

BIOLOGY

Subject Code – 044

Classes XI - XII (2025-26)

The present curriculum provides the students with updated concepts along with an extended exposure to contemporary areas of the subject. The curriculum also aims at emphasizing the underlying principles that are common to animals, plants and microorganisms as well as highlighting the relationship of Biology with other areas of knowledge. The format allows a simple, clear, sequential flow of concepts. It links the discoveries and innovations in biology to everyday life such as environment, industry, health and agriculture. The Biology curriculum is expected to enable the students to:

- develop capacities for observation, experimentation, documentation, and familiarity with quantitative reasoning and multi-disciplinary approaches.
- engender sensitivity towards biological issues (environment, health) in their surroundings and be aware of how citizens can contribute to their local communities and to science.
- be aware of bioethical concerns that arise in biology today.
- understand the integration of different fields of biology and highlight the interconnections between these fields.
- be exposed to diverse careers in the life sciences.

This curriculum of Biology will help in achieving the following curricular goals and competencies delineated in the National Curriculum Framework for School Education 2023:

CG-3 Explores the structure and function of the living world at the cellular level	C-3.1 Explains the role of cellular components (nucleus, mitochondria, endoplasmic reticulum, vacuoles, chloroplast, cell wall), including the semi permeability of cell membrane in making cell the structural basis of living organisms and functional basis of life processes C-3.2 Analyses similarities and differences in the life processes involved in nutrition (photosynthesis in plants; absorption of nutrients in fungi; digestion in animals), transport (transport of water in plants; circulation in animals), exchange of materials (respiration and excretion), and reproduction C-3.3 Describes mechanisms of heredity (in terms of DNA, genes, chromosomes) and variation (as changes in the sequence of DNA)
CG-4 Explores interconnectedness between organisms and their	C-4.1 Applies the knowledge of cellular diversity in organisms along with the ecological role organisms play (autotrophic/ heterotrophic nutrition) to classify them into five-kingdoms

environment	C-4.2 Illustrates different levels of organisations of living organisms (from molecules to organisms) C-4.3 Analyses different levels of biological organisation from organisms to ecosystems and biomes along with interactions that take place at each level C-4.4 Analyses patterns of inheritance of traits in terms of Mendel's laws and its consequences at a population level (using models and/or simulations) C-4.5 Analyses evidences of biological evolution demonstrating the consequences of the process of natural selection in terms of changes — in allele frequency in population, structure, and function of organisms
CG-5 Draws linkages between scientific knowledge and knowledge across other curricular areas	C-5.3 Applies scientific principles to explain phenomena in other subjects (sound pitch, octave, and amplitude in music; use of muscles in dance form and sports)
CG-6 Understands and appreciates the contribution of India through history and the present times to the overall field of Science, including the disciplines that constitute it	C-6.1 Knows and explains the significant contributions of India to all matters (concepts, explanations, methods) that are studied within the curriculum in an integrated manner
CG-7 Develops awareness of the most current discoveries, ideas, and frontiers in all areas of scientific knowledge in order to appreciate that Science is ever evolving, and that there are still many unanswered questions	C-7.1 States concepts that represent the most current understanding of the matter being studied — ranging from mere familiarity to conceptual understanding of the matter as appropriate to the developmental stage of the students C-7.2 States questions related to matters in the curriculum for which current scientific understanding is well-recognised to be inadequate
CG-8 Explores the nature of Science by doing Science	C-8.1 Develops accurate and appropriate models (including geometric, mathematical, graphical) to represent real-life events and phenomena using scientific principles and use these models to manipulate variables and predict results C-8.2 Designs and implements a plan for scientific inquiry (formulates hypotheses, makes predictions, identifies variables, accurately uses scientific instruments, represents data — primary and secondary — in multiple modes, draws inferences based on data and understanding of scientific concepts, theories, laws, and principles, communicates findings using scientific terminology)

It is expected that the students would get an exposure to various branches of Biology in the curriculum in a more contextual and systematic manner as they study its various units. (NCFSE-2023)

Attainment of the competencies shall be done through transaction of the curriculum using appropriate pedagogy; these shall be assessed through an integrated evaluation scheme.

COURSE STRUCTURE
CLASS XI (2025-26)
(THEORY)

Time: 03 Hours

Max. Marks: 70

Unit	Title	Marks
I	Diversity of Living Organisms	15
II	Structural Organization in Plants and Animals	10
III	Cell: Structure and Function	15
IV	Plant Physiology	12
V	Human Physiology	18
	Total	70

Unit-I Diversity of Living Organisms

Chapter-1: The Living World

Biodiversity; Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature

Chapter-2: Biological Classification

Five kingdom classification; Salient features and classification of Monera, Protista and Fungi into major groups; Lichens, Viruses and Viroids.

