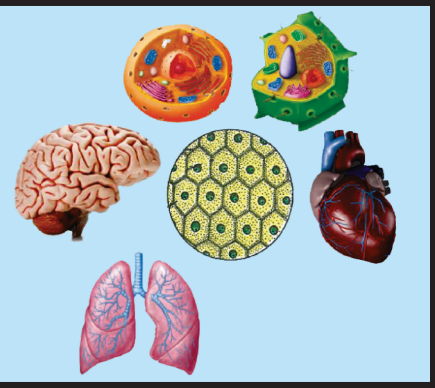

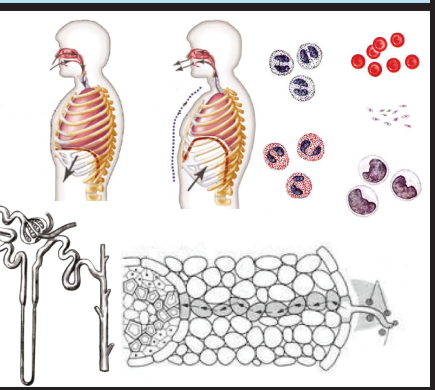

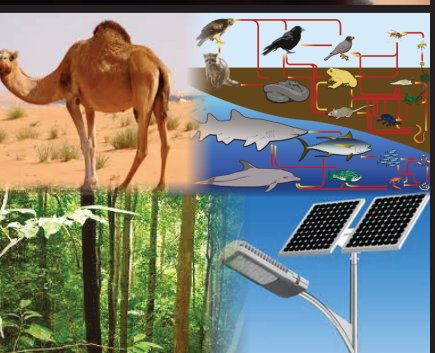

Training Module
Life Science and Environment

Class IX

West Bengal Board of Secondary Education
School Education Department, Govt. of West Bengal
Planning and Development: Expert Committee,
School Education Department

Training Module

Life Science and Environment

Class IX

West Bengal Board of Secondary Education
School Education Department, Govt. of West Bengal
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School Education Department, Government of West Bengal

Bikash Bhavan, Kolkata- 700 091

West Bengal Board of Secondary Education

77/2, Park street, Kol- 700 016

July, 2020

The Teachers' Training Programme under RMSA will be conducted according to this module, developed by the Expert Committee and approved by the WBBSE, which will be coordinated by the SCERT.

Printed at

West Bengal Text Book Corporation Limited
(Government of West Bengal Enterprise)
Kolkata- 700 056

FROM THE BOARD

In 2011 the Honourable Chief Minister Smt. Mamata Banerjee constituted the Expert Committee on School Education of West Bengal. The Committee was entrusted upon to develop the curricula, syllabi and textbooks at the school level of West Bengal. The Committee therefore had developed school textbooks from Pre-Primary level, Class I to Class VIII based on the recommendations of National Curriculum Framework (NCF) 2005 and Right to Education (RTE) Act 2009. In 2015 the new curriculum and syllabus of Life Science and Environment for Class IX came into effect and textbooks were developed accordingly. However, certain questions evoke in our minds: (i) How will the competencies of the learners be modified, refined or improved in Class IX? (ii) How far can the learners establish themselves as citizens with values and responsibilities at the end of Class IX? (iii) How far can the learners go beyond the limits of academic disciplines to apply knowledge in their social life? And in trying to find suitable answers to these questions the Expert Committee developed the framework of the Constructivist methodology for knowledge construction.

Following the recommendations of Samagra Shiksha Abhiyan (SSA), the Govt. of West Bengal has arranged an orientation programme of Life Science and Environment for Class IX on the method of learning and evaluation. This 'Training Module' has been developed for the said orientation programme.

The Hon'ble Minister in Charge for Education, Dr. Partha Chatterjee, has enriched us with his views and comments. We express our sincerest gratitude to him.

We hope that the orientation programme will be successful and have a lasting effect in the teaching-learning process of the future.

Kalyanmoy Ganguly

July, 2020
77/2, Park Street,
Kolkata - 700 016

President
West Bengal Board
of
Secondary Education

PREFACE

The Honourable Chief Minister Smt. Mamata Banerjee constituted the Expert Committee on School Education of West Bengal in 2011. The Committee was given the responsibility to review, reconsider and reconstitute all the aspects of the school curricula, syllabi and textbooks. The new curricula, syllabi and textbooks were developed based on the recommendations of the Expert Committee.

The school textbooks for all classes, from Pre-Primary level to Class VIII, were developed following the guidelines of NCF 2005 and RTE Act 2009. The textbooks for Class IX were developed based on the new curriculum and syllabus.

Following the recommendations of Samagra Shiksha Abhiyan (SSA), the Govt. of West Bengal has organized an orientation programme on the method of learning and evaluation of Life Science and Environment for Class IX. This 'Training Module' has been developed for the said orientation programme.

The Hon'ble Minister in Charge for Education, Dr. Partha Chatterjee, has enriched us with his views and comments. We express our gratitude to him.

The State level Teachers' orientation programme on the methodology of learning and evaluation has been planned and executed in assistance with School Education Department, Govt. of West Bengal, West Bengal Board of Secondary Education and Samagra Shiksha Abhiyan (SSA). It is hoped that the 'Training Module', developed on behalf of School Education Department, Govt. of West Bengal, West Bengal Board of Secondary Education and Samagra Shiksha Abhiyan (SSA), will help in the effective implementation of the methodology of learning and evaluation.

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Expert Committee
School Education Department
Govt. of West Bengal

Textbook Development Committee under Expert Committee

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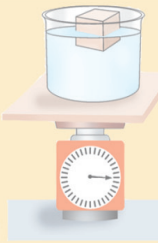


Contents

Samagra Shiksha Abhiyan (SSA)

Introduction

The Right of Children to Free and Compulsory Education (RTE) Act, 2009, seeks to ensure that children enjoy the benefits of the three aspects of Access, Equity and Quality in school education across the nation. To this effect, the Ministry of Human Resource & Development (MHRD) in line with the proposal of the Union Budget, 2018 -2019 has initiated the scheme of SAMAGRA SHIKSHA ABHIYAN (SSA). The scheme takes a holistic stance in treating school education from Pre-Primary to Class XII as a continuum by merging the erstwhile Sarva Shiksha Abhiyan and Rashtriya Madhyamik Shiksha Abhiyan schemes in one, unified whole.

Scope of SSA

The Samagra Shiksha Abhiyan (SSA) collates the three Schemes of Sarva Shiksha Abhiyan, Rashtriya Madhyamik Shiksha Abhiyan and Teacher Education.The SSA scheme aims at improving school effectiveness measured in terms of equal prospects for schooling and equitable learning outcomes. In harmonizing the different and major effectual factors of school education, the SSA scheme provides for the operational mechanisms and transaction costs at all levels, particularly in using state, district and circle level systems and resources, besides envisioning one comprehensive strategic design for advancement of school education. The shift in the focus is from project objectives to refining systems level performance and schooling outcomes which will be the emphasis of the SSA scheme, alongwith encouraging States towards improving quality of education.

Major Objectives of SSA

The holistic nature of the scheme envisages Universal Access, Equity and Quality, promotion of Vocational Education, refurbishment of the use of Soft or e-Materials in schools and strengthening of Teacher Education.

The major objectives of the scheme are summarized below:

- **Provision of Quality Education and enhancing learning outcomes of students**
- **Bridging Social and Gender Gaps in School Education**
- **Ensuring Equity and Inclusion at all levels of School Education**
- **Ensuring minimum standards in schooling provisions**
- **Support States in implementation of Right of Children to Free and Compulsory Education (RTE) Act, 2009**

Traditional method of teacher training and methodology proposed by NCFTE 2009: A comparison

Comprehensive development of education requires, among other things, to make arrangements for teacher education. With this objective in view, the National Council of Teacher Education organized an expert committee which produced a draft document after long and fruitful discussion with many experts, Professors of education departments of several universities, teachers, trainee teachers, NCERT, SCERTs, DIETs and various NGOs. This draft was subsequently revised and published as a book. This very important document in the national educational sphere is known as National Curriculum Framework for Teacher Education, 2009 (NCFTE, 2009). This valuable document has been a beacon to us when we took up the task of designing the present teacher training module. While discussing the general principles of teacher education, the NCFTE, 2009 document says "*.. we have realized the tentative and fluid nature of the so-called knowledge-base of teacher education. This makes reflective practice the central aim of teacher education. Pedagogical knowledge has to constantly undergo adaptation to meet the needs of diverse contexts through critical reflection by the teacher on his/her practices.*". In this section we shall see the fundamental points of difference between the traditional method of teacher training and that proposed by the NCFTE, 2009. The following table has been taken from NCFTE, 2009.

Comparison between the Dominant Current Practice and Proposed Process-Based Teacher Education Curriculum Framework

Dominant Practice of Teacher Education	Proposed Process-Based Teacher Education
Focus on psychological aspects of learners without adequate engagement with contexts. Engagement with generalised theories of children and learning.	Understanding the social, cultural and political contexts in which learners grow and develop. Engagement with learners in real life situations along with theoretical enquiry.
Theory as a "given" to be applied in the classroom.	Conceptual knowledge generated, based on experience, observations and theoretical engagement.
Knowledge treated as external to the learner and something to be acquired.	Knowledge generated in the shared context of teaching, learning, personal and social experiences through critical enquiry.
Teacher educators instruct and give structured assignments to be submitted by individual students. Training schedule	Teacher educators evoke responses from students to engage them with deeper discussions and reflection. Students

Dominant Practice of Teacher Education	Proposed Process-Based Teacher Education
packed by teacher-directed activities. Little opportunity for reflection and self-study.	encouraged to identify and articulate issues for self-study and critical enquiry. Students maintain reflective journals on their observations, reflections, including conflicts.
Short training schedule after general education.	Sustained engagement of long duration professional education integrated with education in liberal sciences, arts and humanities.
Students work individually on assignments, in-house tests, field work and practice teaching.	Students encouraged to work in teams undertaking classroom and learners' observations, interaction and projects across diverse courses. Group presentations encouraged.
No "space" to address students' assumptions about social realities, the learner and the process of learning.	Learning "spaces" provided to examine students' own position in society and their assumptions as part of classroom discourse.
No "space" to examine students' conceptions of subject-knowledge.	Structured "space" provided to revisit, examine and challenge (mis) conceptions of knowledge.
Practice teaching of isolated lessons, planned in standardised formats with little or no reflection on the practice of teaching.	School Internship – students teach within flexible formats, larger frames of units of study, concept web-charts and maintain a reflective journal.

Reference

1. National Curriculum Framework for Teacher Education : Towards Preparing Professional and Humane Teacher, National Council for Teacher Education, New Delhi, 2009

Curriculum and Syllabus of 'Life Science & Environment' of Class IX: A few words

Objectives of Science Education

What should be the objective of science education? To find answer to this question we must try to explore the objective of education. Referring to Mahatma Gandhi it can be said that true education is what inspires the children to manifest their spiritual, cognitive and physical powers. This objective encapsulates the belief that education holds in itself the potential to bring radical change in the individual and the society.

To discuss the objective of teaching science, one must first develop notions about the nature, method, scope and limitations of science education. Man has always observed his surrounding world with awe and admiration. He has tried to seek meaningful relationship between various natural phenomena. He has tried to make different machines to get the benefit of interacting with nature. He has sought the help of various concept models to understand his surrounding nature. This sincere effort of man is called science. Thus, science is a dynamic and expanding resource of knowledge enhanced by ever changing new experiences of mankind. Science is knowledge and knowledge is power. Power engenders wisdom and also leads to freedom. So science is basically an effort that brings changes to the society.

