

## **BIOLOGY (Code No. 044)**

**2020-21**

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 of the curriculum allows a simple, clear, sequential flow of 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 curriculum focuses on understanding and application of scientific principles, while ensuring that ample opportunities and scope for learning and appreciating basic concepts continue to be available within its framework. The curriculum 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 curriculum in a more contextual and systematic manner as they study its various units.

## **BIOLOGY (Code No. 044)**

### **COURSE STRUCTURE**

### **CLASS XI (2020 -21) (THEORY)**

**Time:3 Hours**

**Max. Marks: 70**

| <b>Unit</b> | <b>Title</b>                                  | <b>Marks</b> |
|-------------|---|--------------|
| <b>I</b>    | Diversity of Living Organisms                 | 15           |
| <b>II</b>   | Structural Organization in Plants and Animals | 8            |
| <b>III</b>  | Cell: Structure and Function                  | 15           |
| <b>IV</b>   | Plant Physiology                              | 15           |
| <b>V</b>    | Human Physiology                              | 17           |
|             | <b>Total</b>                                  | <b>70</b>    |

## Unit-I Diversity of Living Organisms

### **Chapter-1: The Living World**

What is living? Biodiversity; Need for classification; three domains of life; 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**

Salient features and classification of plants into major groups - Algae, Bryophyta, Pteridophyta and Gymnospermae. (salient and distinguishing features and a few examples of each category).

### **Chapter-4: Animal Kingdom**

Salient features and classification of animals, non-chordates up to phyla level and chordates up to class level (salient features and distinguishing features of a few examples of each category). (No live animals or specimen should be displayed.)

## Unit-II Structural Organization in Animals and Plants

### **Chapter-5: Morphology of Flowering Plants**

Morphology of inflorescence and flower, Description of 01 family: Solanaceae or Liliaceae (to be dealt along with the relevant experiments of the Practical Syllabus).

### **Chapter-7: Structural Organisation in Animals**

Animal tissues.

## 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, 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

### **Chapter-13: 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; C<sub>3</sub> and C<sub>4</sub> 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**

Growth regulators - auxin, gibberellin, cytokinin, ethylene, ABA.

### **Unit-V Human Physiology**

#### **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.

#### **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.

#### **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 - uremia, renal failure, renal calculi, nephritis; dialysis and artificial kidney, kidney transplant.

#### **Chapter-20: Locomotion and Movement**

Skeletal muscle, contractile proteins and muscle contraction.

#### **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.

#### **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                                  | Marks   |   |
|--|---|---|
| One Major Experiment Part A (Experiment No- 1,3)   | 5   |   |
| One Minor Experiment Part A (Experiment No- 4,5,6) | 4   |   |
| Slide Preparation Part A (Experiment No- 2)        | 5   |   |
| Spotting Part B                                    | 7   |   |
| Practical Record + Viva Voce                       | Credit to the students' work over the academic session may be given | 4 |
| Project Record + Viva Voce                         |   | 5 |
| <b>Total</b>                                       | <b>30</b>   |   |

### **A: List of Experiments**

1. Study and describe a locally available common flowering plant, from any one family: Solanaceae or Liliaceae (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).
2. Study of distribution of stomata in the upper and lower surfaces of leaves.
3. Separation of plant pigments through paper chromatography.
4. Study of the rate of respiration in flower buds/leaf tissue and germinating seeds.
5. Test for presence of sugar in urine.
6. Test for presence of albumin in urine.

### **B. Study/Observer of 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*, liverfluke, *Ascaris*, leech, earthworm, prawn, silkworm, honeybee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit.
4. Tissues and diversity in shape and size of animal cells (squamous epithelium, smooth, skeletal and cardiac muscle fibers and mammalian blood smear) through temporary/permanent slides.
5. Mitosis in onion root tip cells and animal cells (grasshopper) from permanent slides.

### **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 / equipments/animal and plant material / chemicals etc. for assessment in practicals (All experiments)**

- Plants of Solanaceae - Brinjal, Petunia, any other or Liliaceae- Any of the Lilies.
- Mushroom, Succulents such as *Aloe vera*/*Kalanchoe*, Raisins, Potatoes.
- Honey comb, Mollusc shell, Model of cockroach, Pigeon and Star fish.

- Compound microscope, Test tube, Petri dish, Beaker, Scalpel.
- Chromatography paper, Chromatography chamber, Alcohol.

