization, product quality and high yield. • What do genes carry?	• What do you mean by Plant Breeding? • The following question below consists of two statements – Assertion (A) and Reason (R). Answer it selecting appropriate option given below: Assertion (A): Hybridization is defined as crossing of genetically dissimilar plant species. Reason (R): Farmers need to protect the harvested crop from loss.	Byju's video of crop variety improvement. https://youtu.be/8ocYECGqVXw?si=khEm8m4ClmohThf2

Differentiates Inter varietal, Interspecific and Intergeneric hybridization Relates the cultivation practices and crop yield to environmental conditions.	• Are different variety of plants genetically similar? • What does the crossing between genetically dissimilar plants refers to? • What is incorporating desirable characters into crop varieties called? The teacher introduces the terms **species** and **genus** to provide further clarification • If hybridization between two variety of plants is inter varietal, what is hybridization between two different species of the same genus called? • What is the hybridization between different genera called? • What is the name given to crops obtained by introducing gene that would provide the desired characteristic? The teacher elicits the necessities for the acceptance of new varieties of crops. • Are the conditions same for growing crops in different areas? • For acceptance of new varieties of crops, how should be the yield of the plant? • How do new plants grow from? • What would be farmers provided of a particular variety? • Are the weather conditions predictable? • How does the crop yield depend on weather? • Is there any relation between crop yield and soil quality? • What is the relation between crop yield and availability of water?	(e) Both A and R are true and R is the correct explanation of A. (f) Both A and R are true and R is not the correct explanation of A. (g) A is true but R is false. (h) A is false but R is true. • Discuss the role of hybridization in crop variety improvement? • What is genetic manipulation? How is it useful in agricultural practices? • What is GM crop? Name any one crop which is grown in India? • Bt Cotton and vitamin A rich Golden Rice are examples of _____ crops. • Why is crop variety improvement important in cultivation? • Cultivation practices and crop yield are related to environmental conditions. Explain.	IFP panel. YouTube videos Byju's video of crop variety improvement.

Explains the factors for which crop variety improvement is done Applies learning to hypothetical situations	The teacher discusses regarding the factors for which crop variety improvement is done:  • **Higher yield**: HYV of Grains, tubers • **Improved quality**: eg. Good baking in wheat, protein quality in pulses, more unsaturated oils in oil seeds • **Biotic and abiotic resistance**: Biotic- microbes, insects, rodents & nematodes Abiotic- flood, drought,water logging, frost • **Change in maturity duration**: • **Wider adaptability**: Insensitive to variation in light duration and temperature • **Desirable agronomic characteristics**: eg dwarf cereals, long and profuse branching in fodder crops	• Describe the important factors for which variety improvement is done? • What do you mean by HYV of Crops? • List out some useful traits in improved crop? • how do biotic and abiotic factors affect crop production? • What are the desirable agronomic characteristics for crop improvement? • If there is low rainfall in a village throughout the year, what measure will you suggest to the farmers for better cropping?	

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Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 4

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

Total no. of periods : 11

Period plan : 04/11

Time : 40 min

Key Concepts : Crop production management, nutrient management, macro and micronutrients, manure and fertilizer

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LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	Testing previous knowledge • How many stages are there in practices involved in farming? • Which stage deals with the choice of seeds? • Why is crop variety improvement important in cultivation? • What are the important factors for which variety improvement is done? • Which stage helps in the nurturing of the crop plants?		

<table>
<tr>
<td>Relates the farmer's purchasing capacity inputs and production practices</td>
<td>The teacher discusses about the crop production management through simple questioning:
• Our India is an agriculture-based country (51% of people-17% of GDP), how does the farming ranges from?
• Do all farmers have equal land, money and access to information & technology?
• What allows farmers to take up different farming practices and agricultural technologies?
• As farmers differ in their financial conditions, how will be their levels of production practices?
• Levels of production practices- No cost, Low cost, High cost.
• Crop production management is controlling the various aspects of crop production so as to obtain the maximum yield.
• It has 3 components- nutrient management, irrigation and cropping pattern.
• What do we need food for?
• Where do plants get nutrients from?</td>
<td>• In agriculture practices, higher inputs gives higher yields. Discuss how?
• How do plants get nutrients from?
• How are farmer's purchasing capacity inputs and production practices related?
• Crop production management practices can be _____, _____ and _____ production practices.</td>
<td></td>
</tr>
<tr>
<td>Analyses and interprets the role of various nutrients required by plants and their sources</td>
<td>
<table>
<tr><th>SOURCE</th><th>NUTRIENTS</th></tr>
<tr><td>Air</td><td>Carbon, oxygen</td></tr>
<tr><td>Water</td><td>Hydrogen, oxygen</td></tr>
<tr><td>Soil</td><td>Micronutrients- nitrogen, phosphorus, calcium, magnesium, Sulphur
Macronutrients- iron, manganese, boron, zinc, copper, molybdenum, chlorine</td></tr>
</table>
• Mention some physiological processes in plants?
• How do deficiency of nutrients affect plants?
• In what forms are the nutrients supplied to plants?</td>
<td>• What mineral nutrients are supplied to the plants by air, water and soli?
• A total of ___ nutrients are essential to plants.
• _____ and _____ are supplied by air to plants.
• Hydrogen is supplied by _____ to plants.
• Soil supplies ____ nutrients to plants.
• Nutrients are required in large quantity for plants are called _____
• _____ are needed in small quantity for plants.
• Why macronutrients are called so?
• Differentiate macronutrients and micronutrients?
• What happens if plants donot get essential nutrients?
• Name any two physiological processes in plants which are affected by deficiency of nutrients.</td>
<td>Chart showing various nutrients required by plants and their sources</td>
</tr>
</table>

Applies the knowledge of preparing the manure and its uses.	The teacher elicits from students previous experience • If we keep vegetable waste and cow dung in two pots and leave it for one month. What will happen? • How is manure prepared? • What helps in enriching soil with nutrients and organic matter? • Name the main type of soils? • How can we increase the water holding capacity in sandy soils? • How is manure helpful to clayey soil? • What type of waste materials do we use in using manure? • How is manure advantageous in protecting our environment? • Name some farm waste materials? • How can we recycle farm waste? • What is the process of decomposing farm waste in pits called?  **Compost** • Why are earthworms called friends of farmers? • What is the compost prepared by using earthworms called?  **Vermi-compost**	• Ram observed that his mother throws away the vegetable wastes. He suggested his mother to dump the waste in a pit in kitchen garden. Why did he ask so? • What are the constituents of manure? • What we call that the manure prepared by using cow dung, vegetable waste, animal refuse, straw and eradicated weeds? • How is compost prepared? • Why are earthworms used in preparing vermicompost? • Describe the process of preparing vermicompost? • How do you appreciate earthworms in helping farmers?	Sample of Vermi compost and earthworms.