Chapter-3: Plant Kingdom

Classification of plants into major groups; Salient and distinguishing features and a few examples of Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiosperms.

Chapter-4: Animal Kingdom

Salient features and classification of animals, non-chordates up to phyla level and chordates upto class level (salient features and at a few examples of each category).

(No live animals or specimen should be displayed.)

Unit-II Structural Organization in Plants and Animals

Chapter-5: Morphology of Flowering Plants

Morphology of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed. Description of family Solanaceae

Chapter-6: Anatomy of Flowering Plants

Anatomy and functions of tissue systems in dicots and monocots.

Chapter-7: Structural Organisation in Animals

Morphology, Anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of frog.

Unit-III Cell: Structure and Function

Chapter-8: Cell-The Unit of Life

Cell theory and cell as the basic unit of life, structure of prokaryotic and eukaryotic cells; Plant cell and animal cell; cell envelope; cell membrane, cell wall; cell organelles - structure and function; endomembrane system, endoplasmic reticulum, golgi bodies, lysosomes, vacuoles, mitochondria, ribosomes, plastids, microbodies; cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); nucleus.

Chapter-9: Biomolecules

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, and nucleic acids; Enzyme - types, properties, enzyme action. (Topics excluded: Nature of Bond Linking Monomers in a Polymer, Dynamic State of Body Constituents Concept of Metabolism, Metabolic Basis of Living, The Living State)

Chapter-10: Cell Cycle and Cell Division

Cell cycle, mitosis, meiosis and their significance

Unit-IV Plant Physiology

Chapter-11: Photosynthesis in Higher Plants

Photosynthesis as a means of autotrophic nutrition; site of photosynthesis, pigments involved in photosynthesis (elementary idea); photochemical and biosynthetic phases of photosynthesis; cyclic and non-cyclic photophosphorylation; chemiosmotic hypothesis; photorespiration; C₃ and C₄ pathways; factors affecting photosynthesis.

Chapter-12: Respiration in Plants

Exchange of gases; cellular respiration - glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); energy relations - number of ATP molecules generated; amphibolic pathways; respiratory quotient.

Chapter-13: Plant - Growth and Development

Seed germination; phases of plant growth and plant growth rate; conditions of growth; differentiation, dedifferentiation and redifferentiation; sequence of developmental processes

in a plant cell; plant growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA.

Unit-V Human Physiology

Chapter-14: Breathing and Exchange of Gases

Respiratory organs in animals (recall only); Respiratory system in humans; mechanism of breathing and its regulation in humans - exchange of gases, transport of gases and regulation of respiration, respiratory volume; disorders related to respiration - asthma, emphysema, occupational respiratory disorders.

Chapter-15: Body Fluids and Circulation

Composition of blood, blood groups, coagulation of blood; composition of lymph and its function; human circulatory system - Structure of human heart and blood vessels; cardiac cycle, cardiac output, ECG; double circulation; regulation of cardiac activity; disorders of circulatory system - hypertension, coronary artery disease, angina pectoris, heart failure.

Chapter-16: Excretory Products and their Elimination

Modes of excretion - ammonotelism, ureotelism, uricotelism; human excretory system – structure and function; urine formation, osmoregulation; regulation of kidney function - renin - angiotensin, atrial natriuretic factor, ADH and diabetes insipidus; role of other organs in excretion; disorders - uremia, renal failure, renal calculi, nephritis; dialysis and artificial kidney, kidney transplant.

Chapter-17: Locomotion and Movement

Types of movement - ciliary, flagellar, muscular; skeletal muscle, contractile proteins and muscle contraction; skeletal system and its functions; joints; disorders of muscular and skeletal systems - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

Chapter-18: Neural Control and Coordination

Neuron and nerves; Nervous system in humans - central nervous system; peripheral nervous system and visceral nervous system; generation and conduction of nerve impulse

Chapter- 19: Chemical Coordination and Integration

Endocrine glands and hormones; human endocrine system - hypothalamus, pituitary, pineal, thyroid, parathyroid, adrenal, pancreas, gonads; mechanism of hormone action (elementary idea); role of hormones as messengers and regulators, hypo - and hyperactivity and related disorders; dwarfism, acromegaly, cretinism, goiter, exophthalmic goitre, diabetes, Addison's disease.

The following topics are included in the syllabus but will be assessed only formatively to reinforce understanding without adding to summative assessments. The reduces academic stress while ensuring meaningful learning. Schools can integrate these with existing chapters as they align well. Relevant NCERT textual material is enclosed for reference.

