

9. BIOLOGY (Code No. 044)

The present syllabus reinforces the ideas introduced till the secondary classes. It provides the students with new concepts along with an extended exposure to contemporary areas of the subject. The syllabus also aims at emphasizing on the underlying principles that are common to both animals and plants as well as highlighting the relationship of biology with other areas of knowledge. The format of the syllabus allows a simple, clear, sequential flow of concepts without any jarring jumps. The syllabus also stresses on making better connections among biological concepts. It relates the study of biology to real life through the use of technology. It links the discoveries and innovations in biology to everyday life such as environment, industry, health and agriculture. The updated syllabus also focuses on reducing the curriculum load while ensuring that ample opportunities and scope for learning and appreciating basic concepts of the subject continue to be available within its framework. The prescribed syllabus is expected to:

- Promote understanding of basic principles of Biology
- Encourage learning of emerging knowledge and its relevance to individual and society
- Promote rational/scientific attitude towards issues related to population, environment and development
- Enhance awareness about environmental issues, problems and their appropriate solutions
- Create awareness amongst the learners about diversity in the living organisms and developing respect for other living beings
- Appreciate that the most complex biological phenomena are built on essentially simple processes

It is expected that the students would get an exposure to various branches of Biology in the syllabus in a more contextual and friendly manner as they study its various units.

BIOLOGY (Code No. 044) COURSE STRUCTURE Class XI (2016-17) (THEORY)

Time: 3 Hours

Max. Marks: 70

Unit	Title	No. of Periods	Marks
I	Diversity of Living Organisms	23	07
II	Structural Organisation in Plants and Animals	22	11
III	Cell: Structure and Function	35	15
IV	Plant Physiology	40	17
V	* Human Physiology (A) - Section for OTBA Human Physiology (B)	40	*10+10
Total		160	70

Note: The question paper of the year end examination to be held in the March 2017 will include a Section on Open Text Based Assessment (OTBA) which will include questions of a total of 10 marks. No other questions will be asked from the section of the unit earmarked for OTBA. The open text material will be supplied in advance. This material is designed to assess the analytical and higher order thinking skills of students.

*This section will be assessed through OTBA only.

Unit-I Diversity of Living Organisms**23 Periods****Chapter-1: The Living World**

What is living? Biodiversity; Need for classification; three domains of life; taxonomy and systematics; concept of species and taxonomical hierarchy; binomial nomenclature; tools for study of taxonomy-museums, zoological parks, herbaria, botanical gardens.

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

Salient features and classification of plants into major groups - Algae, Bryophyta, Pteridophyta, Gymnospermae and Angiospermae (three to five salient and distinguishing features and at least two examples of each category); Angiosperms - classification upto class, characteristic features and examples.

Chapter-4: Animal Kingdom

Salient features and classification of animals non-chordates up to phyla level and chordates up to class level (three to five salient features and at least two examples of each category).

(No live animals or specimen should be displayed.)

Unit-II Structural Organisation in Animals and Plants**22 Periods****Chapter-5: Morphology of Flowering Plants**

Morphology and modifications: Tissues

Chapter-6: Anatomy of Flowering Plants

Anatomy and functions of different parts of flowering plants: root, stem, leaf, inflorescence, flower, fruit and seed (to be dealt along with the relevant experiment of the Practical Syllabus).

Chapter-7: Structural Organisation in Animals

Animal tissues: Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (a brief account only)

Unit-III Cell: Structure and Function**35 Periods****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, nuclear membrane, chromatin, nucleolus.

Chapter-9: Biomolecules

Chemical constituents of living cells: biomolecules, structure and function of proteins, carbohydrates, lipids, nucleic acids, enzymes, types, properties, enzyme action.

Chapter-10: Cell Cycle and Cell Division

Cell cycle, mitosis, meiosis and their significance.

Unit-IV Plant Physiology**40 Periods****Chapter-11: Transport in Plants**

Movement of water, gases and nutrients; cell to cell transport, Diffusion, facilitated diffusion, active transport; plant-water relations, Imbibition, water potential, osmosis, plasmolysis; long distance transport of water - Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; transpiration, opening and closing of stomata; Uptake and translocation of mineral nutrients - Transport of food, phloem transport, massflow hypothesis; diffusion of gases.

Chapter-12: Mineral Nutrition

Essential minerals, macro- and micronutrients and their role; deficiency symptoms; mineral toxicity; elementary idea of hydroponics as a method to study mineral nutrition; nitrogen metabolism, nitrogen cycle, biological nitrogen fixation.

Chapter-13: Photosynthesis in Higher Plants

Photosynthesis as a mean 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-14: 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-15: 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; growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA; seed dormancy; vernalisation; photoperiodism.

Unit-V Human Physiology**40 Periods**

Part (A) will be assessed through OTBA whereas from the Part (B), there will be usual conceptual question in year end examination.

Part (B) Chapter-16: Digestion and Absorption

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.

Part (B) Chapter-17: 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.

Part (A) Chapter-18: 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.

Part (B) Chapter-19: 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 - uraemia, renal failure, renal calculi, nephritis; dialysis and artificial kidney.

Part (B) Chapter-20: 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 system - myasthenia gravis, tetany, muscular dystrophy, arthritis, osteoporosis, gout.

Part (B) Chapter-21: 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; reflex action; sensory perception; sense organs; elementary structure and functions of eye and ear.