Classifies manure based on the kind of biological material used Gives examples of fertilizers	 **Green manure** **Sequence of preparation: cultivation→ploughed & mixed in soil→decomposed→ green manure** • Why are leguminous plants good for soil? • What will happen if those plants are mulched by ploughing them into the soil?  • Manure is prepared by composting farm waste materials, how are fertilizers prepared? • What are the vegetative parts of plants?  • Fertilizers: Ammonium nitrate, Urea, Potassium chloride, Superphosphate, Potassium sulphate, Calcium ammonium nitrate • What do fertilizers supply to plant?	• Sometimes we see that in fields crops are grown and mulched by ploughing back into soil. Why is it done so? • Which crops we generally used as green manure? Why? • Some plants like _____ or _____ are grown and mulched by ploughing them into soil to prepare green manure. • Arrange in the correct sequence: (a) Green plants are decomposed (b) Green plants are cultivated (c)) Green plants are ploughed and mixed into the soil (d) After decomposition it becomes green manure. • The fields in which legumes are grown get, enriched with nitrogen. Why? • What is the basis of classifying maure? • Give examples for chemical fertilizers? • Why is excess use of fertilizers detrimental for the environment? • What happens to soil fertility, if we use chemical fertilizers continuously?	

Differentiates manure and fertilizers Explains the benefits of organic farming	• What care should be taken in applying fertilizers? • How do fertilizers destroy soil fertility? • Fertilizers provide short-term benefits and manure provides long-term benefits. Discuss. The teacher discusses about organic farming and its benefits.  • Why should we not use excess chemical fertilizers, herbicides and pesticides? • What are the benefits of using organic manures? • **ORGANIC FARMING using Bio-agents, Biofertilizers, Bio-pesticides- Healthy cropping system** **Organic standard Certification** • Bio-agents: Beneficial insects – Ladybugs, parasitic wasps, predatory beetles • Biofertilizers: contain living microorganisms – Nitrogen fixing bacteria, blue green algae, mycorrhizal fungi • Biopesticides: Plants- neem, Bacillus thuringiensis (Bt), fungal • Healthy cropping system: Mixed cropping, inter- cropping, crop rotation	• Excess use of fertilizers leads to water pollution Justify. • Why are manure and fertilizers used in fields? • Compare the use of manure and fertilizers in maintaining soil fertility. • Which of the following crops would require a minimum of NPK for its growth: Paddy, Peas, Wheat, Sugarcane • What is farming without chemical fertilizers, herbicides and pesticides is called? • Organic farming paves way to environmental susceptibility and animal welfare. Justify. • What is the primary focus of organic farming? a) High-yield crop production b) Use of synthetic pesticides c) Sustainable and natural practices d) Genetic modification • What is the primary source of nutrients in biofertilizers? a) Synthetic chemicals b) Organic matter c) Minerals d) Fossil fuels • Organic farming promotes and preserves biodiversity. How? • Organic farming has the potential to contribute for global food security. Discuss • Why should organic foods be preferred over conventional foods?	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 5

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

Total no. of periods : 11

Period plan : 05/11

Time : 40 min

Key Concepts : Crop production management-Irrigation and cropping Pattern

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Differentiates kinds of irrigation sources	Testing previous knowledge • Where do we get our food from? • How does a farmer grow the crop? • How do plants get nutrients from? • Apart from nutrients, what do plants need? • What are the requirements in a crop field? • Are all crops grown in the same way? The teacher introduces the concept of irrigation through simple questions: • India is an agrarian country, what is basically needed for growing the crops? • What will happen if do not get timely rain? • What will happen if crop do not get water at the right stages during their growing season? • What occurs because of irregular distribution of rains? • What do farmers need when there is no rain? **Kinds of Irrigation resources –** **Wells – Dug wells and Tube wells** **Canals from reservoirs or rivers** **River Lift System – in areas close to river** **Tanks- store run-off of small catchment areas** **Fresh initiatives in Water Augmentation-** **Rain water harvesting, Watershed management** **Check-dams**	• Why do droughts occur? • What is irrigation? Why is irrigation of crops necessary? • Describe the main irrigation systems that are adopted in India? • Why is excessive irrigation harmful to crops? • What is judicious use of irrigation? • Fresh initiatives for increasing the water available for agriculture include _____ and _____.	Chart showing various irrigation resources

Exhibits creativity in designing models of modern methods of irrigation Applies learning of irrigation methods to hypothetical situations Analyses and interprets the data related to various cropping methods.	**Modern methods- Drip and Sprinkler System**  • **In drought- prone areas: drought-resistant and early maturing varieties of crop, enriching soil with more humus** The teacher elicits the concept of cropping patterns through discussion and demonstration of models and charts. • What happens to the soil fertility if same crop is grown continuously? • What happens to the crop yield if crop is infested by diseases? • In addition to judicious use of manures and irrigation, what is needed to obtain maximum benefit from same piece of land? • **Cropping Patterns – Multiple Cropping:** **Mixed cropping: Criteria- Duration, growth habit, nutrient demand, root pattern, water requirement** **Eg: Wheat + Gram/ Wheat + mustard/ Groundnut + Sunflower** 	• Prepare a model of drip and sprinkler method using eco-friendly resources. • If there is low rainfall in a village throughout the year, what measures will you suggest to the farmers for better cropping? • What is meant by mixed farming? What are its advantages? • Growing of wheat and groundnuts on the same field is called _____. • Enlist the criteria for selection of crops for mixed cropping? • Which of the following is not a characteristic of mixed cropping? (a) Minimizes risk of crop failure (b) Set patterns of rows (c) Harvesting and threshing of crops separately is not possible (d) Individual marketing and consumption of crop is not possible	**Model of cropping patterns**