## B. List of Practicals

1. Study one locally available common flowering plant of the family– Solanaceae or Liliaceae and identify inflorescence/flower.
2. Study the parts of a compound microscope- eye piece and objective lens, mirror, stage, coarse and fine adjustment knobs.
3. Study honey-bee/butterfly, snail shell, Starfish, Pigeon (through models).
4. Identify the given specimen of a fungus – Mushroom, gymnosperm- pine cone

**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 (including multimedia)

## CLASS XII (2020 - 21) (THEORY)

**Time:3 Hours**

**Max. Marks:70**

| Unit | Title                              | Marks     |
|------|------------------------------------|-----------|
| VI   | Reproduction                       | 14        |
| VII  | Genetics and Evolution             | 18        |
| VIII | Biology and Human Welfare          | 14        |
| IX   | Biotechnology and its Applications | 12        |
| X    | Ecology and Environment            | 12        |
|      | <b>Total</b>                       | <b>70</b> |

### Unit-VI Reproduction

#### Chapter-2: Sexual Reproduction in Flowering Plants

Flower structure; development of male and female gametophytes; pollination - types, agencies and examples; outbreeding devices; pollen-pistil interaction; double fertilization; post fertilization events - development of endosperm and embryo, development of seed and formation of fruit; special modes- apomixis, parthenocarpy, polyembryony; Significance of seed dispersal and fruit formation.

#### Chapter-3: Human Reproduction

Male and female reproductive systems; microscopic anatomy of testis and ovary; gametogenesis - spermatogenesis and oogenesis; menstrual cycle; fertilisation, embryo development upto blastocyst formation, implantation; pregnancy and placenta formation (elementary idea); parturition (elementary idea); lactation (elementary idea).

#### Chapter-4: Reproductive Health

Need for reproductive health and prevention of Sexually Transmitted Diseases (STDs); birth control - need and methods, contraception and medical termination of pregnancy (MTP); amniocentesis; infertility and assisted reproductive technologies - IVF, ZIFT, GIFT (elementary

idea for general awareness).

## **Unit-VII Genetics and Evolution**

### **Chapter-5: Principles of Inheritance and Variation**

**Heredity and variation:** Mendelian inheritance; deviations from Mendelism – incomplete dominance, co-dominance, multiple alleles and inheritance of blood groups, pleiotropy; elementary idea of polygenic inheritance; chromosome theory of inheritance; chromosomes and genes; Sex determination - in human being, birds and honey bee; linkage and crossing over; sex linked inheritance - haemophilia, colour blindness; Mendelian disorders in humans -thalassemia; chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

### **Chapter-6: Molecular Basis of Inheritance**

Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central Dogma; transcription, genetic code, translation; gene expression and regulation - lac operon; Genome, Human and rice genome projects; DNA fingerprinting.

## **Unit-VIII Biology and Human Welfare**

### **Chapter-8: Human Health and Diseases**

Pathogens; parasites causing human diseases (malaria, dengue, chikungunya, filariasis, ascariasis, typhoid, pneumonia, common cold, amoebiasis, ring worm) and their control; Basic concepts of immunology - vaccines; cancer, HIV and AIDS; Adolescence - drug and alcohol abuse.

### **Chapter-10: Microbes in Human Welfare**

Microbes in food processing, industrial production, sewage treatment, energy generation and microbes as bio-control agents and bio-fertilizers. Antibiotics; production and judicious use.

## **Unit-IX Biotechnology and its Applications**

### **Chapter-11: Biotechnology - Principles and Processes**

Genetic Engineering (Recombinant DNA Technology).

### **Chapter-12: Biotechnology and its Application**

Application of biotechnology in health and agriculture: Human insulin and vaccine production, stem cell technology, gene therapy; genetically modified organisms - Bt crops; transgenic animals; biosafety issues, biopiracy and patents.

## **Unit-X Ecology and Environment**

### **Chapter-13: Organisms and Populations**

Organisms and environment: Habitat and niche, population and ecological adaptations; population interactions - mutualism, competition, predation, parasitism; population attributes - growth, birth rate and death rate, age distribution.

## Chapter-15: Biodiversity and its Conservation

Biodiversity - Concept, patterns, importance; loss of biodiversity; biodiversity conservation; hotspots, endangered organisms, extinction, Red Data Book, Sacred Groves, biosphere reserves, national parks, wildlife, sanctuaries and Ramsar sites.

### PRACTICALS

**Time allowed: 3 Hours**

**Max. Marks: 30**

| Evaluation Scheme  | Marks   |   |
|--|---|---|
| One Major Experiment 5, 6  | 5   |   |
| One Minor Experiment 2, 3  | 4   |   |
| Slide Preparation 1, 4   | 5   |   |
| Spotting   | 7   |   |
| Practical Record + Viva Voce                                     | Credit to the students' work over the academic session may be given | 4 |
| Investigatory Project and its Project and its Record + Viva Voce |   | 5 |
| <b>Total</b>   | <b>30</b>   |   |

#### A. List of Experiments

1. Prepare a temporary mount to observe pollen germination.
2. Collect and study soil from at least two different sites and study them for texture, moisture content, pH and water holding capacity. Correlate with the kinds of plants found in them.
3. Collect water from two different water bodies around you and study them for pH, clarity and presence of any living organism.
4. Prepare a temporary mount of onion root tip to study mitosis.
5. Study the effect of different temperatures or three different pH on the activity of salivary amylase on starch.
6. Isolate DNA from available plant material such as spinach, green pea seeds, papaya, etc.

