Government of Telangana

Department of Women Development & Child Welfare - Childline Foundation

When abused in or out of school.

To save the children from dangers and problems.

CHILD LINE 1098 NIGHT & DAY

24 HOUR NATIONAL HELPLINE

When the children are denied school and compelled to work.

When the family members or relatives misbehave.

1098 (Ten...Nine...Eight) dial to free service facility.

State Council of Educational Reasearch and Training
Telangana, Hyderabad

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BIOLOGY

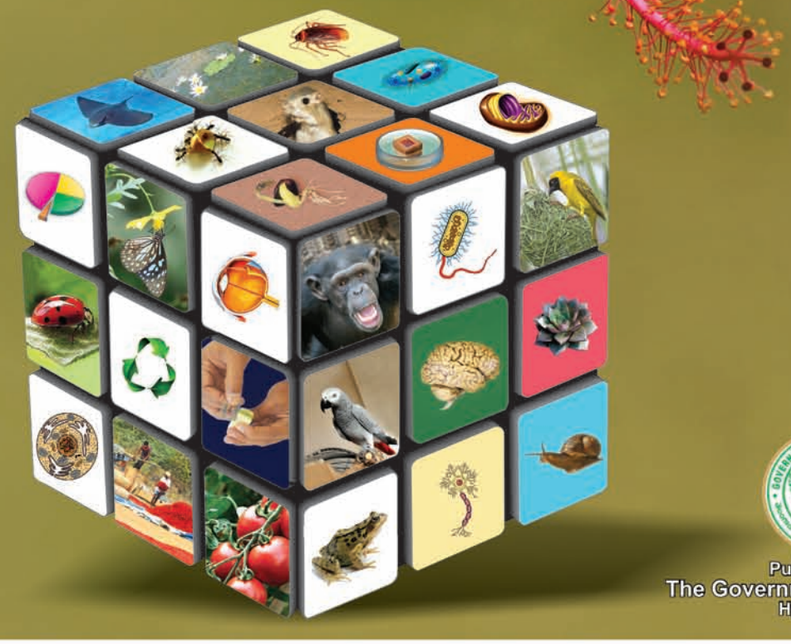
CLASS 9

BIOLOGY

FREE

CLASS 9

P1X6G1



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LEARNING OUTCOMES

The learner...

- **Differentiates** organisms, phenomena and processes based on properties or characteristics, such as, Prokaryotes and eukaryotes, plant cell and animal cell, etc.
- **Classifies** organisms, phenomena and processes based on properties or characteristics, such as, Classification of plants and animals under various hierarchical sub groups, natural resources, etc.
- **Plans and conducts investigations or experiments** to arrive at and verify the facts, principles, phenomena or to seek answers to queries on their own, such as, Where are stomata present in different types of leaves? etc.
- **Relates processes and phenomena** with causes and effects, such as, Tissues with their functions, production with use of fertilisers, etc.
- **Explains processes and phenomena,** such as, Functions of different organelles, spread of diseases and their prevention, etc.
- **Draws labelled diagrams,** flow charts, concept maps, graphs, such as, Biogeochemical cycles, cell organelles and tissues, human ear, etc.
- **Analyses and interprets graphs and figures,** such as, Crop yield after use of fertilisers, etc.
- **Applies** learning to hypothetical situations, such as, What will be happen in future if rearing of camels in polar regions and polar bears in deserts, etc.
- **Applies scientific concepts in daily life** and solving problems, such as, Follows intercropping and crop rotation etc.
- **Draws conclusion,** such as, Classification of life forms is related to evolution, etc.
- **Describes** scientific discoveries and inventions, such as, Discovery of the cell with invention of microscope, classification of living things, etc.
- **Designs models** using eco-friendly resources, such as, 3D model of a cell, etc.
- **Exhibits values** of honesty, objectivity, rational thinking, freedom from myths, superstitions beliefs while taking decisions, respect for life, etc, such as, Records and reports experimental data exactly, etc.
- **Communicates** the findings and conclusions effectively, such as, Those derived from experiments, activities and projects both in oral and written form using appropriate figures, tables, graphs and digital forms, etc.
- **Applies** the interdependency and interrelationship in the biotic and abiotic factors of environment to promote conservation of environment, such as, Organic farming, etc.