Inter-Cropping: Soyabean(1) row: Maize (2) rows, Finger millet(2) rows+ Cowpea(1)row

Crop Rotation

TYPE	ROTATION
One year rotation	Rice – Wheat / Maize – Mustard
Two year rotation	Maize – Potato – Sugarcane – Pea
Three year rotation	Rice- Wheat- Mung- Mustard- Sugarcane- Berseem

- Define inter-cropping with examples.
- Planting of Soyabean and Maize in alternate rows in the same field is called as_____
- What does the number, 1:2 mean in intercropping?
- Compare mixed cropping and inter-cropping?
- Define crop rotation. Why should we adopt it?
- Give an example of crops grown in two-year rotation.
- Growing different crops in a piece of land in a pre-planned succession is called_____.
- Ram has been cultivating paddy crop year after year in the same field. Recently he has observed decline in the yield despite best inputs, he suggested to sow pigeon gram for one or two years before again using the field for paddy crop. What is the rationale behind this suggestion?

Chart showing types of crop rotation

PERIOD PLAN 6

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

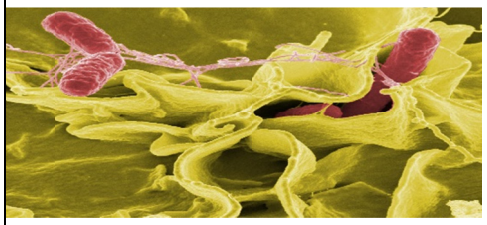
Total no. of periods : 11

Period plan : 06/11

Time : 40 min

Key Concepts : Crop protection management, weeds, pests, pathogens, pesticides and storage of grains

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Relates weed control to crop yield Gives examples of weeds	The teacher tests the previous knowledge: • How many stages are there in practices involved in farming? • Which stage deals with the choice of seeds? • Which stage helps in the nurturing of the crop plants? • Apart from selecting good seeds and nurturing the plants with nutrients and water, what else is needed to be done? • What infests the crops in the field? The teacher elicits the concept of crop protection management through discussion. • Do you find any unwanted plants growing along with the cultivated crop in the field? • What do we need to do if we find any unwanted plants? Why?  **Weeds**: Compete for food, space and light with crop plants.: Xanthium, Parthenium, Cyperinus, Amaranth, Chenopodium, Convolvulus, Wild oat, Gras	• **The yield of the crop decreases if weed is not controlled. Clarify** • Xanthium and Parthenium are commonly known as _____.	Pictures of different types of pests and weed plants

	The teacher shows a secimen/ picture and asks;  • What do you observe in the picture? • Why do insects attack plants? **Pests** attack plants in 3 ways : **Chewing insects** (cut): Locust, hopper, caterpillars, grubs **Sucking insects** (suck): Aphids, plant bugs, leaf hoppers **Borer insects** (bore): To borer, shoot borer, pod borer, cotton boll weevil, grain weevil		Specimen / picture of pests
Applies knowledge to hypothetical situations	The teacher elicits by showing a picture, 	• **A farmer observed an outbreak of a mysterious pest. How could he identify the type of causative pest?** • **Write the modes by which insects affect the crop yield.**	
Gives examples of plant diseases	• What are disease causing microorganisms called? • Where are pathogens present? **Plant Diseases-** Wheat rust, Wheat smut, Blast of Rice **Occurrence and transmission –** **Soil borne – Water borne- Air borne - Seed borne -**	• **Causal organism of any disease is called as _____.** • **Blast is _____ disease of paddy and puccinia causes _____ disease in wheat.**	

Applies scientific concept of using natural insecticides to solve problems	• How can we get rid of weeds? **Methods of weed control**: Mechanical, Cultural, Chemical and Biological **Control of Insect Pests and pathogens:** - **Using pesticides (**Herbicides, insecticides, fungicides**)** - **Using biological methods (**friendly birds and insects**)** - **Using natural insecticides (**nicotine, neem**)**	• **Collect information about natural insecticides and prepare a sample of insecticide to solve the problem of pests in your local village and prepare a project report**	
Explains the best practices of crop protection management	• What do farmers do the crop after the harvest? • What happens if the food grains are not stored properly? - Factors responsible for loss during - **Abiotic factors**- Improper moisture, humidity and temperature - **Biotic factors**- Insects, rodents, birds, worms, bacteria, fungi and mites **Causes**- Degradation in quality, loss in weight, poor germination capacity, poor marketability, infestation, discoloration and contamination • How do you think the farmer stores the grain or agriculture produce free from pests for a long time? Preventive and Control measure: • Strict cleaning before storage • Maintenance of Hygiene • Chemical control- spraying of pesticides: Benzene hexa chloride, Malathion, Pyrethrum • Fumigation- Solid fumigant - Aluminium phosphide Liquid fumigant - Ethylene dichloride Gaseous fumigant - Methyl bromide • Plant products (natural pesticides)	• **_____ and ____ climate is more congenial for manifestation of weeds, insect-pests and diseases** • **How do storage grain losses occur?** • **Why should fumigation be preferred over spraying in godowns?** • The following question below consists of two statements – Assertion (A) and Reason (R). Answer it selecting appropriate option given below: Assertion (A): Humidity in air promotes growth of fungi. Reason (R): Food grains are stored in silos on large scale. (i) Both A and R are true and R is the correct explanation of A. (j) Both A and R are true and R is not the correct explanation of A. (k) A is true but R is false. (l) A is false but R is true.	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 7