Objectives of 'Life Science and Environment'

The significance of naming the subject as 'Life Science and Environment' lies in knowing about various concepts, principles and methods of Life Science and finding out from the environment the application or cause-effect relationship of those concepts, principles and methods. While designing the curriculum of 'Life Science and Environment' care has been taken to manifest how environment is inextricably connected with various aspects of Life Science. Let us now find out the main objectives of learning 'Life Science & Environment':

i) Based on their preliminary idea of the living world, the learners will be able to construct knowledge related to different terminologies used for different biological phenomena, principles and methods.

ii) This will lead to the development of curiosity, interest,values and awareness among the learners about environment.

iii) The learners will be able to understand and appreciate the unity regarding the structure, existence and growth of organs of living organisms in the living world rather than their apparent diversity. They will be able to identify the cause-effect relationship of the structure and functions of the living body.

iv) The learners will be facilitated to develop their clear understanding and values on aspects like environmental conservation, natural resources, role of community, position of man and his influence in the biosphere etc.

v) The learners will be able to develop a balanced approach to Life Science and Environment so that they have the most modern outlook about the subject.

vi) The learners will be able to realize the social and economic implications of the topics of 'Life Science & Environment' and relate those to the needs of mankind extensively and apply the same in daily life.

vii) The learners will be able to develop skills in observation, questioning and experimentation.

viii) Creativity, innovativeness and intelligence will be developed in the learners.

ix) The learners will be able to develop a working knowledge of those portions of Physics, Chemistry and Mathematics that are necessary for proper understanding and interpretation of 'Life Science and Environment'.

x) The learners will demonstrate alertness in evaluating and explaining biological phenomena in daily life.

Curriculum of 'Life science & Environment': Main characteristics

i) Integrated Curriculum

From the stage of planning and designing the curriculum and syllabus of 'Life Science and Environment' for classes VI, VII, and VIII, environment as a topic has been introduced through the integration of other branches of science (such as Physics or Life Science.) The main policies adopted in this respect are: Learning about the Environment, Learning through the Environment and Learning for the Environment. While presenting the various topics in the syllabus for classes VI and VII, mainly Learning about the Environment and Learning through the Environment doctrines have been implemented. However, in the syllabus for class VIII various topics related to Learning for the Environment have been included. This trend has also been followed in the syllabus of 'Life Science and Environment' for class IX. The theme of the syllabus 'Life and its Diversity' is indeed a true illustration of Learning through the Environment. Similarly, the theme 'Environment and its Resources' is presented through Learning for the Environment; that is, conservation of environment & its resources and the use of diverse resources of the environment in the need of human society has been presented in varied ways.

ii) Exploratory activity-based curriculum

The curriculum and syllabus of 'Life Science and Environment' have been so designed as to generate in learners an attitude of investigation, exploration and inquiry. While discussing the various themes in the curriculum, it has been suggested that at first an inquiring mindset is developed in the learners through examples from daily happenings and thereby work the way towards the main topics of the textbook. Further, active participation of the learners wherever necessary will facilitate them in gaining practical experience on the textual topics. This will also help them in developing their skills in the practical field.

iii) Learner-centric approach

Based on the theory of constructivism, the curriculum and syllabus of 'Life Science and Environment' have been so designed that the learners are kept at the centre of the teaching-learning process. Questions that arise in the mind of the learners owing to the multifarious incidents occurring in the surrounding environment has led to the introduction of various topics in the syllabus. Hence various instances of daily life have been presented before the introduction of main topic included in the themes.

(iv) Evaluation: an integral part of the curriculum

Learning and evaluation when viewed in the light of Constructivism emphasizes that evaluation is not the final step of teaching; rather it is viewed as a continuous process. In this ongoing process of teaching-learning, the teachers closely observe the learners and record their significant progress or limitations and facilitate them accordingly. Based on this concept, the curriculum for class IX has included provision for Internal Formative Evaluation so that evaluation does not get separated from the curriculum. The learners are to be evaluated within the classroom keeping pace with their level of learning. According to the concept of Constructivism, evaluation has an integral relation to learning progress. The appropriate implementation of Internal Formative Evaluation within the classroom will eventually do away with the traditional concept of evaluation with pen & paper at the end of the teaching process. Six tools have been mentioned in this regard. They are: Survey, Nature Study, Case Study, Creative Writing, Model Making and Open Text **b**ook Evaluation. The Internal Formative Evaluation should be conducted within the span of the classroom. There is no need to go beyond the classroom. This enables the teachers to assess the advancement or lacuna of the learners even before the summative evaluation. So there is scope for adopting appropriate measures. Consequently, both the teachers and the learners get ample scope to be familiar with different methodologies and tools used for evaluating the level of learning or skills of the learners.

(v) Development of varied skills

During the framing of the curriculum and syllabus of 'Life Science and Environment', the development of various skills of the learners have been taken into consideration. The skill of using the microscope appropriately will be developed among the learners by using microscopes to enhance their practical knowledge about different organisms or histological slides of organs of different organisms, cells and its various organelles etc. have been included in the syllabus. The psychomotor skills of the learners will be developed by drawing and labelling the pictures of various organisms, cells and cellular organelles,organs and systems of the human body. The decision making and problem solving skills in the learners will be developed by discussion on various topics related to the syllabus and solving problems related to it. These skills will not only help the learners to study science in future, but also help them in their daily life.

(vi) Use of ICT as a learning aid

Information Communication Technology (ICT) is an efficacious mode of learning in the present era. It should not be treated as a separate discipline. In fact, there is a wrong notion that only the experts of Information Technology can teach ICT, and not the subject-teachers. This definitely deters effective integration of ICT with different subjects. It also debars the subject-teachers to develop their interest and skills in ICT. Thus, ICT should be viewed as an important tool for the success of the curriculum. In the implementation of ICT as an integral component for the success of education the role of the subject-teachers is irrefutably significant.

To develop a clear conception about various topics included in the syllabus help may be sought from different educational websites. Practical knowledge about different morphological concepts of living beings can be developed by observing the virtual dissections in these websites. Using computer software, e.g. Microsoft Powerpoint, a topic can be explained with ease with the help of slideshow presentations. However, the teacher ought to be careful on two areas — i) information, pictures or Powerpoint presentations downloaded from the websites should be checked for authentication; ii) care should be taken so that copyright laws are not violated for downloading and using information, pictures and Powerpoint presentations of those websites.

The teachers' active role is desirable for using ICT in the process of learning. Care should be taken so that the teachers and the learners can collectively collaborate in co-creation and exploration for successful implementation of the concept of constructivism by the use of ICT.

Varied areas of Life Skill development in the curriculum of 'Life Science and Environment' of Class IX

Some abilities are needed to successfully cope with various demands and challenges of the individual and society. These abilities are nothing but life skills. Life skills enable us to translate knowledge, attitude and values into actual abilities i.e. "what to do and how to do it." Life skill education is necessary for holistic development of the human beings. Holistic development include development of various physical, mental and social abilities as well as development of cognitive abilities.

The abilities essential for becoming a complete human being can be termed as life skills. Infact, any ability for moving ahead in daily life is actually a life skill. Life skill can be illustrated by citing various examples from daily life – arranging different books at the study place in respect of subjects so that the required book can be found easily whenever necessary, choosing appropriate food for healthy lifestyle, asking suggestions from a stranger about going to a specific place, boarding a particular bus for going to a specific place etc.

The list of essential life skills can vary in accordance with geographical, social and cultural environment. But the most important aspect of it is that when faced with a new

challenge she/he is able to apply her/his knowledge for solving the said problem; that is, the urge and skill to learn something new (Learning to learn). Any life skill i.e. ability can be developed through education and practice.

Now the question is how are life skills to be practised and developed? Can these skills be developed through the subjects? Development of various life skills is possible while discussing different key concepts in the classroom included in different themes as mentioned in the syllabus of 'Life Science & Environment' for Class IX. It is necessary to try to develop life skills in the classroom through channelling topic-based discussions in specific directions by the timely and appropriate interventions of the teachers.

The areas for discussion and subsequent development of probable life skills given in the following table are samples only. Other life skills except the ones mentioned in the table can also be developed. It is possible to develop the skill of effective communication in almost all the areas for discussion mentioned in the table. For this reason it is not mentioned in the table.

Curricular area	Areas for discussion	Development of probable life skills
1. Life and its Diversity	What are the differentiating characteristics between living organisms and non-living objects?	Critical thinking, Decision making
	How did life originate and go through evolution?	Critical thinking
	How does the knowledge of Life Science influence social and professional world?	Critical thinking, Decision making
	How is an unknown organism classified?	Problem solving
2. Levels of organisation of life	What are the types of biological molecules and what roles do they have in the body of living organisms?	Critical thinking
	How is the body of an organism created sequentiallly from biological molecules?	Critical thinking
	How do the organelles inside the cell complete specific tasks or various stages of specific tasks while communicating with each other?	Critical thinking, Decision making
	What is the significance of producing different types of tissue by organisation of the cells ?	Critical thinking, Decision making
	What problems are faced if an organ of human body such as stomach stops functioning?	Problem solving, Decision making

Curriculur area	Areas for discussion	Development of probable life skills
3. Physio-logical processes of Life	How does sunlight affect the living world?	Critical thinking
	What roles are played by minerals in the plant body?	Critical thinking, Decision making
	Why is smoking and intaking of fatty food harmful to health?	Critical thinking, Problem solving, Decision making
	What are the dangers of blood transfusion without crossmatching?	Critical thinking, Decision making
	Why is the storage of nitrogenous excretory products in animal body harmful if stored as in the plant body?	Critical thinking, Decision making
	How does water go up to the leaves against the gravitational pull through the xylem of stem?	Problem solving
4. Biology and Human Wellfare	What is the relation between disease causing microbes and immunity in the human body?	Critical thinking, Decision making
	What diseases are caused in the human body by harmful microbes?	Critical thinking
	What symptoms are observed in the human body as a result of various ailments?	Critical thinking
	What role does WASH play in human hygiene?	Critical thinking
	How do microbes help in the daily life of human beings?	Critical thinking
	How transmission of AIDS can be avoided?	Problem solving
	How can we counter the entry of rabies virus in the body through dog bite?	Problem solving, Decision making
5. Environ-ment and its Resouces	How do various living organisms adapt to changing conditions of the environment?	Critical thinking, Decision making
	What are the ecological steps in organisation of life?	Critical thinking
	What roles are played by various organisms in ecology?	Critical thinking
	What is the relation between food chain, food web and energy flow?	Critical thinking
	What are the utilities of environmental resources?	Critical thinking
	Let's consider that the natural food sources of the world is depleting. How can we overcome this problem?	Problem solving, Decision making
	How to conserve energy in daily life?	Problem solving

Concept of equity and the curriculum of 'Life Science and Environment'

Equity in education has two main aspects: provision of proper facilities and inclusion. The first creates enough potential for provision of educational facilities to weak learners. The objective of inclusion is to create opportunities of success for differently-abled learners and to minimize the chance of failure of all students. The more is the prospect of achieving equity the less is the chance of school dropouts. Thus the scope for developing life skills increases and new opportunities in the professional world also increases. Now let us review what are the arrangements that are to be taken at different levels to ensure equity.

- To ensure participation of all in curriculum development and implementation by mentioning various topics invented by scientists of different countries, race, religion, creed and gender.
- To provide equal opportunities to the learners of different race, religion, creed, gender and also to the differently-abled learners in co-curricular activities.
- To provide opportunities to all for expressing opinions during teaching-learning process in the classroom.
- While setting question papers the competency of all learners are to be assessed and balance has to be maintained for proper reflection of all cognitive areas.
- While evaluating answer scripts no extra importance should be given to any special creed, race, religion, gender or learner with added skills.
- While framing a curriculum the topics should be selected such that they are acceptable to all.
- Use of alternative question papers or framing questions in alternative ways have to be designed for mentally and physically challenged so that they are raised to equal grade with others.
- To prepare evaluation manual and discussion with the learners using the same for error corrections at the end of the evaluation.