Energized Text Books facilitate the students in understanding the concepts clearly, accurately and effectively. Content in the QR Codes can be read with the help of any smart phone or can as well be presented on the Screen with LCD projector/K-Yan projector. The content in the QR Codes is mostly in the form of videos, animations and slides, and is an additional information to what is already there in the text books.

This additional content will help the students understand the concepts clearly and will also help the teachers in making their interaction with the students more meaningful.

At the end of each chapter, questions are provided in a separate QR Code which can assess the level of learning outcomes achieved by the students.

We expect the students and the teachers to use the content available in the QR Codes optimally and make their class room interaction more enjoyable and educative.

Let us know how to use QR codes

In this textbook, you will see many printed QR (Quick Response) codes, such as

Use your mobile phone or tablet or computer to see interesting lessons, videos, documents, etc. linked to the QR code.

Step	Description
A.	**Use Android mobile phone or tablet to view content linked to QR Code:**
1.	Click on **Play Store** on your mobile/ tablet.
2.	In the search bar type **DIKSHA.**
3.	 will appear on your screen.
4.	Click **Install**
5.	After successful download and installation, Click **Open**
6.	Choose your prefered Language - Click **English**
7.	Click **Continue**
8.	Select **Student/ Teacher** (as the case may be) and Click on **Continue**
9.	On the top right, click on the QR code scanner icon and scan a QR code printed in your book OR Click on the search icon and type the code printed below the QR code, in the search bar ( )
10.	A list of linked topics is displayed
11.	Click on any link to view the desired content
B.	**Use Computer to view content linked to QR code:**
1.	Go to **https://diksha.gov.in/telangana**
2.	Click on **Explore DIKSHA-TELANGANA**
3.	Enter the code printed below the QR code in the browser search bar ( )
4.	A list of linked topics is displayed
5.	Click on any link to view the desired content

BIOLOGY

CLASS IX

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Respect the Law
Get the Rights

Grow by Education
Behave Humbly

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Intro ...

Nature is the life source for all the living organisms. Rocks, water, hills and valleys, trees, animals etc. embedded in it... each of them are unique by themselves. Everything has its own prominence. Man is only part of nature.

The aspect which distinguishes man from nature and exclusive for himself is thinking power. Thinking transforms man as a unique power from rest of the nature. Though it, usually, appears simple and normal, the very nature often challenges us to untie the tough knots of its hidden secrets day in and day out.

Man intuitionally contemplates and searches solutions for all the challenges forever. Curiously, the questions and answers are concealed in the nature itself. The role of science, in fact, is to find them out. For this sake, some questions, some more thoughts, and some other investigations are quite necessary.

Scientific study is to move on systematically in different ways, until finding concrete solutions. The essence of investigations lies in inquiring *i.e.* identifying questions, asking them and thus deriving adequate answers. That is why, Galileo said that scientific learning is nothing but improving the ability of questioning.

The classroom teaching of science must be in such a way that it encourages children to think and work scientifically. Also, it must enhance love towards nature. Even it should enable to comprehend and appreciate the laws governing the nature in constructing so much diversity all around. Scientific learning is not just disclosing new things.

It is also necessary to step forward without interrupting the interrelationship and interdependency along with understanding of the nature's intrinsic principles.High School children possess cognitive capacity of comprehending the nature and characteristics of the transforming world surrounding them. And they are able to analyze abstract concepts.

At this level, we cannot quench their sharp thinking capability with the dryteaching of mere equations and theoretic principles. For that, we should create a learning environment in the classroom which provides an opportunity for them to apply the scientific knowledge, explore multiple alternatives in solving problems and establish new relations.

Scientific learning is not just confined to the four walls of classroom. It has a definite connection to lab and field as well. Therefore, there is a lot of importance to field experience/ experiments in science teaching.