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES Class : 09

Total no. of periods : 11
Period plan : 07/11
Time : 40 min
Key Concepts :Animal Husbandry, Cattle farming, milch animals, draught animals, lactation period,

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Identifies the need to improve animal husbandry practices	The teacher tests the previous knowledge: • Apart from plants, where do we get food from? • Why do we rear animals? • What food do we get from animals? • What is needed to be done to get food from animals? • What do you mean by white revolution? • What should be improved to the growing need of milk and its products? The teacher introduces the concept of animal husbandry • To bring improvement in crop variety we manage crops scientifically, what do we need to do to improve animal livestock? • Which aspects are to be scientifically managed? • What animals are reared in the farms? • Along with the increasing demand for milk and meat, what is needed to be improved? The teacher elicits the purpose of cattle farming By showing cards – Cow- bull, he-buffalo- she-buffalo • Which among the above animals gives us milk?	• What is Animal Husbandry? • What does Animal based farming include? • Why should we improve animal husbandry practices? • What are Milch animals? Give examples.	

Differentiates milch and draught animals Identifies local and exotic breeds of cattle	• Which among the above animals are used for farm labour? The teacher shows the picture of Indian cattle Bos indicus  Bos bubalis  • How long does a cow or buffalo give milk after giving birth to a calf? • If the lactation period is increased what can be increased? The teacher shows the picture of Exotic breeds – Jersey (longer lactation period) 	• What are draught animals? Give examples? • Differentiate milch and draught animals. • What are the benefits of cattle farming? • Indian cattle belongs to two different species, name them. • The following question below consists of two statements – Assertion (A) and Reason (R). Answer it selecting appropriate option given below: Assertion (A): Draught breeds of cows are used mainly as beasts of burden. Reason (R): Draught breeds of cow gives less milk but are strong and sturdy. (m) Both A and R are true and R is the correct explanation of A. (n) Both A and R are true and R is not the correct explanation of A. (o) A is true but R is false. (p) A is false but R is true.	Indian cattle pictures Charts BYJUS Content (BYJUS.COM) www.vedantu.com

Gives examples of local and exotic breeds of cattle	Brown swiss (longer lactation period)  Local breeds- Red Sindhi (Resistance to diseases)  Sahiwal (Resistance to diseases)  The teacher elicits the methods of cattle breeding: Methods of cattle breeding	• What do you mean by Lactation period? • How can we increase the milk production? • Give examples of exotic breeds of cattle? • Name two cows that can yield 5000-6000 liters of milk during lactation period. • Give examples of local breeds of cattle?	

Explains the methods of cattle breeding Communicates the findings and conclusions effectively Explains about the livestock farm management practices	- Natural breeding (mating) - Artificial Insemination - Super Ovulation and embryo transplantation Local x Exotic → Hybrid • If the two breeds are cross-bred, • What type of animals do we get? Teacher guides the students to conduct activity 12.3 and discusses the findings The teacher elicits through simple questions and video demonstration **LIVESTOCK FARM MANAGEMENT PRACTICES** **- Grooming of Cattle** **-Shelter for cattle** **-Feeding of cattle** **-Health Care of Cattle** • What happens if we do not clean our house? • What happens if we do take bath regularly? • Why should we clean the cattle and their shelter regularly? • Why do cattle require regular brushing? • What does our house protect us from? • Why should be the cattle sheltered	• How many cows can be approximately impregnated by the semen from one bull? • What desired qualities of animal we get if animals with longer lactation period and animals with resistance to diseases are cross-bred? • What is the need of crossing the exotic cattle with Indian cattle when exotic cattle have higher yield as compared to the hybrid cattle? • Name the breeds of cattle in your local livestock farm. • Which method is commonly used for improving cattle breeds and why? • What is the difference in the amount of milk production from different breeds? • Explain the common management practices in dairy? • How much space is needed for each cattle in a shed? • What happens if the shed is crowded with more cattle?	Chart showing farm management practices

	under well-ventilated roofed shelters? **-Feeding Requirements of cattle: 2 types** **(i) - Maintenance Requirement** **(ii) – Milk Producing Requirement** **- Roughages: 15 – 20 kg** **(Leguminous and Non - leguminous fodders)** **- Concentrates: 4 -5 kg** **(Grains, Seeds, Oil cakes and Rice bran)** **-Water: 30- 35 liters** **-Feed Additives (vitamins, minerals and antibiotics)** **-Health Care of Cattle** **- Cattle suffer from** • Parasitic Diseases: - External - skin disease Internal – Liver fluke • Communicable Diseases by pathogens (Foot and mouth diseases, Anthrax, Rinderpest, Cow pox, Salmonellosis) • Non-Communicable Diseases due to deficiency of nutrients, malfunctioning of body organs and mechanical agents. **Prevention of Animal Diseases**: (Grooming, hygienic and ventilated shelter, nutritious food, controlling parasites and rodents, isolating infected animals) 	• Name two types of animal feed and write their functions? • How many liters of water is required for each cattle? • Why animals require roughages in their food? • Give few examples for Concentrates. • What is the use of additives in cattle food • Write any two infectious diseases in cattle? • Name the various diseases and their causes in cattle • Ram, a farmer observed his cow becoming inactive, reduced appetite, shaky limbs and blisters on mouth and feet. What happened to the cow. What measures does he need to take? • What are the symptoms of a sick cattle? • Mention few measures for prevention of diseases in cattle? • Draw a concept map depicting the various livestock farm management practices	www.istockphoto.com
Applies learning of animal diseases to hypothetical situations Draws concept			

map to depict the various livestock farm management practices Takes initiatives to know about the contributions of Veerghese Kurein in white revolution	Teacher elaborates about white revolution and the father of white revolution in INDIA **VEERGHESE KUREIN (1921 to 2012).**	• Collect information and make a project on the contributions of Veerghese Kurein in increasing the milk production	

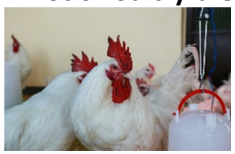
Teacher's Reflections:

1. How did the lesson go?
2. Were the teaching learning strategies adequate?
3. Were the students engaged?
4. Areas of improvement
5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 8

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES
Class : 09
Total no. of periods : 11
Period plan : 08/11
Time : 40 min
Key Concepts : Poultry Farming, Cross breeding, layers, broilers, .