Sample Pedagogical analysis of 'Life Science and Environment' syllabus of Class IX

Serial no.	Theme	Sub-theme	Previous knowledge & class in which acquired		Learning outcome
			Previous knowledge	Class	
1.	Life and its diversity	1. Basic properties of life	(i) Able to differentiate between living and non-living organisms.	IV	(i) Will be able to understand the main charateristics of the living beings.
			(ii) Able to list the characteristics of living beings.	IV	(ii) Will be able to differentiate between living and non-living.
			(iii) Able to know and understand how animals cope with the changing environment.	IV	(iii) Will be able to identify the different stages of development of life from non-living objects.
			(iv) Able to understand the significance of specially adapted parts of plants and animals.	IV	(iv) Will be able to explain the basic concept of evolution.
			(v) Able to explain the concept of biodiversity.	VII	(v) Will be able to understand interrelationship between mutation, adaptation and evolution.
			(vi) Able to explain the importance of biodiversity.	VII	(vi) Will be able to identify and explain the role of mutation as a source of variation.
		2. Biology is the study of patterns and processes of life and its diversity	(i) Able to cite some examples of the use of various bacteria in manufacturing medicine.	VI	(i) Will be able to mention the name of different branches of Biology.
			(ii) Able to mention and explain the concept of agricultural science.	VIII	(ii) Will be able to develop basic concept about the topics studied in different branches of Biology and explain the same.
			(iii) Able to mention and explain the concept of crops.	VIII	(iii) Will be able to list new branches of science formed by amalgamating the knowledge of different branches of science with different fields of Biology.
			(iv) Able to mention the basic concept of horticulture alongwith relevant examples.	VIII	

Serial no.	Theme	Sub-theme	Previous knowledge & class in which acquired		Learning outcome
			Previous knowledge	Class	
					(iv) Will be able to develop basic concept about the topics discussed in these new branches of Biology and can also explain the same. (v) Will be able to mention and explain the application of modern Biology in agriculture, medicine manufacturing, space science etc.
		3. Classification of diversity of life : Taxonomy	(i) Able to estabish relationship between organisms and species.	VI	(i) Will be able to mention the history of modern taxonomy. (ii) Will be able to identify and explain the justification of organising diversities of life based on the principles of classified groups. (iii) Will be able to organise mango and human being in various levels of taxonomic hierarchy. (iv) Will be able to explain and cite examples of the concept of binomial nomenclature. (v) Will be able to group different organisms in specific kingdoms on the basis of their identifying characteristics. (vi) Will be able to compare Algae, Bryophyta, Pteridophyta, Gymnosperm and Angiosperm on the basis of the differentiating characteristics and also citing examples of different groups. (vii) Will be able to identify the identifying characteristics of the main animal groups and also cite examples of the animal groups.
			(ii) Able to tell and write the names of the species of different organisms.	VI	
			(iii) Able to classify the living world in specific kingdoms on the basis of similarities and dissimilarities.	VI	
			(iv) Able to classify plants and animals in specific phylum or class.	VI	
			(v) Able to identify and mention the identifying characteristics of monocotyledons and dicotylendons.	VI	
			(vi) Able to list the invertebrates and vertebrates living in different environments.	VI	

Serial no.	Theme	Sub-theme	Previous knowledge & class in which acquired		Learning outcome
			Previous knowledge	Class	
2.	Levels of organisation of life	1. Biomolecules and their behaviour	(i) Able to identify and list plant and animal sources of carbohydrate, protein, fat, vitamin, minerals.	VII	(i) Will be able to mention the structure or characteristics of different types of biomolecules. (ii) Will be able to identify and explain the roles of these biomolecules in different life processes. (iii)Will be able to identify and explain the role of vitamin A, D, E, K, B-complex and C in human body. (iv) Will be able to identify and explain the roles of different minerals in human body.
			(ii)Able to identify and explain the role of carbohydrate, protein, fat, vitamin and minerals in human body.	VII	
		2. Cell	(i) Able to identify various shapes of cells from the diagram.	VIII	(i) Will be able to mention the structures and functions of different cell organelles. (ii) Will be able to draw labelled diagrams of different cellular organelles. (iii) Will be able to differentiate between the characteristics of Prokaryotic and Eukaryotic cells with the help of diagrams. (iv)Will be able to compare the characteristics of plant and animal cell with the help of diagrams.
			(ii) Able to apply the acquired concept about the units of measuring cells.	VIII	
			(iii) Able to observe different organelles of plant and animal cells through hands on activities and to draw labelled diagrams of them.	VIII	
			(iv) Able to identify different cellular organelles by observing diagrams of three dimensional models of plant and animal cells.	VIII	
			(v) Able to mention the structure and function of different cellular organelles and to draw diagrams of those cellular organelles.	VIII	

Serial no.	Theme	Sub-theme	Previous knowledge & class in which acquired		Learning outcome
			Previous knowledge	Class	
		3. Tissue	(i) Able to identify and mention the various stages of development of the body of organisms.	VIII	(i) Will be able to explain the concept of tissue with examples. (ii) Will be able to explain the characteristics, location and functions of meristematic tissue with diagrams. (iii)Will be able to explain the characteristics, location, types and functions of permanent tissue with the help of diagrams. (iv)Will be able to explain the location, structural features and functions of different tissues of animals.
			(ii) Able to explain the basic concept of different types of plant and animal tissues.	VIII	
		4. Major organs of human body and their functions	(i) Able to identify different parts of alimentary canal from the diagram and to know about different organs associated with digestion.	IV	(i) Will be able to mention the location of different important organs of human body with the help of diagrams. (ii) Will be able to explain the role of different important human organs.
			(ii) Able to identify the location of respiratory organs in the body.	IV	
			(iii) Able to explain the basic concept about the structure of skin.	V	
			(iv) Able to identify the sources of various outgrowths of skin.	V	
			(v) Able to mention the basic concept of the location, shape and function of human heart.	V	

Serial no.	Theme	Sub-theme	Previous knowledge & class in which acquired		Learning outcome
			Previous knowledge	Class	
			(vi) Able to mention the location of the human heart by listening to sound.	VI	
			(vii) Able to label the chambers of the human heart in diagrams.	VI	
			(viii)) Able to explain the sequential stages of circulation of blood through the heart with the help of arrow marks in a suitable diagram.	VI	
			(ix)Able to explain the functioning of lungs as a respiratory organ.	VI	
			(x) Able to mention and explain the location and structure of lungs by drawing or observing diagrams.	VI	

How the learners will learn (Learning indicators) :

(i) The learners are able to speak about any concept in her/his own language.

(ii) The learners are able to explain a concept in her/his own language.

(iii) The learners are able to mention relevant examples about a particular concept.

(iv) The learners are able to ask relevant questions during a discussion on a concept.

(v) The learners are able to cite relevant examples from the environment.

(vi) The learners are able to give appropriate explanation about a concept.

(vii) The learners are able to apply their knowledge appropriately.

In the same way the other themes included in the curriculum can be explained pedagogically.

Constructivist approach in classroom transaction

Class IX

Unit : Life and its Diversity

Sub-unit : Five Kingdoms of Life

Sl. No.	Phase	What activities may happen
1.	Observation	The teacher may start discussion by asking questions on the learner's experience gathered through observation; e.g. (i) Name a few living organisms that you have seen. Classify those living organisms into different groups. Say why you have classified them into different groups. (ii) Classify the following into different groups — dog, snake, frog, pigeon, cow, crocodile, man, rohu, house lizard. (iii) What is the use of classifying the living beings into different groups? etc.
2.	Contextualisation	The teacher will connect the information gathered through the discussion and questioning based on the observations of the learners in regard to their daily experience; e.g. (i) In which group do we classify the following— Penicillium, Amoeba, Lactobacillus, Hibiscus plant, Pigeon? (ii) Have you heard of these groups before? Which of them is unicellular? (iii) Which of them can produce food? etc. The learners can also ask questions to their peers or their teacher; e.g. What other organisms do we find in the group that includes Penicillium? etc.
3	Cognitive apprenticeship	The teacher will try to provide knowledge through interactions in areas where there is lacuna or deficiency in knowledge construction or in the construction of basic concepts in the learners; e.g. (i) Lactobacillus and amoeba— both are unicellular. Why are they classified into different groups? Are all plants autotroph and animals heterotroph? What are the differences between plant cells and animal cells? etc.

Sl. no.	Phase	What activities may happen
4	Collaboration	While classifying different living organisms into different groups the learners may discuss among themselves why they are classifying living organisms into different groups. So a learner who lacks in clear concept about a particular topic will develop idea about it through discussion with peers.
5	Interpretation Construction	The learners will develop their own ideas on a particular topic. The teacher will modify such ideas as required; e.g. (i) Are all bacteria or fungi harmful, or are there some useful bacteria or fungi also? (ii) How many types of nutritional processes are there in living organisms? (iii) How many types of heterotrophic nutrition are there? What is the advantage of classifying living organisms into different groups? etc.
6	Multiple Interpretation	The learners will not only cite common examples but also examples from their local environment or of other areas to develop clear concept of five kingdoms of living organisms' e.g.— (i) Classifying the living organisms familiar to the learners in five kingdoms (ii) On the basis of which characteristics did they classify those living organisms into different groups?
7.	Multiple Manifestation	Concept will be developed about how to know the common features of plants or animals included in the same group through simple examples of classification of plants or animals. That is, the learners will be able understand the usefulness of classification.

Class IX

Unit : Physiological processes of Life

Sub-unit : Plant Physiology (Concept of Photosynthesis, Site of Photosynthesis and Role of Different Components)

Sl. no.	Phase	What activities may happen
1	Engagement Phase	In this phase the learners' interest can be increased by involving them in various discussions, activities etc. A feature of this phase is trying to know the background knowledge of the learners. Another feature is trying to relate the previous learning experience of the learners with the new experience and to lay foundation of the following activities; e.g. — (i) Which of the food items that we have are taken from plants? (ii) Are the food items that we get from animals actually derived from plants? (iii) How do the plants produce their food? (iv) What are the components required for production of their food? (v) What is the name of the process of food production in green plants? What does the word 'photosynthesis' mean? etc.
2.	Exploration Phase	The learners will cooperate with each other and work in groups. They will gain a common experience by interacting with each other. In this phase, the teacher will facilitate them by imparting necessary information or any other help to carry forward the exploration process. The students' urge to explore will help them to construct their knowledge; e.g. — (i) Which part of the plant body does photosynthesis occur? (ii) Does photosynthesis occur in other living organisms apart from plants? etc.
3.	Explanation Phase	In this phase, the learners will get the chance to explain what they have learnt till now. The discussion may happen within the learners or between the learners and the teacher. Through the discussion the learners will be able to identify their own wrong conceptions and develop new concepts; e.g.—(i) Explain the role of water and light in photosynthesis through discussion. Here also the teacher will remain as a facilitator.

Sl. no.	Phase	What activities may happen
4	Elaboration Phase	In this phase, the learners will carry forward the knowledge developed through various activities, try to make connections among other related concepts and use their acquired concept to explain the diverse natural phenomena occurring in their surrounding environment e.g.—(i) Explain the role of CO_2, water, sunlight and pigments in photosynthesis through detailed discussion. (ii) Production of O_2 by breaking down of water in the process of photosynthesis, (iii) Explain absorption spectrum and action spectrum with the help of diagrams. etc.
5.	Evaluation Phase	This phase is an ongoing process. This phase helps the teacher to understand whether the knowledge of the learners has been properly constructed. However, it is to be noted that evaluation can be made in all the stages of knowledge construction. Besides, various kinds of evaluation tools can be used to assess the level of learning of the learners.