Digestion and Absorption (Please Refer to CBSE Reading Material)

Alimentary canal and digestive glands, role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; calorific values of proteins, carbohydrates and fats; egestion; nutritional and digestive disorders - PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.

PRACTICALS

Time: 03 Hours

Max. Marks: 30

Evaluation Scheme		Marks
One Major Experiment Part A (Experiment No- 1,3,7,8)		5 Marks
One Minor Experiment Part A (Experiment No- 6,9,10,11,12,13)		4 Marks
Slide Preparation Part A (Experiment No- 2,4,5)		5 Marks
Spotting Part B		7 Marks
Practical Record + Viva Voce	(Credit to the student's work over the academic session may be given)	4 Marks
Project Record + Viva Voce		5 Marks
Total		30 Marks

A: List of Experiments

1. Study and describe locally available common flowering plants, from family Solanaceae (Poaceae, Asteraceae or Brassicaceae can be substituted in case of particular geographical location) including dissection and display of floral whorls, anther and ovary to show number of chambers (floral formulae and floral diagrams), type of root (tap and adventitious); type of stem (herbaceous and woody); leaf (arrangement, shape, venation, simple and compound).
2. Preparation and study of T.S. of dicot and monocot roots and stems (primary).
3. Study of osmosis by potato osmometer.
4. Study of plasmolysis in epidermal peels (e.g. Rhoeo/lily leaves or flashy scale leaves of onion bulb).
5. Study of distribution of stomata on the upper and lower surfaces of leaves.

6. Comparative study of the rates of transpiration in the upper and lower surfaces of leaves.
7. Test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials.
8. Separation of plant pigments through paper chromatography.
9. Study of the rate of respiration in flower buds/leaf tissue and germinating seeds.
10. Test for presence of urea in urine.
11. Test for presence of sugar in urine.
12. Test for presence of albumin in urine.
13. Test for presence of bile salts in urine.

B. Study and Observe the following (spotting):

1. Parts of a compound microscope.
2. Specimens/slides/models and identification with reasons - Bacteria, *Oscillatoria*, *Spirogyra*, *Rhizopus*, mushroom, yeast, liverwort, moss, fern, pine, one monocotyledonous plant, one dicotyledonous plant and one lichen.
3. Virtual specimens/slides/models and identifying features of - *Amoeba*, *Hydra*, liver fluke, *Ascaris*, leech, earthworm, prawn, silkworm, honey bee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Mitosis in onion root tip cells and animal's cells (grasshopper) from permanent slides.
5. Types of inflorescence (cymose and racemose).
6. Human skeleton and different types of joints with the help of virtual images/models only.

Practical Examination for Visually Impaired Students Class XI

Note: The 'Evaluation schemes' and 'General Guidelines' for visually impaired students as given for Class XII may be followed.

A. Items for Identification/Familiarity with the apparatus /equipment /animal and plant material / chemicals for assessment in practicals (All experiments)

B. Equipment - compound microscope, test tube, petri dish, chromatography paper, chromatography chamber, beaker, scalpel

Chemical – alcohol

Models – Model of Human skeleton to show – Ball and socket joints of girdles and limbs, Rib cage, Honeycomb, Mollusc shell, Pigeon and Star fish, cockroach

Specimen/Fresh Material – mushroom, succulents such as *Aloe vera*/ kalenchoe, raisins, potatoes, seeds of monocot and dicot- maize and gram or any other plant, plants of Solanaceae - Brinjal, Petunia, any other

C. List of Practicals

1. Study locally available common flowering plants of the family – Solanaceae and identify type of stem (Herbaceous or Woody), type of leaves (Compound or Simple).
2. Study the parts of a compound microscope- eye piece and objective lens, mirror, stage, coarse and fine adjustment knobs.
3. Differentiate between monocot and dicot plants on the basis of venation patterns.
4. Study the following parts of human skeleton (Model): Ball and socket joints of thigh and shoulder
5. Rib cage
6. Study honeybee/butterfly, snail/sheik snail through shell, Starfish, Pigeon (through models).
7. Identify the given specimen of a fungus – mushroom, gymnosperm-pine cone.
8. Identify and relate the experimental set up with the aim of experiment: For Potato Osmometer/endosmosis in raisins.

Note: The above practicals may be carried out in an experiential manner rather than only recording observations.

Prescribed Books:

1. Biology Class-XI, Published by NCERT
2. Other related books and manuals brought out by NCERT (including multimedia).
3. Biology supplementary Material (Revised). Available on CBSE Website.
4. Reading Material Biology Class XI.