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	The teacher tests the previous knowledge: • Apart from plants, where do we get food from? • Why do we rear birds? • What food do we get from birds? • What do you mean by silver revolution? • What should be improved to the growing need of chicken and eggs? The teacher introduces the concept of poultry farming with the help of a picture?  • Poult means Chicken, What is rearing of domestic fowl called? • What do we get from domestic fowls? • Where are chicken reared in your village? • What qualities do local breeds of chicken have? • Which chicken do you prefer to eat, local or farm? • Which chicken lays more eggs, local or farm? • Which chicken possess natural immunity?	• What is Poultry? • What are the two main products obtained from raising domestic fowl?	Chart or poultry birds

Distinguishes between indigenous and exotic species. Gives examples of indigenous and exotic poultry breeds Relates crossbreeding to obtaining improvement in fowl variety	The teacher exhibits the pictures of Indigenous and exotic breeds of chicken **Indigenous Poultry breeds**  Aseel  Kadaknath  Bursa **Exotic Poultry breeds**  White Leghorn  Rhode Island Red  Plymouth  Black Minorca • As indigenous and exotic breeds both have desirable and undesirable qualities, how can we raise domestic fowl for egg production and chicken meat?	• How do you distinguish indigenous and exotic species of chicken? • Give examples of Indigenous Poultry breeds. • Give examples of Exotic Poultry breeds.	Pictures of Indigenous Poultry breeds

Explains the desirable traits to be focused in developing new varieties	Aseel x Leghorn → improved variety • What do we get when we crossbreed indigenous and foreign breeds of chicken? The teacher discusses about desirable traits in chicken **DESIRABLE TRAITS IN CHICKEN** • **Q&Q of chicken** • **Dwarf parents** • **Temperature Tolerance** • **Low maintenance** • **Reduction in size** • **Utilize cheaper diet** • What do we get from chicken? Growers- birds in first phase Layers → Eggs Broilers → Meat • What is the most economic aspect of poultry? • What are female fowls raised for? • What are egg laying fowls called as? **Important considerations to improve Q&Q of Eggs:** (Egg number, weight, size, shape, shell colour) **Broiler production** → Quick growing birds, 7-8 weeks 1-1.5kgs, Ration= protein rich, fat adequate, and high vitamin A & K rich supplementary food. **Broilers** → 4kg of feed into 1.5 – 2kgs of body weight • What are broiler chicken fed for good growth rate and better feed efficiency? • As broilers and layers are reared for different	• The following are varieties of poultry birds; A and B are Aseel and Bursa, C and D are White Leghorn and Rhode Island Red. Which are indigenous and which are exotic? What would you obtain if indigenous species are bred with exotic species? What would be the advantages of this process? • Explains the desirable traits to be focused in developing new varieties of fowl? • _____ are hens which have high rate of egg production. • Name the main food component found in egg white? • Broilers are chicken which are 7-8 weeks old and are raised for _____ . • Why is egg considered as a nutritious food? • Name two vitamins that should be included in high amount in poultry feed.	Chart showing desirable traits in chicken. https://www.Vedantu.com http://infinity learn.com Youtube IFP Bord

Differentiates broilers and layers	products, do they have same nutritional requirements? The teacher elicits about the poultry care: {**Hygienic conditions in housing- dry and well ventilated, light, maintenance of temperature 34-38 C, poultry feed, prevention**- (Vaccination) **and control of pests and diseases; Bacterial- (**Cholera, Diarrhoea) **- Viral**-(Bird flu, Ranikhet)**- Fungal- (**Aspergillosis) }	• What are the differences between broilers and layers, and in their management? • Name two external factors that have favourable effect on egg laying of hens? • Write two infectious diseases of poultry? • Mention some viral diseases of fowl.	
Communicates the findings and conclusions effectively	Teacher guides the students to conduct activity 12.4 and discusses the findings • What types of breeds did you observe? • What ration is given to them? • How was the lighting and housing facilities given to them?	• How can we maintain hygiene in poultry farm? • Why is it necessary to provide good lighting to birds?	
Takes initiatives to know about the contributions of B. V. Rao, in silver revolution	The teacher elaborates about silver revolution and the father of silver revolution in India, B. V. Rao (1935-2004) and his contribution in increasing the egg production, at a cheaper cost to reach even to the poor  	• Collect information and make a project on the contributions of B. V. Rao in increasing the egg production. • Discuss about silver revolution? • What is our country's place in egg production?	

PERIOD PLAN 9

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

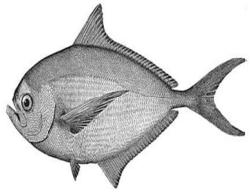
Total no. of periods : 11

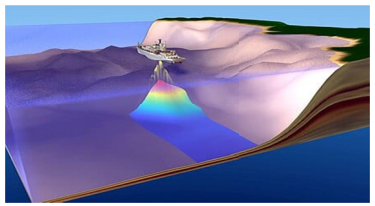
Period plan : 09/11

Time : 40 min

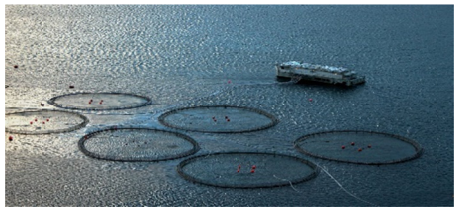
Key Concepts : Fish Production- Marine Fisheries, Mari culture