Internal Formative Evaluation

Guidelines for Implementation

The WBBSE in consultation with the Expert Committee has issued a circular mentioning the framework for evaluation procedure in respect of the revised curricula and syllabi being followed in all affiliated schools of WBBSE from January 2015. On recommendation of the Expert Committee, the WBBSE has now issued the following guidelines for smooth implementation of the Internal Formative Evaluation for Class-IX in the academic session in 2015:

Six modes of Internal Formative Evaluation are to be followed. They are –

1. Survey Report. 2. Nature Study. 3. Case Study. 4. Creative Writing. 5. Model Making. 6. Open Textb Book Evaluation.

The six options noted above, any three are to be chosen in an academic year for Internal Formative Evaluation for the seven academic subjects Therefore, each term will have one option for a particular subject. Subject teacher(s) are expected to correlate the modalities of Internal Formative Evaluation with the learning competencies of the concerned subjects. It may be noted that for a particular class. one modality is to be applied for one term. There should not be any repetition of a particular modality for a particular class in an academic year.

1. Internal Formative Evaluation (IFE) should be considered as an integral part of teaching-learning process for enhancement of learning.
2. The IFE programme should be carried out within the classroom in a stress-free manner before the respective summative evaluation for each term.
3. The evaluation techniques should be integrated with the classroom processes and should focus on enhancement of understanding and application of knowledge.
4. During implementation of the IFE, innovative teaching-learning processes are expected to emerge. While planning for such processes, the diverse needs and capacities of students should be taken care of and the school should ensure that students are able to participate and derive benefit.
5. The teachers of respective subjects in each school will decide the nature and difficulty level of the activities to be carried out under the banner of Survey, Nature Study, Case Study, Creative Writing, Model Making and Open Text Book Evaluation in a student-friendly manner according to the needs of the students of the school

and accordingly design such IFE programme. However, some exemplar activities for different subjects for IFE are provided herewith.

6. It will be expected that the assessment will be done on the basis of innovative approaches adopted by the students and not necessarily on the accuracy of the end-results.

7. The written records of activities carried out in the classroom for IFE, duly endorsed and assessed by the subject-teacher and signed by the guardian will be preserved by each student until completion of Class-IX and will have to be produced at the school for any future requirement.

8. A learner will be expected to demonstrate her/his abilities in the following manner during the innovative teaching-learning processes adopted for IFA:

- Describing a case/event/phenomenon/situation/picture in her/his own language.
- Exploring further- a case/event/phenomenon/situation/picture and produce new examples, alternative explanations, new vocabulary in conformity with the respective discipline.
- Providing innovative opinions and suggestions in conformity with the discipline.
- Elaborating the clues, ideas, dialogues, conversations etc.
- Suggesting innovative approach for presentation of a concept and in problem-solving in conformity with the discipline.
- Drawing conclusions, making inferences, and taking decisions in respect of a case/ event/ phenomenon/situation in conformity with the discipline.
- Creating something new on her/ his own.

Tools for Internal Formative Evaluation : A Brief Note

1. Survey:

The term 'survey' is often used for collecting and interpreting information to demonstrate the achievement or otherwise of well-defined goal(s) or specified objective(s) (Devin Kowalczyk,2013). As a part of the Internal Formative Evaluation, the goals or objectives are those expected learning outcomes specified in each subject domain. A survey focuses on factual information and helps surveyors, who are students in the present context, to reinforce their learning under the able monitoring provided by teachers.

2. Case study:

Case studies are stories or contexts. They present realistic, complex, and contextually

rich situations and often involve a dilemma, conflict, or problem that students are expected to analyze/solve by applying their acquired learning skills. It provides an indepth look into a subject/context of study (the case), as well as its related contextual conditions. A case study involves an intensive study of a learning unit and inspires students to examine as condition, situation, or value ofthe given context.

3. Nature study:

"Nature Study, as a process, is seeing the things that one looks at, and the drawing of proper conclusions from what one sees" (Hyde Bailey, 1904).Nature study involves observation of plants, animals, natural phenomena, and human activities as a mode oflearning. Nature study attempts to reconcile scientific investigation with spiritual, personal experiences gained from interaction/study with the world/contexts that students live in or are aware of.

4. Model making:

A model connotes a pattern, ideal, reproduction or draft of things (increased, reduced or in actual size). "Apart from real things models can also be mental constructions" (Mueller Science, 1971). Model making is a logical next step in the thinking process for many ideas. It helps students to concretize abstract and complex concepts/ideas through hands-on experience. A model may be a two-dimensional or three-dimensional representation of concepts/ideas. Model making provides scope for reinforcement of critical and creative thinking skills as well as the problem-solving and decision making skills.

5. Creative writing:

Creative Writing involves written expression that draws on creative and critical thinking to convey meaning. Creative writing focuses on learning competencies in the subject domains, while developing the creative skills. It provides scope or students to apply multiple learning strategies vis-a-vis demonstrating clarity of concepts and their application underlined by aesthetic appreciation a value judgements.

6. Open Text Book Evaluation:

OTBE implies an application of theory to real life situations. It is based upon the principle that the whole objective of leaming is not about constant delivery. There must be effective transaction oflearning, not just content in the classroom. Therefore, OTBE not only reinforces learning competencies, but also provides scope for transference of learning skills. It inspires students to use a range of strategies including accurate decoding to read for meaning, to describe, select or retrieve information, events or ideas from texts and to deduce, infer or interpret information, events or ideas from texts.

Some samples of Internal Formative Evaluation of 'Life Science and Environment'

Survey

1. Topic : Over-utilization of water

Theme 5 : Environment and its resources (Sub-theme : Natural resources and its sustainable use)

Required time : One period

Desired learning outcome

(i) Students will learn about daily approximate requirement of water at home and also the activities where water is used in excess.

(ii) After this survey they will be able to convince their family members to stop over-utilization of water, if needed.

Instruction for the students

Make a survey on the over-utilization of water in the houses of your five classmates. Try to find out the following aspects from this survey – name of the activities in the house where water is needed, approximate amount of water needed daily for each activity, name of the activities where water is used in excess, name of the activities where the use of water can be reduced, the steps to be taken to save water etc.

Teacher's activities

(i) Divide the class in groups of six members and explain them what to do.

(ii) Explain them the questions that they should ask one another.

(iii) At the end of the class, collect students' copy and assess the work done by the students.

Students' activities

Part-I (Group activity)

- Collecting data, exchange of ideas and forming views about over-utilization of water.

Part-II (Individual activity)

To write about collected data, ideas, analysis or conclusion in their respective copies and deposit the same to the teacher.

Criteria for assessment

To assess how one has achieved desired learning competency and to what level.

2. Topic : Energy Usage

Theme 5 : Environment and its Resources (Sub-theme : Natural resources and its sustainable use)

Required time : One period

Desired Learning outcome

(i) Students will become aware about the ways energy can be wasted by preparing a questionnaire for making a survey on the use of energy.

(ii) Once the students become aware about how energy wastage can be reduced, the students will refrain from wasting energy in their own life.

Instruction for the students

Prepare a questionnaire to make a survey on energy usage in different household work of your classmates' house. Try to find out the following with the help of a questionnaire – what is the main source of energy that is used at home, which activities are energy-instensive, activities where energy is misused, how misuse of energy can be minimised etc.

Teacher's activities

i) To explain the relevant aspects on which the questions are to be set while preparing the questionnaire on energy usage.

ii) To frame one or two questions for the purpose of illustration, if needed.

iii) To divide the students in groups.

iv) To assess the questionnaires prepared by the students at the end of the class.

Students' activities

- Collecting relevant data, exchange of ideas and forming views about energy usage.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

3. Topic : Infectious diseases and their propagation

Theme 4 : Biology and Human Welfare (Sub-theme : Immunity and Human Diseases)

Required time : One period

Desired Learning outcome

- To discern the infectious diseases from other common diseases.
- To demarcate the symptoms of the infectious diseases and identify those diseases on the basis of symptoms.

- To identify the ways through which the germs of infectious diseases can enter the body.
- To find out the time of the year when the germs of some particular infectious disease can enter the body.
- To identify the age group which is the most affected by infectious diseases.
- To identify when infectious diseases can turn into epidemics.
- To know how to avoid infectious diseases or how to save yourself from it and apply the same.

Instruction for the students

Discuss about the outbreak of infectious disease in your locality in recent time. Try to find out how many people have fallen victim to the disease, how the disease has spread in the locality, what are the problems of the diseased people, how the infectious diseases can be avoided or what precautions can be taken and the programmes undertaken for locality-wise public awareness.

Teacher's activities

- To divide the students in small groups and provide necessary help to each group.
- To familiarize the students with the steps to be undertaken in the course of survey.
- To help in analysing the obtained data.
- To help in coming to appropriate conclusions from the obtained data.
- To assess work done by the students.

Students' activities

Part-I (Group work)

Collect data about infectious disease, exchange of ideas and forming views.

Part-II (Individual work)

- Collecting relevant data, exchange of ideas and forming views about infectious diseases.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

4. Discuss about the various food chains of your locality with your classmates. Prepare a list of those food chains. Try to find out how those food chains are associated with each other.

5. Perform a survey among your classmates on the methods and necessity of wash. Try to know how WASH is related with healthy and disease-free lifestyle. Also try to find out the awareness among people about this relationship between WASH and healthy, disease-free lifestyle.

Nature Study

1. Topic : Making a list of animals observed on the way from house to school and classifying them

Theme 1 : Life and its diversity (Sub-theme : Classification of Kingdom animalia)

Required time : One Period

Desired learning outcome

i) Developing observation power by thinking and writing about animals seen on the way from house to school.

ii) Acquring hands-on experience of classifying animals by arranging animals in various phyla and classes. As a result, gaining practical knowledge about the characteristics of different phyla and classes.

Instruction for the students

Make a list of the animals seen today on the way from house to school. Classify them. Mention the class of animals belonging to phylum chordata.

Teacher's activities

i) Explain the activity to the students.

ii) Classify some of the animals he/she has seen on the way from home to school, if needed.

iii) Assessing the work of students at the end of the class.

Students' activities

Part-I (Group Activity)

- To make a list of the animals seen on the way from house to school.
- To classify them in appropriate phylum or class.

Part-II (Individual Activity)

Collected data, opinion and analysis or inference should be recorded in the student's copy and submitted to the teacher.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

2) Topic : Making a list of animals of an ecosystem.

Chapter 5 : Environment and its resources (Ecology and ecological organization)

Required time : One Period

Desired learning outcome

i) By making a list of the animals of an ecosystem, concept would be cleared about the animals that are part of the ecosystem.

ii) To understand which animals are producers and which animals are consumers.

iii) To understand the organization of food chain by placing the organisms of the ecosystem in food chains.

Instruction for the students

Make a list of the animals of an ecosystem observed by you. Try to ascribe places to them on the basis of primary, secondary, tertiary and quaternary consumers in different food chains.

Teacher's activities

i) To explain the activity to the students.

ii) If required, explain by placing the organisms of an ecosystem in food chains.

iii) To assess the work of students at the end of the class.

Students' activities

Part-I (Group Activity)

- To make a list of the animals of an ecosystem.
- To allot places to the organisms of an ecosystem in different food chains.