There is a great need for compulsory implementation of instructions of the National Curriculum Framework- 2005 which emphasizes linking of the science teaching with local environment. The Right to Education Act- 2009 also suggested that priority should be given to the achievement of learning competencies among children. Likewise, science teaching should be in such a way that it would help cultivate a new generation with scientific thinking.

The key aspect of science teaching is to make the children understand the thinking process of scientists and their efforts behind each discovery. The State Curriculum Framework- 2011 stated thatchildren should be able to express their own ideas and opinions on various aspects. These Science Text Books are prepared to meet the set standards of the SCF and thus assist children in becoming self-reliant researchers capable of thinking intensely in scientific terms.

New textbooks are developed to achieve desired academic standards. So teachers should develop various teaching learning strategies to make their students to achieve class based academic standards. We should avoid rote learning methods for successful implementation of Continuous Comprehensive Evaluation (CCE). It is very impart to know more about different methods to assess student progress by summative and formative evaluation. New textbooks reflects Continuous Comprehensive Evaluation and teaching method with respect of discussed concepts. This is more useful to teachers and students.

We thank the Vidya Bhawan Society, Rajasthan for their cooperation in designing these new text books,the writers for preparing the lessons, the editors for checking the textual matters and the DTP group for cutely composing the text book.

Teachers play a pivotal role in children's comprehensive use of the text book. We hope, teachers will exert their consistent efforts in proper utilization of the text book so as to inculcate scientific thinking process and inspire scientific approach in the children.

Director,
SCERT, Hyderabad

Dear teachers...

New Science Text Books are prepared in such a way that they develop children's observation power and research enthusiasm. It is a primary duty of teachers to devise teaching- learning processes which arouse children's natural interest of learning things. The official documents of National& State Curriculum Frameworks and Right to Education Act are aspiring to bring grass root changes in science teaching. These textbooks are adopted in accordance with such an aspiration. Hence, science teachers need to adapt to the new approach in their teaching. In view of this, let us observe certain **Do**s and **Don't**s:

- Read the whole text book and analyze each and every concept in it in depth.
- In the text book, at the beginning and ending of an activity, a few questions are given. Teacher need to initiate discussion while dealing with them in the classroom, attempt to derive answers; irrespective of right or wrong responses, and so try to explain concept.
- Develop/Plan activities for children which help understand concepts presented in text.
- Textual concepts are presented in two ways: one as the classroom teaching and the other as the laboratory performance.
- Lab activities are part and parcel of a lesson. So, teachers must make the children conduct all such activities during the lesson itself, but not separately.
- Children have to be instructed to follow scientific steps while performing lab activities andrelevant reports can be prepared and displayed.
- In the text some special activities as boxed items- 'think and discuss, let us do, conduct interview, prepare report, display in wall magazine, participate in Theatre Day, do field observation, organize special days' are presented. To perform all of them is compulsory.
- 'Ask your teacher, collect information from library or internet'- such items must also be considered as compulsory. (A.S. indicates academic standerds in improve your learning.)
- If any concept from any other subject got into this text, the concerned subject teacher has to be invited into the classroom to elucidate it.
- Collect info of relevant website addresses and pass on to students so that they can utilize internet services for learning science.
- Let there be science magazines and science books in the school library.
- Motivate every student to go through each lesson before it is being actually taught and encourage everyone to understand and learn independently, with the help of activities such as Mind Mapping and exciting discussions.
- Plan and execute activities like science club, elocution, drawing, writing poetry on science, making models *etc.*to develop positive attitude among children environment, biodiversity, ecological balance *etc.*
- As a part of continuous comprehensive evaluation, observe and record children's learning abilities during various activities conducted in classroom, laboratory and field.
- Teaching learning strategies and the expected learning outcomes, have been developed class wise and subject-wise based on the syllabus and compiled in the form of a Hand book to guide the teachers and were supplied to all the schools. With the help of this Hand book the teachers are expected to conduct effective teaching learning processes and ensure that all the students attain the expected learning outcomes.