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
	The teacher tests the previous knowledge: • What food do we get from animals? • Name the nutrients we get from animal foods? • Name an important aquatic food rich in protein? • What do you mean by blue revolution? • Where do fish live? • What should be improved to the growing need of fish? The teacher introduces the concept of fish production through simple questioning; • Why is fish called aquatic food? • What is the main nutrient we get from fish? • When compared to other animal food- mutton, is it costlier? • Among mutton, chicken and fish which is easily digestible? • Why does a large section of population use fish as food? The teacher further elicits displaying a char **Total Fish Production- 45%. 2nd in the world** **Fish Production:** Finned true fish and Shellfish **Ways**: **Capture Fishery**-Locating- Capturing- storage- Marketing **Culture Fishery** –Pisci culture , Aqua culture Mari culture **Water Source : Marine and Inland**	• What does fish production include? • How many types of fisheries are there based on the mode of obtaining?	Chart showing types of fish, fishery and sources

Locates the marine fishery area in our country	**Marine (Coastal, offshore and deep sea)** • **What are the main sources to obtain fish?** • **Based on the water source, how can we classify fishes as?** **The teacher shows an outline India map and asks**  **Coastal Line – 7500 Kms** • **What does the dark shade in the map indicates?** • **How long is it?** • **What is meant by marine fisheries?**	• What is India's position in fish production? • **India's marine fishery resources include _____ km of coastal line and deep sea.**	
Explains marine capture fisheries	**The teacher displays pictures / specimen of edible marine capture fish varieties and elicits**  **Pomphret**  Mackerel	• What is the method of catching fish from natural resources called?	**pictures / specimen of marine capture fish varieties**

Gives examples of popular marine capture fishes.	 Tuna  Sardine  Bombay duck • Where do marine fish live? • Who takes care of growing these fishes? • Can we get the desired type of fish through capture fisheries? • How are marine fish caught?  Fishing Nets  Fishing Boats  Satellites, Eco-sounders • Does marine capture fisheries helps to obtain fishes of same size and type?	• **Give examples of popular marine fish varieties obtained through capture fisheries.** • How are marine capture fishes obtained? • Yield of marine fish are increased by locating large schools of fish in open sea using _____ and _____. • What is the use of satellites and Eco-sounders in marine capture fisheries?	

Differentiates between Capture Fishery and Culture Fishery **Gives examples of popular marine culture fishes.** **Classifies fish based on the structure**	• Does marine capture fisheries helps to obtain fishes of same economic value? • What can be done to get fish of high economic value? • Can marine fish be cultivated in sea? The teacher introduces that marine fish of high economic value can be farmed and displays the pictures. **Finned fishes**  Mullet  Pearl spot **Shelled fishes**  • What is the commercial use of oyster? Seaweed Oyster	• What is culture fisheries? • How can fishes be classified? • Shell fish include prawn and_____. • Mullets, prawn and mussels are examples of (a) marine fishes (b) fresh water fishes (C) finned fishes (d) shelled fishes • State if the statement is true or false Mullets are marine fish farmed in sea water	**Pictures / specimen of marine culture fish varieties**

Differentiate capture fishery and culture fishery	  • How is seaweed useful to us? • As we cannot get our desired fish through capture fisheries, what can we do to meet that demand? • As culturing fishes in water is called Aqua culture, what can we call such culture in marine water?  Maricultu	• **How is capture fishery different from culture fishery** • How do you differentiate Capture Fishery and Culture Fishery? • Give merits and demerits of fish culture. • **What do you mean by mariculture?**	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 10

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

Total no. of periods : 11

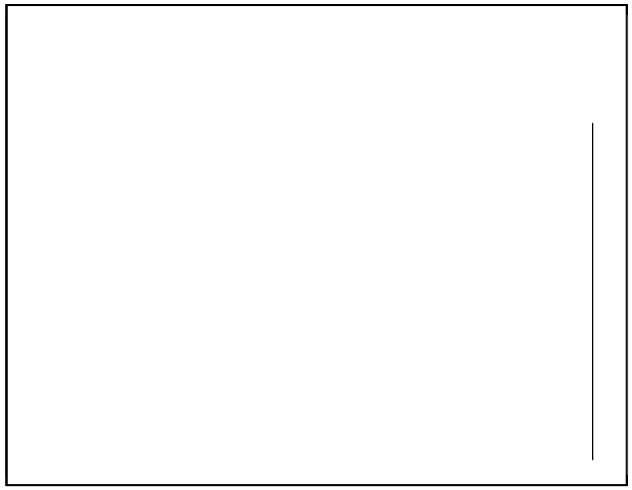
Period plan : 10/11

Time : 40 min

Key Concepts : Inland fisheries, Composite fish culture, Hyophysation

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Identifies the major resources for fish production	The teacher tests the previous knowledge: • Name an important aquatic food rich in protein? • Why is fish called aquatic food? • What do you mean by blue revolution? • Name the resources of fish? • How can fishes be classified? • What do you call the fishes which grow in sea? The teacher introduces the concept of Inland fisheries with the help of a chart and simple questioning: • What are the major resources of water? **Water Resources:** (for both Capture and Culture Fishery) **Marine-(Coastal, offshore and deep sea)** **Inland -** **(Brackish water- estuaries and lagoons)** **(Fresh water- Rivers, canals, reservoirs, Lakes and ponds)** • What do we call the fish obtained from sea? • Apart from the sea, where do we obtain fish from? • How does the sea water taste? • Is the water from lakes and rivers also taste salty? • What is the water from lakes and rivers called as? • What is brackish water?	• Enlist various inland water resources? Identify the freshwater fish among the following ○ sharks ○ Hilsa ilisa ○ Rays and skates ○ Catla catla	Chart showing major water resources