Part-II (Individual Activity)

- Collecting relevant data, exchange of ideas and forming views about infectious diseases.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

3. **Topic : Identifing the process of excretion of local plants.**

Theme 3 : Physiological processes of life (Sub-theme : Excretion)

Time required : One Period

Desired learning outcome

- To explain necessity of excretion in plants.

- To identify excretory processes in plants.
- To identify which plant excretes in what way.
- To identify whether excretion occurs in a particular season of the year or occurs throughout the year.

Instruction for the students

Make a list of local plants. Mention their excretory processes.

Teacher's activities

- To explain the characteristics of plant excretion.
- To divide students in small groups, engage them in observation and write questions (for them) on the blackboard.
- To help record received information or answer.
- To assess the work of the students.

Questions

- Do plants have specific excretory organs?
- What kind of materials are excreted by plants?
- How are the excretory products are stored in the plant body?
- By what process do plants excrete?
- Which plants uses which method? Do the same plant use various processes of excretion?
- In which other plants are these processes seen?

Students' activities

Part-I (Group Activity)

- Collecting information, exchange of opinions, form opinions.
- To find answers to the teacher's question through nature study.

Part-II (Individual Activity)

- To submit answers gathered during nature study to the teacher.

Criteria for assessment

To assess how one has achieved desired learning competency and to what level.

4. Prepare a list of biodiversity of your school.
5. Prepare a list of plants that you have seen on the way to school from your home. Arrange them in appropriate groops.

Case Study

1. **Topic : Role of plant excretory products in daily life**

Theme 3 : Physiological processes of life (Sub-theme : Excretion)

Required time : Two Periods

Desired Learning outcome

i) To make the students understand how we use of different kinds of plant excretory products in our daily life.

ii) To make students understand the benefical role of plants in our daily life.

Instruction for the students

Read the passage given below and solve the problem.

Iman, Suman's brother, started crying from the very morning. Somehow the cover of his story book has been torned. Suman promptly pasted the cover with gum. His brother was relieved and stopped crying. In the meantime their mother appeared with a ladle in her hand. Iman then was intently listening to Suman reading a story from the book. His mother asked "Will you like to have pumpkin curry with asafoetida. The two brothers jumped up with joy. They exclaimed. "Hurrah!"

So you have read about the story of Suman and Iman. Do you know the above story contains the names of some plant excretory products. Try to identify them. Try to write names of other plant excretory products from which we benefit in our daily life. Also write how do we use these excretory products in our daily life.

Teacher's activities

i) Select a subject/issue which has some relation with the curriculum.

ii) Then identify a problem related with the subject which can be given to the students to solve.

iii) Divide the students into groups and make them understand what activities they are supposed to do.

Students' activities

Part-I (Group Activity)

i) To read the selected subject matter intently.

ii) To discuss the problems with the other members of his/her group.

iii) To find a solution to the given problem by discussing among themselves. They should also write down the solution.

Part-II (Individual Activity)

- To submit answers gathered during nature study to the teacher.

Criteria for Assessment :

To assess how one has achieved desired learning competency and to what level.

2. **Topic : Role of Natural Resource and their Crisis**

Theme 5 : Environment and its Resources (Sub-theme : Ecology and ecological organization)

Time Required : Two Periods

Desired Learning Outcome

i) The students should come to understand how different natural resources are utilized in our daily life.

ii) They should also understand how to use different natural resourses effectively in our daily life without depleting them.

Instruction for the students

Read the passege given below and solve the problem :

Afsana while trying to fetch some water found to her dismay that the tubewell is dry. What will happen? Nothing can be done without water. Water is indispensable for drinking, cooking, washing clothes, bathing, cleaning utensils. Afsana's brother, Salim suggested, "There is a tubewell in front of uncle Karim's house. Sister, let's go and fetch some water from that tubewell." Afsana objected, "That is far away". Her brother assured : "Don't worry! we'll manage it together".

What have you understood after reading the story? Water is absolutely necessary in our daily life. Water is a natural resource. We cannot survive without natural resources. Water is absolutely indispensable for drinking, agricultural and industrial use. Other natural resources (forest, food, energy) like water have definite impacts on our lives. Again indiscriminate use of these natural resources may lead to their scarcity in the environment. Write on the uses of different natural resoures in your daily life. You should also write on the ways of solving the problem of the crisis of these natural resources.

Teacher's activities

i) Select a subject/issue which has some relation with the syllabus.

ii) Then identify a problem related with the subject which can be given to the students to solve.

iii) Divide the students into groups and make them understand what activities they are supposed to do.

Students' activities

Part-I (Group Activity)

i) To read the selected subject matter intently.

ii) To discuss the problems with the other members of his/her group.

iii) To find a solution to the given problem by discussing among themselves. They should also write down the solution.

Part-II (Individual Activity)

- To submit answers gathered during nature study to the teacher.

Criteria of Assessement

To assess how one has achieved desired learning competency and to what level.

3. **Topic : Malaria and its propagation**

Theme 4 : Biology and human welfare (Sub-theme : Immunity and human diseases)

Time required : Two Periods

Desired Learning Outcome

- To mention how does the parasite that causes malaria enters the human body.
- To identify the mosquito that causes malaria.
- To identify the common breeding grounds of mosquitoes.
- To locate the problems regarding the spread of malaria in our locality.
- To identify the possible solutions to eradicate malaria
- To understand and implement the programme for prevention of malaria.

Students' activities

Read the passage given below, identify the problem and answer the questions. Submit your answer to your teacher :

Malaria is s fatal disease caused by mosquitoes. A Protozoa named 'Plasmodium' causes malaria. Malaria is spread by the bite of a female anopheles mosquito when it transfers the parasite from the infected person to that of a healthy person's body. The female anopheles mosquito needs to suck blood in order to mature their eggs.

Today above 40% people living in the poorest countries of the world stand the chance of getting infected with malaria. Although malaria was eradicated in many quarters in the 20th Century in the world, it has returned as a menace in today's world.

Anopheles mosquitoes lay eggs in transparent water. Nowadays it is noticed that in both urban and rural areas water gets clogged here and there due to different human activities. Female Anopheles mosquitoes lay eggs there. Malaria infections are on a steady rise. The steady rise in temparture has added to the problem. So, nowadays we get to hear people getting affected with malaria ever in colder regions.

Now discuss the questions in your group and write down the answers.

Questions pertaining to Survey :

- State if there are incidences of malaria infection in your locality.
- In which cities have you noticed water logging? What are the causes of water logging?
- In what kinds of places in the rural areas do you find water logging? What are the causes?
- Locate the places in your house where mosquitos can breed and lay eggs in collected water.
- What problem is caused when the trunks are left after felling the tress?
- What problems arise from the excess use of plastic bottle, jar and cup?
- What problems arise from the irregular clearance of water hyacinth in ponds and drains?
- How can we use the rain water by not allowing it to collect in any particular place?
- How can you restrict the mosquitoes from laying eggs?
- What are the human activities responsible for the rise of global temperature?
- What steps do you need to adopt to check the rise in global temperature? How will this have an effect on restricting the spread of malaria?

Teacher's activities

- The teacher will frame relevant questions related to the topic and note it down in small pieces of paper and hand them over to the students. He/she will help the students for registering their personal opinion in their own copies.
- The teachers may supply some write up, paper cutting, report bearing conformity with the topic of the case study to the students.
- To assess the students' work.

Criteria of Assessement

To assess how one has achieved desired learning competency and to what level.

Creative Writing

1) **Topic : Importance of blood donation**

Theme 3 : Physiological process of life (Sub-theme : Circulation)

Required time : One period

Desired learning outcome

1. To understand the importance of blood donation.
2. To inspire others to donate blood in future.
3. Express ability for presenting organized thoughts about something through skillful writing.

Instruction for the students

"Importance of blood donation in our society" — express your thought on the subject by writing.

Teacher's activities

i) To tell the students how much to write.

ii) To mention the subjects to be included in the write-up, if needed.

iii) To assess the students' work.

Students' activities

i) To make an initial scheme of the various aspects to be included in the write-up before starting to write.

ii) Accordingly present his/her thoughts in an organized manner.

Criteria of Assessement

To assess how one has achieved desired learning competency and to what level.

2) **Topic : Interaction between organisms in nature.**

Theme 5 : Environment and wealh (Sub-theme : Ecology and ecological organization)

Required time : one period

Desired learning outcome

1. Understand the importance of various kinds of interactions between organisms in nature.
2. Understand how these interactions help in the maintenance of balance in the environment.
3. Express ability for presenting organized thoughts about something through skillful writing.

Instruction for the students

You have already learnt about the various kinds of interactions in nature (competition, prey-predator relationship, parasitism, cooperation)

Teacher's activities

i) To mention how much to write.

ii) To mention the aspects to be included in the write-up if needed.

iii) To evaluate the work of students.

Students' activities

i) To make an initial scheme before starting to write.

ii) Accordingly present her/his thoughts in an organized manner.

Criteria of Assessement

To assess how one has achieved desired learning competency and to what level.

3) **Topic : Human food, required energy and related problem**

Theme 3 : Physiological processes of life (Sub-theme : Nutrition)

Required time : One period.

Instruction for the students

An incomplete description of an observation is given below. Use your imagination to complete the writing.

Amal's mother usually gives him various vegetables to eat. Sometimes he takes them reluctantly, but mostly he would not eat. He likes butter, ghee and eggs. Nowadays his weight has increased a lot.

Desired learning outcome

- To understand need and importance of various food components in human body.
- To identify health problems from prolonged consumption of food that are rich in only one or two food components.
- To adopt correct lifestyle through analysis of collected data.

Teacher's activities

- To supply incomplete description to the students.
- To give various hints for creative writing.
- To assess students' write-up.

Students' activities

Part-I (Group Activity)

- To collect material for creative writing.

Part-II (Personal activity)

- To do alternative thinking, analytical thinking and submit it in writing to the teacher.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

4. 'Chemical fertiliser vs bio-fertilisers' – write a paragraph on this topic.

5. 'Food problem and alternative food sources' – write your thoughts on this subject.

6. 'An endangered animal and endangered plant seen by you' – write your thoughts on the subject. Mention where you have seen them and how they look like and behave.

Model Making

1 Topic : Blood circulation through the heart

Theme 3 : Physiological processes of life (Sub-theme : Circulation)

Time required : Two periods

Desired learning outcome

i) The student will be able to express her / his idea of blood circulation through heart.

ii) To exhibit skills regarding drawing pictures and line diagrams.

Instruction for the Students

Explain blood circulation through the heart with the help of picture and flow diagram.

Teacher's activities

i) Explain how to represent blood circulation though heart.

ii) Evaluate the drawings and line diagrams in the students' copies .

Students' activities

i) To organize the steps of blood circulation through heart and write them down in the copy.

ii) Draw a diagram of heart to explain blood circulation through heart.

Criteria for Assessneant

To assess how one has achieved desired learning competency and to what level.

2) **Topic : The process of inhalation and exhalation in human**

Theme 3 : Physiological processes of life (Sub-theme : Respiration)

Desired Learning outcome

i) To express her/his idea about the processes of inhalation and exhalation.

ii) To exhibit skills regarding drawing pictures and line diagrams.

Instruction for the students

Represent the underlying physiological processes behind inhalation and exhalation with the help of flow diagram.

Teacher's activities

i) To explain how to represent the process of human breathing in the students' copy.

ii) To assess the flow diagrams in the students' copy.

Students' activities

i) Organize the steps of breathing in orderly manner in the students' copy.

ii) To explain the process of inhalation and exhalation through flow diagram.

Criteria for Assessment

To assess how one has achieved learning competency and to what level.

