

# GRADE XII

## BIOLOGY

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.

### CLASS XII (THEORY)

**Time: 3 Hrs.**

**Max. Marks: 70**

Unit	Title	No. of Periods	Marks
<b>I</b>	Reproduction	30	14
<b>II</b>	Genetics and Evolution	40	18
<b>III</b>	Biology and Human Welfare	30	14
<b>IV</b>	Biotechnology and its Applications	30	10
<b>V</b>	Ecology and Environment	30	14
<b>Total</b>		<b>160</b>	<b>70</b>

## UNIT 1: REPRODUCTION:

### Chapter-1: Reproduction in Organisms:

Reproduction, a characteristic feature of all organisms for continuation of species; modes of reproduction - asexual and sexual reproduction; asexual reproduction - binary fission, sporulation, budding, gemmule formation, fragmentation; vegetative propagation in plants.

### 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 2: 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.

## **Chapter-7: Evolution**

Origin of life; biological evolution and evidences for biological evolution (paleontology, comparative anatomy, embryology and molecular evidences); Darwin's contribution, modern synthetic theory of evolution; mechanism of evolution - variation (mutation and recombination) and natural selection with examples, types of natural selection; Gene flow and genetic drift; Hardy - Weinberg's principle; adaptive radiation; human evolution.

# **UNIT 3: BIOLOGY AND HUMANA 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-9: Strategies for Enhancement in Food Production:**

Animal husbandry, Plant breeding, tissue culture, single cell protein.

## **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 4: 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 5: 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-14: Ecosystem:

Ecosystems: Patterns, components; productivity and decomposition; energy flow; pyramids of number, biomass, energy; nutrient cycles (carbon and phosphorous); ecological succession; ecological services - carbon fixation, pollination, seed dispersal, oxygen release (in brief).

### 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.

### Chapter-16: Environmental Issues:

Air pollution and its control; water pollution and its control; agrochemicals and their effects; solid waste management; radioactive waste management; greenhouse effect and climate change impact and mitigation; ozone layer depletion; deforestation; case study exemplifying success story addressing environmental issue(s).

## PRACTICALS

**Time: 3 Hrs**

**Max. Marks: 30**

Evaluation Scheme		Marks
One Major Experiment 5, 6, 8, 9		5
One Minor Experiment 2, 3, 4		4
Slide Preparation 1, 7		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:****(60 Periods)**

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. Study the presence of suspended particulate matter in air at two widely different sites.
5. Study the plant population density by quadrat method.
6. Study the plant population frequency by quadrat method.
7. Prepare a temporary mount of onion root tip to study mitosis.
8. Study the effect of different temperatures and three different pH on the activity of salivary amylase on starch.
9. 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. Pollen germination on stigma through a permanent slide or scanning electron micrograph.
3. Identification of stages of gamete development, i.e., T.S. of testis and T.S. of ovary through permanent slides (from grasshopper/mice).
4. Meiosis in onion bud cell or grasshopper testis through permanent slides.
5. T.S. of blastula through permanent slides (Mammalian).
6. Mendelian inheritance using seeds of different colour/sizes of any plant.
7. Prepared pedigree charts of any one of the genetic traits such as rolling of tongue, blood groups, ear lobes, widow's peak and colourblindness.
8. Controlled pollination - emasculation, tagging and bagging.
9. 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.
10. Two plants and two animals (models/virtual images) found in xeric conditions. Comment upon their morphological adaptations.
11. Two plants and two animals (models/virtual images) found in aquatic conditions. Comment upon their morphological adaptations.

**Practical Examination for Visually Impaired Students of Class XII  
Evaluation Scheme**

**Time: 2 Hrs.****Max. Marks: 30**

<b>Topic</b>	<b>Marks</b>
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 practical 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 practical. 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 practical 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)**

Beaker, flask, petri plates, soil from different sites- sandy, clayey, loamy, small potted plants, aluminium foil, paint brush, test tubes, starch solution, iodine, ice cubes, Bunsen burner/spirit lamp/water bath, large flowers, Maize inflorescence, model of developmental stages highlighting morula and blastula of frog, beads/seeds of different shapes/size/texture *Ascaris*, Cactus/*Opuntia* (model).

#### **B. List of Practical:**

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. Study of Mendelian inheritance pattern using beads/seeds of different sizes/texture.

5. Preparation of pedigree charts of genetic traits such as rolling of tongue, colour blindness.
6. Study of emasculation, tagging and bagging by trying out an exercise on controlled pollination.
  
7. Identify common disease causing organisms like *Ascaris (Model)* and learn some common symptoms of the disease that they cause.
8. 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.