Differentiates between the freshwater Capture and Culture fisheries.	• Where are brackish water and fresh water resources present? • As they are located in land, what can we call that fish culture as? • Marine capture fisheries are done in large areas hence gives high yield, how will be the yield in inland water bodies? • Where are the fish captured from? • What are the resources for capture fisheries? • Who rears the fish seeds in capture fisheries? • How are fish captured? • As capture fisheries in inland fisheries gives low yield, what can be done to improve the yield? • What is production from inland water bodies called? The teacher further elicits the concept of Culture fishery • What is culture fisheries? • What are the resources for culture fisheries? • Who rears the fish seeds in culture fisheries? • How many types of culture fisheries? • Why is culture fisheries preferred over capture fisheries?	• Estuaries and lagoons are _____ water, inland water resources. • • What is capture fisheries? • What are the two ways of obtaining fish? • Differentiate between Capture and Culture fisheries • Give the merits and demerits of fish culture? • If more than one species of fish is cultured, what is it called as? • What type of culture does the below picture show?  • State if the statement is true or false: Mullets are fresh water fish farmed in river water. • Rohu and Catla are types of _____. • Match the following • Surface feeder - Rohu	Chart of types of Culture fishery Pictures of fish 4   Scan the QRCode in the lesson and follow the content through

Analyses and interprets the data related to Composite Fish Culture	The teacher elaborates Composite Fish Culture  **COMPOSITE FISH CULTURE**  • What happens when the same kind of fish is grown in a single water body? • A combination of how many species is used here? • Which species are used in the culture? • Which fish feed on the surface? • Where does Rohu fish feed? • Do fishes compete for food and space? • Do all the fishes have same feeding habits?	• Middle zone feeder - Common carp • Bottom feeder - Mrigal • In composite fish culture system both local and imported fish species are used. Identify the local and imported fish species from the picture given below:  • What are the advantages of Composite fish culture? • How is culture of Pomhret and Mackeral different from that of Catla and Rohu?	Diksha App https :// diksha.gov.in/ play/co ntent /do_3132224 416734 0851215413

Relates hypophysation in fishes to ensured supply of pure seeds in desired quantities	**The teacher discusses the major problems and solutions to the problems with composite fish culture.**  • When do most of the fishes breed? • How many types of fishes are cultured in composite fish culture? • Are the seeds provided by natural breeding of fish quantitatively sufficient to grow fish? • As most of the fishes breed only during monsoon, is it possible to collect pure seeds of fish? • What do you observe in the above picture? • How does the induced pituitary hormone stimulation helps in qualitative and quantitative improvement in fish and fish seed.	• What do you mean by hypophysation? What are its advantages? • Why is hyophysation commonly used in aquaculture? • A fish farmer is planning to induce spawning in a composite fish species using hyophysation. What are the primary hormones involved in the hypophysation process, and how do they contribute to successful spawning?	Picture of hypophysation
Takes initiatives to know about the contributions of Scientists, in blue revolution	The teacher instructs the students to collect information about blue revolution and the contribution of scientists to improve it.	• Collect information and make a project on the contributions of Scientist in increasing the fish production. • Discuss about blue revolution? • What is our country's place in fish production	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

PERIOD PLAN 11

Name of the Chapter : IMPROVEMENT IN FOOD RESOURCES

Class : 09

Total no. of periods : 11

Period plan : 11/11

Time : 40 min

Key Concepts : Bee keeping

LEARNING OUTCOMES	TEACHING - LEARNING PROCESS	ASSESSMENT STRATEGIES	TLM
Explains why honey is widely used **Applies knowledge of honey and its use in daily life to lead a healthy lifestyle**	The teacher tests the previous knowledge: • Do you like sweets? • What are sweets made up of? • Can we use a substitute for sugar and jaggery? • Where do we get honey from? • What is rearing honey bees for honey called? The teacher introduces the topic - bee keeping and elicits the wide usage of honey and bee keeping as an agricultural enterprise. n), vitamins, 's. propolis, s growth tics, • How does honey taste? • What do we get from honey? • When compared to Cattle farming and poultry how much investment does Bee	• Why is honey widely used? • What are the applications of Honey in modern and traditional medicine? • How are the products of honey useful in our daily life? • How does the consumption of honey support the immune system, and in what ways can it be incorporated into daily routine for immune health?	Chart showing honey its products and uses

Gives examples of Bee varieties Gives reasons why Italian bee is considered the best in honey production	keeping need? • As it needs low investments, how do farmers use it as to improve his income? • Where do we get honey from? The teacher further elaborates showing the pictures Bee varieties  Apis cerana indica- Indian bee  d , • Where do honey bees store the honey? • Where do we find bee hives? • What do we need to establish for commercial production of honey?	• What are the advantages of bee keeping? • Apis cerana is commonly known as _____. • _____ an exotic variety of bee is domesticated in India to increase the yield of honey. • _____ is a less swarming bee species. • The following question below consists of two statements – Assertion (A) and Reason (R). Answer it selecting appropriate option given below: Assertion (A): Italian bee is commonly used for honey production. Reason (R): Italian bees have high honey collecting capacity, are stingless and breeds very well. (q) Both A and R are true and R is the correct explanation of A. (r) Both A and R are true and R is not the correct explanation of A. (s) A is true but R is false. (t) A is false but R is true. • What are the desired characteristics of a bee for honey production? • Name two local and exotic breeds of bees used for commercial production of honey. List any three qualities for which	Pictures of Bee varieties

Explains the measures to be taken to promote responsible bee production	Bee farm   The teacher emphsises that income on apiculture oney lance of best is son depends on the quality and quantity of honey. - What factors determine the the yield of honey?	foreign breed are adopted. • What are apiaries and why are they established? • What measures are to be taken to promote responsible bee production? • how is honey flow period related to honey production?	Pictures of bee farms Chart- Factors effecting bee production

Relates pasturage to honey production Exhibits values of rational thinking and freedom from myth towards the need to protect and improve the bee population. Takes initiatives to know about the contribution of scientists in improving apiculture.	The teacher elicits showing few pictures?  • What do the honey bees collect from flowers? • What is th collected pollen converted into? • So, what is needed in abundance to make quality honey? The teacher reinforces the need to culture and protect bees, presenting the quote of **Albert Einstein** in connection with honeybees, "If the bee disappeared off the face of the earth, man would have only four years left to live" • What does the above quote implies? • Why is the bee population declining? The teacher guiges the students to collect information about the Golden revolution and the contribution of scientists in improving apiculture.	• To obtain good quality of honey, bee-hive should be developed near _____. • What is pasturage and how is it related to honey production? • What happens if the bees get extinct? • How does the bee keeping industry approach sustainability, considering concerns about the declining bee population? . • Collect information and make a project on the contributions of Scientist, Nirpakh Tutaj in increasing the honey production. • Discuss about blue revolution? • What is our country's place in honey production? • What is golden revolution?	