3) **Topic : Construction of human body**

Theme 2 : Levels of Organization of life (Sub-theme : Biomolecules and their behaviour)

Time required : Two periods

Desired learning outcome

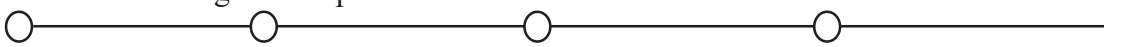
- To know the constituents of the body of an organism.
- To represent through a model the various changes in organization that an organism has undergone from the primitive to the present state.
- To identity the correlation between different levels of organization.
- To represent the steps in the levels of organization through which human body is formed with the help of a model.

Instruction for the students

Represent the intermediate steps of formation of the complete body of an organism through a model.

You can start like this -

Element Inorganic compound



(Example :) (Example :)

Teacher's activities

- To explain how to represent the level of organization of the body of an organism through a model.
- To assess the works of students.

Students' activities

- To identify the organizational levels of the body of an organism.
- To represent through models how previous level of organization is changed to the next level.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

4) Explain through a flow diagram how urine is produced in our kidney.

Open Book Evaluation

1) **Topic : Pacemaker**

Theme 3 : Physiological processes of life (Sub-theme : Circulation)

Time required : Two period

Desired learning outcome

(i) To find application of functioning of the pacemaker in real life .

(ii) To understand importance of implanting and artificial pacemaker in human body.

Instruction for the student

Read the passage below and answer the questions :

A few days ago Amalbabu suddenly fell unconscious while talking. Coming to his senses, he said that this had happened twice in the last one month. His daughter took him to the doctor. Amalbabu told the doctor that recently he had been feeling weak and did not get any energy for work. He was also having breathing troubles, while doing any work hastily. The doctor examined him thoroughly. He prescribed blood tests and halter monitoring and told him to come after a few days.When the reports came the doctor said that the rate of Amalbabu's

heartbeat had decreased and is the cause behind his problems.An operation had to be done to implant an artificial pacemaker in his body.

(i) Do our body possess a natural pacemaker ? What is its function?

(ii) Which part of the heart generate heartbeat? Do any other part of the heart also generate heartbeat?

Teacher's activities

(i) To bring up a real incident related to SA node or pacemaker.

(ii) To frame questions whereby the student can apply his / her knowledge of SA node or pacemaker.

Students' activities

(i) To read attentively the paragraph on pacemaker.

(ii) To find relation between the pacemaker related content and the concerned area of the syllabus.

(iii) To write answers in the student's copy.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

2) **Topic : Polio Vaccination**

Theme 4 : Biology and human welfare (Sub-theme : Immunity and human diseases)

Time required : One period

Desired learning outcome

(i) To understand the importance of vaccination in preventing diseases.

(ii) To apply the acquired knowledge about various types of vaccines.

Instruction for the student

Read the passage below and answer the questions:

It has been a year since the World Health Organization (WHO) has declared India to be a polio - free country. Our state had a fair share of contribution in the country's success. To stop polio attacks for four years the State Health Department and the Administration has kept sharp vigil. Even if India was declared polio - free, there was cause to worry about West Bengal. In a Howrah village a polio victim was discovered four year ago. The scenario has changed since then. But the Health Department assumes that there is no cause for complacency. Vigil continues from border areas to distant villages. Health Director Biswaranjan Satpathi

says, 'The State Government is carrying on the vigil actively in every area. Special attention is being given to the children of border areas.' He says that vaccination programme have been stepped up in places where anti-polio campaign were far from satisfactory. — From a news-paper report.

i) What role do you think vaccination has in making India polio-free?

ii) You have learnt about various categories of vaccines. Can you tell the category of vaccines under which polio vaccine falls?

Teacher's activities

i) Collect a passage on polio vaccination. If necessary, he / she should frame such a passage. The paragraph should be in comformity with the relevant topic in the syllabus.

ii) Questions are to be framed in conformity with the syllabus to instil inquisitiveness in the students.

iii) To assess the answers given by the students.

Students' activities

i) To read the paragraph on polio vaccination attentively.

ii) Write the answers in students' copies.

Criteria for Assessment

To assess how one has achieved desired learning competency and to what level.

Summative Evaluation

Life Science and Environment

Class IX

Syllabus –

1. **Life and its Diversity**
2. **Levels of Organization of Life**
3. **Physiological Processes of Life**
4. **Biology and Human Welfare**
5. **Environment and its Resources**

First Summative Evaluation- 40	**Month of evaluation : April**
Internal Formative Evaluation : 10	

1. **Life and its Diversity**
2. **Levels of Organization of Life**

Second Summative Evaluation : 40	**Month of evaluation : August**
Internal Formative Evaluation : 10	

3. **Physiological Processes of Life**

Third Summative Evaluation: 90	**Month of evaluation : December**
Internal Formative Evaluation : 10	

4. **Biology and Human Welfare**
5. **Environment and its Resources**

N.B. : Along with these 2 themes, 3 themes from the first and second summative evaluation are to be included.

Life Science and Environment

Blueprint for Summative Evaluation of Class IX

Question Pattern and Distribution of Marks

1st Summative Evaluation

Total Marks: 40

Sl. no.	Theme	Group A	Group B	Group C	Group D	Total Marks per Theme	Total Number of Questions
		MCQ One mark per question	VSA One mark per question	SA Two marks per question	LA Five marks per question		
1.	Life and its Diversity	1×2=2	1×5=5	2×2=4	5×1=5	16	10
2.	Levels of Organization of Life	1×5=5	1×6=6	2×4=8	5×1=5	24	16
	Total	7	11	12	10	40	26

Group A - MCQ : All questions are compulsory. There will be no alternative for MCQ.

Group B - VSA : Out of 13 questions, 11 questions are to be attempted. One (1) extra question is to be set from each theme. VSA questions may be of four types – answer in one word or one sentence, fill in the blanks, true/false and match column A with column B. In column matching two points are to be kept in mind – i) For each correct matching one (1) mark is allotted. ii) There should be at least one (1) extra option in Column B.

Group C - SA : Out of 8 questions, 6 questions are to be attempted. One (1) extra question is to be set from each theme.

Group D - LA : 2 questions are to be attempted. Alternative question from the same theme is to be set for each question. 5 marks can be given as a whole or can be divided in 3+2 or 2+3.

Life Science and Environment

Blueprint for Summative Evaluation of Class IX

Question Pattern and Distribution of Marks

2nd Summative Evaluation

Total Marks: 40

Sl. no.	Theme	Group A	Group B	Group C	Group D	Total Marks per Theme	Total Number of Questions
		MCQ One mark per question	VSA One mark per question	SA Two marks per question	LA Five marks per question		
1.	Physiological Processes of Life	1×5=5	1×10=10	2×5=10	5×3=15	40	23
	Total	5	10	10	15	40	23

Group A - MCQ : MCQ : All questions are compulsory. There will be no alternative for MCQ.

Group B - VSA : Out of 13 questions, 10 questions are to be attempted. VSA questions may be of four types – answer in one word or one sentence, fill in the blanks, true/false and match column A with column B. In column matching two points are to be kept in mind – i) For each correct matching one (1) mark is allotted. ii) There should be at least one (1) extra option in Column B.

Group C - SA : Out of 7 questions, 5 questions are to be attempted.

Group D - LA : 3 questions are to be attempted. Alternative question from the same theme is to be set for each question.

5 marks can be given as a whole or can be divided in 3+2 or 2+3.

Life Science and Environment

Blueprint for Summative Evaluation of Class IX

Question Pattern and Distribution of Marks

3rd Summative Evaluation

Total Marks: 90

Sl. no.	Theme	Group A	Group B	Group C	Group D	Total Marks per Theme	Total Number of Questions
		MCQ One mark per question	VSA One mark per question	SA Two marks per question	LA Five marks per question		
1.	Life and its Diversity	1×3=3	1×3=3	2×2=4	5×1=5	15	9
2.	Levels of Organization of Life	1×3=3	1×4=4	2×3=6	5×1=5	18	11
3.	Physiological Processes of Life	1×3=3	1×5=5	2×3=6	5×2=10	24	13
4.	Biology and Human Welfare	1×3=3	1×4=4	2×2=4	5×1=5	16	10
5.	Environment and its Resources	1×3=3	1×5=5	2×2=4	5×1=5	17	11
	Total	15	21	24	30	90	54

Group A - MCQ : All questions are compulsory. There will be no alternative for MCQ.

Group B - VSA : Out of 26 questions, 21 questions are to be attempted. One (1) extra question is to be set from each theme. VSA questions may be of four types – answer in one word or one sentence, fill in the blanks, true/false and match column A with column B. In column matching two points are to be kept in mind – i) For each correct matching one (1) mark is allotted. ii) There should be at least one (1) extra option in Column B.

Group C - SA : Out of 17 questions, 12 questions are to be attempted. One (1) extra question is to be set from each theme.

Group D - LA : 6 questions are to be attempted. Alternative question from the same theme is to be set for each question. 5 marks can be given as a whole or can be divided in 3+2 or 2+3.

Some discussions on types of questions

Necessary things to be noted for framing different types of questions

- **Multiple Choice Question (MCQ)**

  There are mainly two parts in an MCQ: the stem and the options. Only one of the options should be absolutely correct while the rest of the options should be incorrect. There should be at least four options. Certain features has to be borne in mind to frame the stem-part of the question:

  (i) The major part of the information has to be included in the stem so that the options are stated with minimum words. It is necessary to state the main theme of the question in the stem portion.

  (ii) The language of the stem should be simple and unambiguous so that the learners have no difficulty in understanding the instruction.

  (iii) Care should be taken in the use of words in the stem. The words used in the stem should be from the known vocabulary of the learners.

  (iv) It is better not to use negative words in the stem.

  ♦ **Things to be noted for framing options:**

  (i) In every MCQ there should be four options. Apart from the correct option, the other three options are called 'Distractors'.

  (ii) There should be only one correct option among the four options.

  (iii) Each of the options should be independent. There should not be any overlapping in the options.

  (iv) The four options i.e. one correct option and three distractors should have similarity in respect of length, complexity and use of language.

  (v) 'All the options given above are correct' or 'None of the above options are correct'— such sentences should not be used as an option.

  (vi) The correct options of various questions should be arranged at random. That is, if in a question (a) is the correct option, then it is desirable that in the subsequent questions the correct option is (b), (c) or (d).

  ♦ **Things to be noted for using distractors:**

  (i) It should be borne in mind that the distractors should be apparently logical.

  (ii) The common errors and misconceptions of the learners may be given as distractors.

(iii) Sentences that are absolutely wrong should not be given as options.

(iv) Correct sentence but which is not the correct answer to the question — it is desirable to use such distractors.

- **Very Short Answer type questions (VSA)**

  ♦ **One word answer or answer in a sentence**

  Certain things are to be kept in mind for framing these type of questions:

  (i) The use of language in a sentence ought to be as simple and unambiguous as possible so that the learners do not have any difficulty in understanding the question.

  (ii) The questions should be such that the answers would be short and precise.

  ♦ **Fill in the blanks**

  Certain things are to be kept in mind for framing these type of questions:

  (i) The use of language in a sentence ought to be as simple and unambiguous as possible so that the learners do not have any difficulty in understanding the question.

  (ii) It should be noted that only one word should fill up each blank.

  ♦ **Identifying correct or incorrect sentence:**

  Certain things are to be kept in mind for framing these type of questions:

  (i) The use of language in a sentence ought to be as simple and unambiguous as possible so that the learners do not have any difficulty in understanding the question.

  (ii) Extremely complicated and long sentences should be avoided.

  (iii) It is better not to present more than one idea in a sentence.

  ♦ **Match the columns**

  Certain things are to be kept in mind for framing these type of questions:

  (i) An award of 1 mark should be provided for every correct relationship.

  (ii) The number of items included in column B should be at least one in excess of the items in column A.