#### B. Study/observation of the following (Spotting)

1. Flowers adapted to pollination by different agencies (wind, insects, birds).
2. Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
3. Meiosis in onion bud cell or grasshopper testis through permanent slides.
4. T.S. of blastula through permanent slides (Mammalian).
5. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colour blindness.
6. Common disease causing organisms like *Ascaris*, *Entamoeba*, *Plasmodium*, any fungus causing ringworm through permanent slides, models or virtual images. Comment on symptoms of diseases that they cause.
7. Two plants and two animals (models/virtual images) found in xeric conditions. Comment

- upon their morphological adaptations.
8. Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations.

**Practical Examination for Visually Impaired Students of Classes XI and XII  
Evaluation Scheme**

**Time Allowed: Two hours**

**Max. Marks: 30**

| Topic   | Marks     |
|---|-----------|
| Identification/Familiarity with the apparatus         | 5         |
| Written test (Based on given / prescribed practicals) | 10        |
| Practical Records                                     | 5         |
| Viva  | 10        |
| <b>Total</b>  | <b>30</b> |

**General Guidelines**

- The practical examination will be of two hour duration. A separate list of ten experiments is included here.
- The written examination in practicals for these students will be conducted at the time of practical examination of all other students.
- The written test will be of 30 minutes duration.
- The question paper given to the students should be legibly typed. It should contain a total of 15 practical skill based very short answer type questions. A student would be required to answer any 10 questions.
- A writer may be allowed to such students as per CBSE examination rules.
- All questions included in the question paper should be related to the listed practicals. Every question should require about two minutes to be answered.
- These students are also required to maintain a practical file. A student is expected to record at least five of the listed experiments as per the specific instructions for each subject. These practicals should be duly checked and signed by the internal examiner.
- The format of writing any experiment in the practical file should include aim, apparatus required, simple theory, procedure, related practical skills, precautions etc.
- Questions may be generated jointly by the external/internal examiners and used for assessment.
- The viva questions may include questions based on basic theory / principle / concept, apparatus / materials / chemicals required, procedure, precautions, sources of error etc.

**Class XII**

**A. Items for Identification/ familiarity with the apparatus for assessment in practicals (All experiments)**

- Soil from different sites- sandy, clayey, loamy; Small potted plants, Cactus/*Opuntia* (model), Large flowers, Maize inflorescence.
- Model of *Ascaris* and developmental stages of frog highlighting morula and blastula.
- Beaker, flask, petri plates, test tubes, aluminium foil, paint brush, bunsen burner/spirit lamp/water bath.
- Starch solution, iodine, ice cubes.



**A. List of Practicals**

1. Study of the soil obtained from at least two different sites for their texture.
2. Study of flowers adapted to pollination by different agencies (wind, insects).
3. Identification of T.S of morula or blastula of frog (model).
4. Preparation of pedigree charts of genetic traits such as rolling of tongue, colour blindness.
5. Identify common disease causing organisms like *Ascaris* (*Model*) and learn some common symptoms of the disease that they cause.
6. Comment upon the morphological adaptations of plants found in xerophytic conditions.

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

**Prescribed Books:**

1. Biology, Class-XII, Published by NCERT
2. Other related books and manuals brought out by NCERT (including multimedia)
3. Biology Supplementary Material (Revised). Available on CBSE website.

**Assessment Areas (Theory) 2020-21**  
**Class XII**  
**Biology (044)**

**Time : 3 hrs.**

**Maximum Marks: 70 Marks**

| <b>Competencies</b>                            |     |
|--|-----|
| <b>Demonstrate Knowledge and Understanding</b> | 50% |
| <b>Application of Knowledge / Concepts</b>     | 30% |
| <b>Analyse, Evaluate and Create</b>            | 20% |

**Note:**

- Typology of questions: VSA including MCQs, Assertion – Reasoning type questions; SA; LA-I; LA-II; Source-based/ Case-based/ Passage-based/ Integrated assessment questions.
- An internal choice of approximately 33% would be provided.

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**Suggestive verbs for various competencies**

- **Demonstrate Knowledge and Understanding**  
State, name, list, identify, define, suggest, describe, outline, summarize, etc.
- **Application of Knowledge/Concepts**  
Calculate, illustrate, show, adapt, explain, distinguish, etc.
- **Analyze, Evaluate and Create**  
Interpret, analyse, compare, contrast, examine, evaluate, discuss, construct, etc.