Teacher's Reflections:

1. How did the lesson go?

2. Were the teaching learning strategies adequate?

3. Were the students engaged?

4. Areas of improvement

5. Measures taken to refine the teaching-learning process.

ASSESSMENT-1

CLASS: IX **Max marks:20**

TOPIC: IMPROVEMENT IN FOOD RESOURCES

ANSWER THE GIVEN QUESTIONS:

ASSESSMENT-1

CLASS: IX **Max marks:20**

TOPIC: IMPROVEMENT IN FOOD RESOURCES

ANSWER THE GIVEN QUESTIONS: 5X1=5M

1.Farming without the use of chemical fertilizers, herbicides and pesticides is _____.

2.Vegetables, spices and _____ provide vitamins minerals and small amount of nutrients.

3.Barseem is a important _____crop.

4.Which one of the following is not a part of the biotic environment-
a) Man b) Air c) Trees d) Insects

5.If there is low rainfall in a village throughout the year, what measures will you suggest to the farmers for better cropping.
(a)Reduced tilling
(b) Enrich soil with humus which increases its water holding capacity
(c)use of Drought resistant and early maturing varieties of crops.
(d)None of the above

6.Match the following 2M

(a)Green Revolution	(i)Fish production
(b)White Revolution	(ii)Pulses production
(c)Yellow Revolution	(iii)Grain production
(d)Golden Revolution	(iv)Milk production
(e)Blue Revolution	

7.Why are the Kharif crops are most susceptible to infection than the rabi crops? 2M

8.How do biotic and abiotic factors adversely affect crop production? 3M

9.Ram has been cultivating wheat crop year after year in the same field. Recently he has observed decline in the yield despite best input. Agriculture inspector of the area suggested him to soyabean for one or two years before again using the field for wheat crop. What is the rationale behind his suggestion? 3M

10.(a)How can crop variety improvement methods come to the rescue of farmers facing repeated failures? Describe three factors for which they could do crop improvement. 5M
(b)Which is the most common method of obtaining improved variety of crops? Explain briefly.

ASSESSMENT-2

CLASS: IX **Max marks:20**

TOPIC: IMPROVEMENT IN FOOD RESOURCES

ANSWER THE GIVEN QUESTIONS: 4X1=4M

1.Milk production can be increased by increasing _____ period.

2 Name two vitamins that should be included in high amount in poultry feed.

3 _____ is regarded as father of white revolution.

4.Which one of the following is a viral disease in cattle-
a) Foot and mouth diseases b) Anthrax c) Aspergillus d) Tuberculosis

5.Identify the animals shown in the picture. To which category each one belongs 2M
A

B

The following questions below consists of two statements – Assertion (A) and Reason (R). 2x1=2M
Answer them selecting appropriate option given below:
6. Assertion (A): An egg laying poultry is called Layers.
Reason (R): The poultry reared for obtaining meat is called broiler.
7.Assertion (A): Draught breeds of cows are used mainly as beasts of burden.
Reason (R): Draught breeds of cow gives less milk but are strong and sturdy

(a)Both A and R are true and R is the correct explanation of A.
(b)Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false
(d) A is false but R is true.

8.What management practices are common in dairy and poultry farming? 2M

9.Name (a) a milch animal with maximum fat content in its milk. 2M
(b) Cattle disease transferable to human beings.
9. What are poultry diseases and how can be they prevented? 3M
OR
Ram, a farmer observed his cow becoming inactive, reduced appetite, shaky limbs and blisters on mouth and feet.
What happened to the cow? What measures does he need to take?

11.(a)Name an indigenous breed of domestic fowl. 5M
(b) Why are improved poultry breeds developed?
(c) Describe briefly. the desired traits for which new varieties are developed.

ASSESSMENT-

CLASS: IX **Max marks:20**

TOPIC: IMPROVEMENT IN FOOD RESOURCES

ANSWER THE GIVEN QUESTIONS: 4 X14M

1. Apis cerana is commonly known as _____.

2.Shell fish include prawns and _____.

3._____ is a less swarming bee species.

4.Which one of the following is not a marine fish-
a) Mullets b) Catla c) Pearl spots d) Shellfish

5.In composite fish culture mark the fish as Top feeder (T), Mid zone feeder (M)and Bottom feeder (B). 4x1/2=2

	FISH	FEEDDING ZONE
(i)	Rohu	( )
(ii)	Common carp	( )
(iii)	Catla	( )
(iv)	Mrigal	( )

The following questions below consists of two statements – Assertion (A) and Reason (R). 2x1=2M
Answer them selecting appropriate option given below:
6. Assertion (A): Honey has medicinal properties.
Reason (R): Apis cereca and Apis dorsata are exotic varities of honeybee.

7. Assertion (A): Italian bee is commonly used for honey production.
Reason (R): Italian bees have high honey collecting capacity, are stingless and breeds very well.
(a)Both A and R are true and R is the correct explanation of A.
(b)Both A and R are true and R is not the correct explanation of A.
(c) A is true but R is false
(d) A is false but R is true.

8. What is pasturage and how is it related to honey production? 2M

9. How is culture of Pomhret and Mackeral different from that of Catla and Rohu? 2M

10. A fish farmer is planning to induce spawning in a composite fish species using hyophysation. 3M
What are the primary hormones involved in the hypophysation process.
and how do they contribute to successful spawning?

11(a)Describe composite fish culture system. 5M
(b) What is the major problem in fish farming?
(c) How is it overcome.

Video links -IMPROVEMENT IN FOOD RODUCTION

- http://tinyurl.com/2sc6fam3
- http://tinyurl.com/4x4n9rj2
- http://tinyurl.com/2s35mxe3
- http://tinyurl.com/3vunw3k7
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