  (iii) The items included in column A and B should be as brief as possible.

  (iv) Two columns should be in one page.

- **Short Answer type questions (SA)**

  Certain things are to be kept in mind for framing these type of questions:

  (i) The use of language in a sentence ought to be as simple and unambiguous as possible so that the learners do not have any difficulty in understanding the question.

  (ii) Questions should be such that the answers should be in two or three sentences.

- **Long Answer type questions (LA)**

  Certain things are to be kept in mind for framing these type of questions:

  (i) The use of language in a sentence ought to be as simple and unambiguous as possible so that the learners do not have any difficulty in understanding the question.

  (ii) In this type of question the marks can be in 5, 3+2, 2+3. The answer of 2 marks question should be in two/three sentences. The answer of 3 marks question should be in three/five sentences. The answer of 5 marks question should be in seven/ten sentences.

Variety of questions based on the proposed blueprint

- **MCQ and Very Short Answer type questions**

  Questions can be set on the following items:

  (i) Factors
  (ii) Characteristics
  (iii) Process/method
  (iv) Occurrence
  (v) Functions
  (vi) Significance
  (vii) Use of terminologies related to Biology
  (viii) Identifying the dissimilar
  (ix) Identifying the correct pair
  (x) Identifying the correct picture sequence
  (xi) Writing the correct logical sequence
  (xii) Various applications of Biology
  (xiii) Establishing interrelationship (e.g. between event and structure, between structure and function etc.)
  (xiv) Example

- **Short Answer type questions and Long Answer type questions**

  Questions can be set on the following topics:

  (i) Characteristics

  (ii) Occurrence

  (iii) Function

  (iv) Role

  (v) Significance

  (vi) Difference/comparison

  (vii) Cause-effect relationship

  (viii) Explanation

  (ix) Example

  (x) Analytical question

  (xi) Drawing diagrams

  (xii) Questions related to diagrams

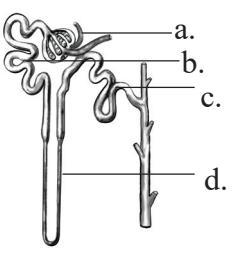
  (xiii) Diagram analysis

  (xiv) Identification

  (xv) Making line diagram and asking questions on it

Development of specific learning outcome and type of questions

Sl. no.	Cognitive domain	Learning outcome	Curricular areas (Themes)	Type of questions	Specific questions
1.	Remembering	Identify	Life and its Diversity	MCQ	In which of the following non-flowering plant group vascular tissue can be found? (a) Algae (b) Bryophyta (c) Monocotyledons (d) Pteridophyta
2.	Remembering	Tabulate	Environment and its Resouces	SA	Mention two conditions that determines the density of population.
3.	Remembering	Complete	Levels of organisation of life	VSA	Fill in the blanks with specific word: _____ is an energy producing cell organelle enclosed by a unit membrane.
4.	Remembering	Name	Environment and its Resouces	VSA	Which group of organism initiates food chain?
5.	Remembering	Select	Levels of organisation of life	MCQ	Which of the following is not a carbohydrate? (a) Glucose (b) Collagen (c) Starch (d) Glycogen
6.	Understanding	Associate	Levels of organisation of life	MCQ	Which of the following organ maintains acid-base balance in human body? (a) Pancreas (b) Brain (c) Kidney (d) Ovary
7.	Understanding	Differentiate	Physiological processes of Life	SA	Write one structural and one functional difference between vein and artery.

Sl. no.	Cognitive domain	Learning outcome	Curricular areas (Themes)	Type of questions	Specific questions
8.	Understanding	Infer	Life and its Diversity	SA	Give two reasons for including bats in the mammal group.
9.	Applying	Classify	Levels of organisation of life	SA	Classify the cell organelles of animals in respect of presence/absence of cell membrane.
10.	Analysing	Compare	Physiological processes of Life	SA	Differentiate between the digestion of protein in the stomach and in the smaller intestine based on enzymes and the nature of the medium.
11.	Analysing	Select	Physiological processes of Life	SA	Mention which of the labelled parts in the diagram of nephron are related with filtration and passive reabsorption of water. 
12.	Analysing	Contrast	Physiological processes of Life	SA	Differentiate between the auricle and ventricle of human heart in respect of location and function.
13.	Evaluating	Explain	Physiological processes of Life	LA	Draw a line diagram of the human heart and show the route of blood circulation by using arrows.

Sl. no.	Cognitive domain	Learning outcome	Curricular areas (Themes)	Type of questions	Specific questions
14.	Evaluating	Assess	Biology and Human Wellfare	SA	Why is WASH important for ensuring human health?
15.	Evaluating	Summarise	Levels of organisation of life	LA	Mention three roles of minerals for maintaining human health.
16.	Creating	Modify	Biology and Human Wellfare	VSA	Correct the wrong information in the given sentence: Hepatitis B is a bacterial disease.
17.	Creating	Prepare	Life and its Diversity	LA	Show with the help of a line diagram how Biology is clubbed with other branches of science to create five new disciplines.
18.	Creating	Formulate	Physiological processes of Life	SA	Express all the reactions that occur when respiratory substrates are oxidized with free or molecular oxygen in terms of chemical equations.
19.	Creating	Integrate	Levels of organisation of life	SA	Mention the functions associated with epithelial tissue in animals.
20.	Creating	Rearrange	Physiological processes of Life	SA	The sequential steps of cellular respiration are— Krebs' cycle, terminal respiration, glycolysis, oxidative decarboxy-lation. Write the steps in the correct sequence.

Sample Question Paper

Life Science and Environment

First Summative Evaluation

Class IX

Full Marks - 40

Group A

1. Choose the correct answer : **1×7 = 7**

(i) Which one of the following is the correct scientific name of mango tree?

(a) *Mangifera Indica* (b) *Indica mangifera*

(c) *Mangifera indica* (d) *Indica Mangifera*

(ii) Which one of the following is produced at the final stage of breakdown of Polysaccharide?

(a) Amino acid (b) Fatty acid

(c) Nucleotide (d) Monosaccharide

(iii) Which of the following is one of the main characteristic feature of phylum Chordata?

(a) Presence of stomochord (b) Presence of pharyngeal gill slit

(c) Presence of mantle (d) Presence of combplate

(iv) Which of the following pairs is correct?

(a) Vitamin A- Rhodopsin Synthesis (b) Vitamin C- Helps in the foetal growth in the womb

(c) Vitamin D- Haemoglobin synthesis (d) Vitamin K- Clotting of blood

(v) Which organelle is entrusted with the function of developing cytoplasmic structure?

(a) Mitochondria (b) Endoplasmic reticulum

(c) Ribosome (d) Lysosome

(vi) In which organ of human body RBC is destroyed?

(a) Liver (b) Kidney

(c) Lungs (d) Spleen

(vii) In which tissue Sarcolemma can be found?

(a) Nervous tissue (b) Muscular tissue

(c) Epidermal tissue (d) Connective tissue

Group B

2. Answer in one sentence (Any three) **1×3 = 3**

(i) Gastrovascular cavity, Tentacle, Cnidaria, Nematocyst— of these four words which one is related with the other three words.

(ii) Mention the name of the organ in male body that helps in the production of sperms and secrection of hormone.

(iii) I am a cell organelle with unit membrane and I also help in food production in green plants. Who am I ?

3. Fill in the blanks (Any two): **1×2 = 2**

i) Bionics is a branch of science that comprises of Biology and _____ .

ii) _____ is present between the two lungs in the human chest cavity.

iii) The solid spherical object present inside the nucleus is termed as _____ .

4. Put '✓' mark beside correct sentence and '×' mark beside wrong sentence: **1×2 = 2**

(i) Adenine, Guanine, Cytosine and Thymine are present as nitrogenous bases in RNA.

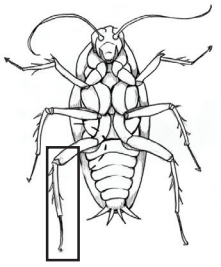
(ii) Members of phylum Annelida are divided into many ring-like parts.

5. Match column 'A' with column 'B' and write accordingly: **1×4=4**

Column A	Column B
(i) Ribosome	(a) Gives mechanical strength
(ii) Platyhelminthes	(b) Tube-like body
(iii) Mollusca	(c) Flat body
(iv) Sclerenchyma	(d) Synthesises protein
	(e) Soft body

Group C

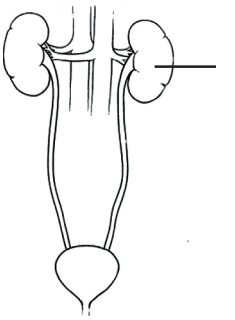
6. Answer briefly (Any six): **2×6 = 12**



(i) Write the name of the ☐ labelled part in the picture of cockroach. Write the name of the phylum in which the cockroach can be included based on the presence of ☐ labelled part in the picture of cockroach.

(ii) Mention two roles of vitamin A in human body.

(iii) Write the name of the labelled organ and mention its location in human body.



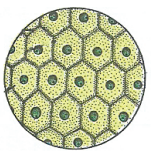
(iv) Correct the two sentences given below:
   a) Basement membrane is present in connective tissue.
   b) Sclerenchyma is present in the hypodermis of stem.

(v) Give two examples of application of modern biology in agriculture.

(vi) Differentiate between monocotyledonous and dicotyledonous plants on the basis of the root characteristics by drawing diagrams.

(vii) Mention two functions of centriole.

(viii) Write the name of the tissue and one of its characteristics whose cross-sectional diagram is given here.



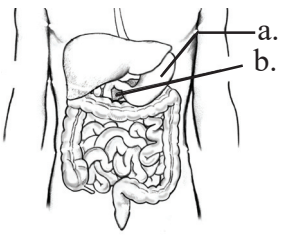
Group D

7. Mention the differences between Monera and Animalia based on the given identifying characteristics – (a) Nature of the cell (b) Nature of cellular organization. Mention three identifying characteristics of Reptilia. **2+3 = 5**

Or

Mention two identifying characteristics of Angiosperms. Mention two identifying characteristics of phylum Porifera and one example of it. **2+3 = 5**

8. Mention three roles of proteins in different life processes. Mention the roles of the two organs of human body labelled in the diagram. **3+2 = 5**



Or

Draw a diagram of mitochondria and label the location of Cristae and Oxysome. **3+2 = 5**

Life Science and Environment

Second Summative Evaluation

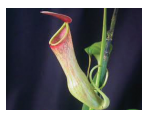
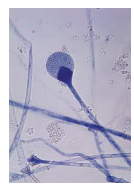
Class IX

Full Marks - 40

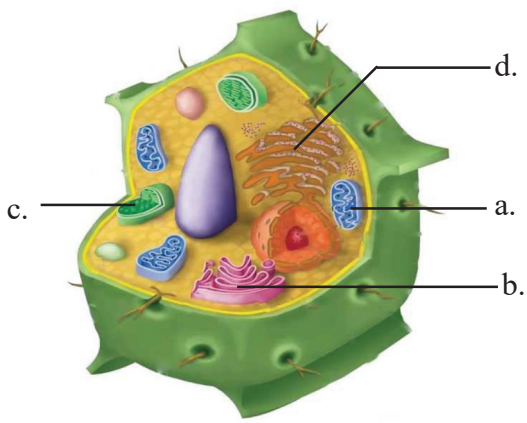
Group A

1. Choose the correct answer : **1×5 = 5**

(i) In which of the following plants symbiotic nutrition is found?

(a)  (b)  (c)  (d) 

(ii) Which one of the labelled cell organelles is related to photosynthesis?



(iii) What helps in the blood circulation in human heart to remain uni-directional?