Part (A) Chapter-22: 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 goiter, diabetes, Addison's disease.

Note: Diseases related to all the human physiological systems to be taught in brief.

PRACTICALS

Time Allowed: Three hours

Max. Marks: 30

Evaluation Scheme	
One Major Experiment	5 Marks
One Minor Experiment	4 Marks
Slide Preparation	5 Marks
Spotting	7 Marks
Practical Record+Viva Voce	4 Marks
Project Record + Viva Voce	5 Marks
Total	30 Marks

A. List of Experiments

60 Periods

- Study and description of three locally available common flowering plants, one from each of the families Solanaceae, Fabaceae and Liliaceae including dissection and display of floral whorls,

anther and ovary to show number of chambers (floral formulae and floral diagrams). Types of root (Tap and adventitious); 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. Rhoec leaves).
5. Study of distribution of stomata in the upper and lower surface of leaves.
6. Comparative study of the rates of transpiration in the upper and lower surface of leaves.
7. Test for the presence of sugar, starch, proteins and fats. Detection 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/observation of the following (spotting)

1. Study of the parts of a compound microscope.
2. Study of the 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. Study of virtual specimens/slides/models and identification with reasons - Amoeba, Hydra, liverfluke, Ascaris, leech, earthworm, prawn, silkworm, honeybee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Study of tissues and diversity in shapes and sizes of plant and animal cells (palisade cells, guard cells, parenchyma, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibers and mammalian blood smear) through temporary/permanent slides.
5. Study of mitosis in onion root tip cells and animal cells (grasshopper) from permanent slides.
6. Study of different modifications in roots, stems and leaves.
7. Study and identification of different types of inflorescence (cymose and racemose).
8. Study of imbibition in seeds/raisins.
9. Observation and comments on the experimental set up for showing:
 - a) Anaerobic respiration
 - b) Phototropism
 - c) Effect of apical bud removal
 - d) Suction due to transpiration
10. Study of human skeleton and different types of joints with the help of virtual images/models only.
11. Study of external morphology of cockroach through virtual images/models.

Practical Examination for Visually Impaired Students Class XI

Note: Same Evaluation scheme and general guidelines for visually impaired students as given for Class XII may be followed.

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

Plants of -

- Solanaceae- Brinjal, Petunia, any other
- Fabaceae- Rice, Wheat, any other
- Liliaceae- Any of the Lilies

A compound microscope, seeds of monocot and dicot- maize and gram or any other

Model of Human skeleton to show -

- Ball and socket joints of girdles and limbs
- Rib cage

Test tube, honey comb, Mollusc shell, Models of Pigeon and Star fish, mushroom, petridish, succulents such as *Aloe vera*/kalanchoe, raisins, beaker, potatoes, scalpel, chromatography paper, chromatography chamber, alcohol, specimen/model of cockroach.

B. List of Practicals

1. Study three locally available common flowering plants of the families - Solanaceae, fabaceae, Liliaceae and identify:
 - Types of roots as Tap and Adventitious
 - Types of stems as Herbaceous or Woody
 - Types of leaves as Compound or Simple
2. Study the parts of a compound microscope- eye piece and objective lense, 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
 - Rib cage
5. Study honey bee through comb, snail through shell, Starfish through model, Pigeon through model.
6. Identify the given specimen of a fungus - Mushroom.
7. Study the adaptive features of xerophytic plants.
8. Study the process of osmosis through endosmosis in raisins.
9. Identify and relate the given experimental set up with aim of experiment:

- Paper Chromatography
- or
- Potato Osmometer

10. Study the external features/morphology of cockroach through model

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

Prescribed Books:

1. Biology Class-XI, Published by NCERT
2. Other related books and manuals brought out by NCERT (consider multimedia also)

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QUESTION PAPER DESIGN

Class - XI (2016-17)

Time: 3 Hours

Max. Marks: 70

S. No.	Typology of Questions	Very Short Answer (VSA) (1 mark)	Short Answer-I (SA-I) (2 marks)	Short Answer - II (SA-II) (3 marks)	Value based question (VBQ) (4 marks)	Long Answer (LA) (5 marks)	Total Marks	% Weightage
1.	Remembering- (Knowledge based) Simple recall questions, to know specific facts, terms, concepts, principles, or theories, Identify, define, or recite, information)	2	1	1	-	-	7	10%
2	Understanding- (Comprehension - To be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information)	-	2	4	-	1	21	30%
3	Application (Use abstract information in concrete situation, to apply knowledge to new situations, Use given content to interpret a situation, provide an example, or solve a problem)	-	2	4	-	1	21	30%
4	High Order Thinking Skills (Analysis & Synthesis- Classify, Compare, Contrast, or differentiate between different pieces of information, Organize and/or integrate unique pieces of information from a variety of sources)	2	-	1	-	1	10	14%
5	Evaluation- (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	1	-	2	1	-	11	16%
	TOTAL	5x1=5	5x2=10	12x3=36	1x4=4	3x5=15	70(26)	100%

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QUESTION WISE BREAK UP

Type of Question	Mark(s) per Question	Total No. of Questions	Total Marks
VSA	1	5	05
SA-I	2	5	10
SA-II	3	12	36
VBQ	4	1	04
LA	5	3	15
Total		26	70

1. Internal Choice: *There is no overall choice in the paper. However, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and one question of 5 marks weightage (Content based question).*
2. *The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.*