We believe, you must have realizedthat the learning of science and scientific thinking are not mere drilling of the lessons but, in fact, a valuable exercise in motivating the children to explore solutions to problems all around by themselves systematically and preparing them to meet life challenges properly.

Dear Students...

Learning science does not mean scoring good marks in the subject. Competencies like thinking logically and working systematically, learned through it,have to be practiced in daily life. To achieve this, instead of memorizing the scientific theories by rote, one must be able to study them analytically. That means, in order to understand the concepts of science, you need to proceed by discussing, describing, conducting experiments to verify, making observations, confirming with your own ideas and drawing conclusions. This text helps you to learn in that way.

What you need to do to achieve such things:

- Thoroughly go through each lesson before the teacher actually deals with it.
- Note down the points you came across so that you can grasp the lesson better.
- Think of the principles in the lesson. Identify the concepts you need to know further, to understand the lesson in depth.
- Do not hesitate to discuss analytically about the questions given under the sub-heading 'Think and Discuss' with your friends or teachers.
- You may get some doubts while conducting an experiment or discussing about a lesson. Express them freely and clearly.
- Plan to implement experiment/lab periods together with teachers, to understand the concepts clearly. While learning through the experiments you may come to know many more things.
- Find out alternatives based on your own thoughts.
- Relate each lesson to daily life situations.
- Observe how each lesson is helpful to conserve nature. Try to do so.
- Work as a group during interviews and field trips. Preparing reports and displaying them is a must.
- List out the observations regarding each lesson to be carried through internet, school library and laboratory.
- Whether in note book or exams, write analytically,expressing your own opinions.
- Read books related to your text book, as many as you can.
- You organize yourself the Science Club programs in your school.
- Observe problems faced by the people in your locality and find out what solutions you can suggest through your science classroom.
- Discuss the things you learned in your science class with farmers, artisans *etc.*

ACADEMIC STANDARDS

S.No.	Academic Standard	Explanation
1.	Conceptual understanding	Children are able to explain, cite examples, give reasons, compare and write differences, explain the process of given concepts in the textbook. Children are able to develop their own brain mappings.
2.	Asking questions and making hypothesis	Children are able to ask questions to understand, to clarify the concepts and to participate in discussions. They are able to make hypothesis on experimental results and given issues.
3.	Experimentation and field investigation.	To understand given concepts in the textbook, children are able to do experiments on their own. They are able to arrange the experimental materials, note their observations, collect alternate expermental materials, take precautions, participate in field investigation and make reports on them.
4.	Information skills and Projects	Children are able to collect information (by using interviews, checklist, questionaire) and analyses systematically. They are able to conduct their own project works.
5.	Communication through drawing, model making	Children are able to explain their conceptual understanding by drawing figures labelling, describing the parts and making models. They are able to plot graphs by using given information or collected data.
6.	Appreciation and aesthetic sense, values	Children are able to appreciate man power and nature, and have aesthetic sense towards nature. They are also able to follow constitutional values.
7.	Application to daily life, concern to bio diversity.	Children are able to utilize scientific concept to face their daily life situations. They are able to show concern towards bio diversity.

INDEX

OUR NATIONALANTHEM

- Rabindranath Tagore

Jana-gana-mana-adhinayaka, jaya he
Bharata-bhagya-vidhata.
Punjab-Sindh-Gujarat-Maratha
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchhala-jaladhi-taranga.
Tava shubha name jage,
Tava shubha asisa mage,
Gahe tava jaya gatha,
Jana-gana-mangala-dayaka jaya he
Bharata-bhagya-vidhata.
Jaya he! jaya he! jaya he!
Jaya jaya jaya, jaya he!!

PLEDGE

- Pydimarri Venkata Subba Rao

"India is my country; all Indians are my brothers and sisters.
I love my country, and I am proud of its rich and varied heritage.

I shall always strive to be worthy of it.

I shall give my parents, teachers and all elders respect,
and treat everyone with courtesy.

To my country and my people, I pledge my devotion.

In their well-being and prosperity alone, lies my happiness."