(a) Auricle (b) Ventricle (c) Artery (d) Valve

(iv) Which one of the following pairs is correct?

(a) Ascent of sap - Xylem tissue (b) Light-independent phase of photosynthesis-Grana

(c) Glycolysis - Mitochondria (d) Oxygen transport - WBC

(v) Which one of the following fish breathes through accessory respiratory system?

(a) Rohu (b) Catla (c) Shingi (d) Kalbaus

Group B

2. Answer in one sentence (Any two): **1×2 = 2**

(i) Mention one characteristic feature of closed circulatory system.

(ii) Mention the name of Agglutinin present in blood group A.

(iii) Mention the difference between Synovial fluid and Cerebrospinal Fluid (CSF) on the basis of location.

3. Fill in the blanks (Any two): **1×2 = 2**

(i) In osmosis _____ molecule moves through semipermeable membrane.

(ii) Transpiration occurs through the presence of _____ in stems.

(iii) _____ is used for tanning leather in leather industry.

4. Put '✓' beside correct sentence and '×' beside wrong sentence: **1×2 = 2**

(i) Arthritis occurs due to the increase of glucose in blood.

(ii) Amylase enzyme present in human stomach helps in the digestion of carbohydrate.

(iii) In diffusion, molecules or ions of matter move from greater density to lesser density.

5. Match column 'A' with column 'B' and write accordingly: **1×4 = 4**

Column A	**Column B**
(i) Alkaline, saline fluid tissue	(a) Guava
(ii) Liver	(b) Lemon
(iii) Kidney	(c) Gallbladder
(iv) Shedding of bark	(d) Maintains equilibrium of water in body
	(e) Blood

Group C

6. Answer briefly (Any five): **2×5 = 10**

(i) Mention two roles of transpiration in the well-being of plant body.

(ii) Mention two physiological roles of active transport.

(iii) Mention two roles of pigments in photosynthesis.

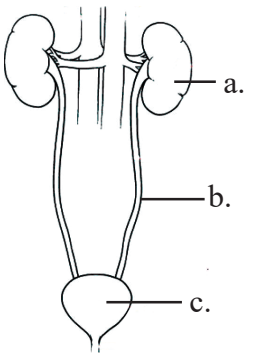
(iv) Mention two roles of S.A. node and Purkinje fibre as special connective tissue associated with cardiac membrane.

(v) Mention the role of Calcium and vitamin K in clotting of blood.

(vi) How does carbohydrate get digested in human mouth cavity?

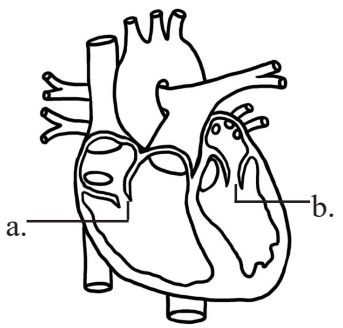
(vii) Why is smoking injurious to health?

Group D



7. Write the names of the parts labelled a, b and c in the diagram. Name the structural and functional unit of kidney and also mention its role in the production of urine. **3+2 = 5**

Or



Write the names of the parts labelled a and b in the diagram. Explain the sequential stages of circulation of less oxygenated blood through the heart. **2+3 = 5**

8. Explain coprophagous nutrition with examples. Mention the role of transpiration in ascent of sap. **2+3 = 5**

Or

How does CO_2 fixation occurs in the light-independent phase of photosynthesis? Mention the role of renal tubule in the production of urine. **2+3 = 5**

9. Mention three general functions of micronutrients in plants. Mention the differences between aerobic and anaerobic respiration based on the nature of oxidation and the energy produced. **3+2 = 5**

Or

Mention the role of cross-matching in blood transfusion. How does food is transported through phloem? **2+3 = 5**

Life Science and Environment

Third Summative Evaluation

Class IX

Full Marks - 90

Group A

1. Choose the correct answer: **1×15 = 15**

(i) Which cell organelle helps in photosynthesis?

(a) Lysosome (b) Centriole

(c) Ribosome (d) Microtubule

(ii) In which part of human body is RBC destroyed?

(a) Spleen (b) Liver

(c) Kidney (d) Testis

(iii) My body is soft and undivided; mantle membrane is present in my body. Who am I?

(a) Mollusca (b) Arthropoda

(c) Hemichordata (d) Annelida

(iv) Since my cells are closely arranged, there is no intercellular space and my cells have the power of division. What type of tissue am I?

(a) Collenchyma (b) Parenchyma

(c) Sclerenchyma (d) Meristematic tissue

(v) What do we call the coexistence of rhizobium and pea plant?

(a) Parasitism (b) Symbiosis

(c) Prey-predator relationship (d) Competition

(vi) What is the name of the part of the alimentary canal following mouth cavity?

(a) Esophagus (b) Pharynx

(c) Small intestine (d) Stomach

(vii) Which disease is borne by the female Aedes mosquito?

(a) Malaria (b) Hepatitis

(c) Tuberculosis (d) Dengue

(viii) Which type of cellular respiration produces curd?

(a) Aerobic respiration (b) Anaerobic respiration

(c) Alcoholic fermentation (d) Lactic acid fermentation

(ix) Which of the following organism exists in the body of host as an ectoparasite?

(a) Amoeba (b) Lice

(c) Flatworm (d) Roundworm

(x) 'Body covered with epidermal dry scales'—which of the following type of organism has this characteristic?

(a) Mammalia (b) Echinodermata

(c) Reptilia (d) Amphibia

(xi) When I attack the humans, they have sore throat as tonsil swells; they feel pain to swallow food. Name the disease that I create.

(a) Tetanus (b) Diphtheria

(c) Malaria (d) Hepatitis

(xii) Which cell in blood helps in blood coagulation?

(a) Platelet (b) Red Blood Corpuscle

(c) Neutrophil (d) Eosinophil

(xiii) Which of the following pairs is correct?

(a) Cnidaria - Flame cell (b) Tinophora - Colloblast cell

(c) Poriphera - Cnidoblast cell (d) Annelida - Choanocyte cell

(xiv) Which free-living bacteria help in nitrogen fixation?

(a) Azotobacter (b) Rizobium

(c) *Escherichia coli* (d) *Bacillus thuringiensis*

(xv) Which of the following is the alternative source of human food?

(a) Fish (b) Spirulina

(c) Milk (d) Prawn

Group B

2. Answer in one sentence (Any six): 1×6 = 6

(i) Who was the founder of Binomial Nomenclature?

(ii) Give an example of active transport.

(iii) Mention a function of cell wall.

(iv) Mention the role of decomposer in nutrient cycle.

(v) Which vitamin maintains the balance of calcium in bones and blood?

(vi) 'Cyanobacteria creates a net like mantle on the roots of pine trees'—replace the first word and rewrite the sentence.

(vii) Mention a problem of lipid metabolism related to problem of capillary wall.

(viii) Give an example of heat adaptation in animals.

3. Fill in the blanks (Any five): 1×5 = 5

(i) Centriole produces_____ during cell division.

(ii) The scientific name is always written in _____ language.

(iii) When foreign microbes enter the body it creates_____.

(iv) The name of the salivary gland beneath the ear is called _____ gland.

(v) During winter the reptiles go into_____.

(vi) The temperature of earth can _____ due to deforestation.

(vii) Aerobic respiration occurs due to the presence of _____.

4. Put '✓' beside correct sentence and '×' mark beside wrong sentence: 1×5 = 5

(i) There is no role of carrier molecule in active transport.

(ii) The word 'Vaccine' has been derived from the Latin word 'Vacca'.

(iii) The members of the plantae function as decomposers.

(iv) Sweat comes out due to the presence of sebaceous glands in skin.

(v) Foodweb is created on the basis of interrelation between different organelles.

(vi) The microbe causing tuberculosis is a kind of virus.

5. Match column 'A' with column 'B' and write accordingly: 1×4 = 4

Column A	Column B
(i) Monera	(a) Mycorrhiza
(ii) 80S ribozome	(b) Mushroom
(iii) Bio-fertiliser	(c) Mitochondria
(iv) Alternative source of food	(d) Eukaryotic cell
(v) Krebs' cycle	(e) Prokaryotic cell
	(f) Cytoplasm

Group C

6. Answer briefly (Any twelve): **2×12 = 24**

(i) Mention two causes of deforestation.

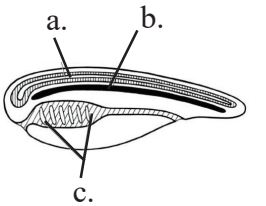
(ii) Mention two functions of endoplasmic reticulum.

(iii) How does humidity affect the rate of transpiration?

(iv) Mention the process of contamination of AIDS.

(v) Mention two roles human liver.

(vi) Mention two out of three main identifying characteristics labelled in the given diagram of Chordata.



(vii) Mention the role of Cyanobacteria as biofertiliser.

(viii) Mention two structural characteristics of meristematic tissue that are absent in permanent tissue.

(ix) Give two examples of the application of modern Biology in the production of medicine.

(x) Mention two economic importances of resin.

(xi) How is digested food assimilated?

(xii) Mention two roles of lipid in life process.

(xiii) Mention two ways of energy conservation in daily life.

(xiv) Mention two roles of lymph in organisms.

(xv) Mention two symptoms of tuberculosis.

(xvi) Mention two characteristics of energy flow in ecosystem.

Group D

7. Mention the importance of WASH in human health. Mention two roles of bacteria in biological control. **3+2 = 5**

Or

Mention three symptoms of diarrhoea. Mention the roles of virus in biological control. **3+2 = 5**

8. Explain the stages of energy flow. Mention the importance of nutrient cycle in environment. **3+2 = 5**

Or

Explain how excessive use of water is giving rise to water crisis. Mention two functions of forest in relation to conservation of water resources and in control of atmospheric functions. **3+2 = 5**

9. Mention the role of respiratory exercise for increasing lung capacity. Mention the role of osmosis in cell to cell transport. **2+3 = 5**

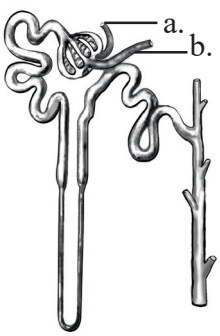
Or

Mention the role of photosynthesis in the trapping and transformation of solar energy. How does mechanical digestion occur? **2+3 = 5**

10. Express briefly with the help of line diagram how life originated on earth from inorganic materials in sequential order. Mention the role of variation as a source of diversity in organisms. **3+2 = 5**

Or

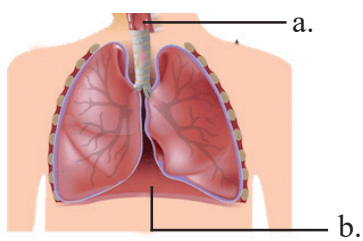
Mention three identifying characteristics of phylum Porifera. Rohu, Shingi, Bhetki, Koi– they differ from each other in respect of length, external structure, colour and other aspects. However they are grouped in class Osteichthyes. Mention two reasons for classifying animals of different species in a single class. **3+2 = 5**



11. Name the parts labelled a and b in the diagram. How does glomerulus purify the impurities present in blood? **2+3 = 5**

Or

Name the parts labelled a and b in the diagram. Express through line diagram the events in the process of inspiration human beings. **2+3 = 5**



12. Mention three differences of prokaryotic and eukaryotic cells. Mention two structural characteristics of nerve tissue. **3+2 = 5**

Or

Mention three differences of plant and animal cells. Mention two structural characteristics of Collenchyma tissue related to providing mechanical strength. **3+2 = 5**

Printed at

West Bengal Text Book Corporation Limited
(Government of West Bengal Enterprise)
Kolkata- 700 056