ICSE Board Biology Syllabus for Class 11

CLass 11
Biology Syllabus

PAPER I –THEORY

There will be one paper of 3 hours duration dividedinto 2 parts.

Part 1 (20 marks) will consist of compulsory short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of
the entire syllabus.

Part 2 (50 marks) will be divided into two Sections A and B. Candidates are required to answer three out of five questions from Section A and two out of fourquestions from Section B. Each question in this part shall carry 10 marks. All structures (internal and external) are requiredto be taught along with diagrams.

SECTION – A

1. The Living World

(i) Tools of Biology: (Dissecting microscope, compound microscope, electron microscope); Methods of scientific research. Scope of Biology.A brief idea of compound microscope, electron microscope with relation to magnification and resolution power. Phase contrast microscope.

Scientific methods (observation, defining a problem, making a hypothesis, testing or experimenting, theorising), scientific attitude; serendipity. Importance of Biology in fields such as: Biomedical Engineering, Biotechnology, Biochemistry, Medicine, Biophysics, Physiotherapy, Pharmacology, Bioinformatics and Environmental Management.

(ii) Being alive: what does it mean? Life as an expression of energy; and homeostasis. Features common to living organisms. Open and closed systems. Examples of homeostasis – water balance, regulation of body temperature with reference to feedback mechanism.

2. Diversity of Life

(i) Taxonomy and phylogeny, shortcoming of two-kingdom classification, five-kingdom classification: general idea of Monera, Protista, Fungi, Plantae and Animalia.6eed for classification should be discussed.Definition and explanation of the terms taxonomy and phylogeny should be given for a clear understanding; common features of Plantae and Animalia; shortcomings of the two-kingdom classification should be discusse A brief account of the five-kingdom system of classification and characteristics of different kingdoms with examples are required.

(ii) Kingdom Monera: Bacteria - forms of bacteria, reproduction, gram +ve and gram –ve bacteria; economic importance; cyanobacteria: characteristic features;archaebacter .Characteristics of Monera, classification intoeubacteria and archaebacteria. Bacteria: plant characteristics, structure, shape, flagellation, differences between gram +ve and gram -ve bacteria; asexual and sexual reproduction.
A brief idea of photoautotrophic, chemoautotrophic, heterotrophic bacteria and economic importance. Actinomyces: general idea and importance in formation of antibiotics should be discussed. Cyanobacteria: characteristics.
A brief idea of the role of different types of archaebacteria (methanogens, halophiles and thermoacidophils in their extreme environments). A brief idea about viroids, virus and PPLO.

(iii)General characteristics of Kingdom Protista -Characteristics and examples of subgroups:

(a) Chrysophytes (b) Dinoflagellates,
(c) Euglenoids, (d) Slime moulds,
(e) Protozoans.

Chrysophytes, i.e. diatoms, slime moulds. Protozoans to be studied under rhizopods, flagellates, ciliates and sporozoans with brief characteristics and common examples of each.

(iv) Kingdom Fungi: zygomycetes, ascomycetes, basidomycetes, deuteromycetes - general characteristics. Brief idea of lichens and mycorrhizae. General characters with typical examples of zygomycetes, ascomycetes, basidomycetes and deuteromycetes. Definition and explanation of and mycorrhiza.

(v) Plant Kingdom: Algae – Classification and economic importance of Chlorophyceae, Phaeophyceae, Rhodophyceae; structure of Spirogyra; Bryophyta: morphology of Funaria. Pteridophyta – morphology of a Fern;Gymnosperms: morphology and life cycle of Pinus; Angiosperms-monocot and dicot plants. Morphology and modification of root, stem and leaves.Characteristics of sub-groups of algae with examples. Structure of Spirogyra; economic importance of Algae. Bryophytes: characteristics, classification into liverworts and mosses. Morphology of Funaria, Pteridophyta: characteristics. Morphology of a fern. (Individual life cycles to be excluded. General life cycle to be explained in terms of alternation of generations only. Emphasis should be laid on gametophyte and
sporophyte stages).Gymnosperms: characteristics and life cycle of Pinus. Angiosperms: factors of dominance of angiosperms. Modification of roots, stems and leaves for storage, perennation, reproduction and mechanical support.

(vi)Animal Kingdom: animal construction - body plan, symmetry, coelom development, segmentation; distinguishing characters of Porifera, Coelenterata, Platyhelminthes,Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata, Chordata – sub phyla Hemichordata, Urochordata, Cephalochordata and Vertebrata (classes - pisces, amphibia,reptilia, aves and mammalia).Students should be able to define and explain cell aggregate plan, blind-sac plan and tube- within-tube plan, spherical, radial and bilateral symmetry, diploblastic and triploblastic animals, acoelomate, pseudocoelomate, coelomate and haemocoelomate.
Sub-classification of Chordata with reference to notochord.

(vii) Morphology and anatomy of different systems of earthworm, cockroach and frog. The following systems to be taught: digestive,

respiratory, circulatory, excretory, nervous and reproductive (Only an elementaryknowledge of morphology and anatomy of different systems of earthworm, cockroach and frog is required).

3. Organism and Environment

(i) Species and Population: concept of species, interaction between members of a species (cooperation, communication and competition). A general idea that they share a common gene pool and represent the lowest taxonomic group. Reasons for origin of new species; interactions between members of a species. Co-operative interactions: mating, parental care, family formation, aggregation, social organisation, animal societies, home range, territoriality and communication.Competition: intra and interspecific competition.

(ii) Biotic community: intraspecific and interspecific relationship, commensalism, predation, scavenging, parasitism, symbiosis, biotic stability and biotic succession.Trophic organisation, stratification, dominance, variety of species, interactions. Biotic stability: should be taught with examples to show that the larger the number of diverse forms, more stable is the community. Succession: definition to explain the meaning, kinds of succession and significance of ecological succession.

(iii) Ecosystem: biotic and abiotic components, food chain, trophic levels, food webs, ecological pyramids, major ecosystems, man made ecosystem – agro ecosystem.Brief idea about biotic and abiotic components, various types of food chains,
terrestrial ecosystems, food webs, trophic levels, ecological pyramids.Major ecosystems: tropical rain forest, deserts and aquatic (only brief idea about marine and fresh water, example: sea and lake),man-made ecosystems.

SECTIO0 B

4. Unit of Life

(i) Biomolecules: Carbohydrates – classification, functions of Monosaccharides, Disaccharides, Oligosaccharides, Polysaccharides; Proteins – amino acids, essential and non-essential amino acids, peptide bond, classification an functions of proteins; Lipids – classification, properties and structure. Structure of nucleic acids and their functions, differences between DNA and RNA. Carbohydrates, Proteins and Lipids - composition, linking and functions.Properties, general classification andfunctions of monosaccharides (glucose, galactose and fructose), disaccharides (maltose, lactose and sucrose), (glycogen, starch, cellulose).
Proteins: simple (keratins, collagen) and conjugated (chromoprotein, glycoprotein, phosphoprotein, metalloprotein, lipoprotein and nucleoprotein); Lipids –classification, properties and structure of fats and oils. 6ucleotides and 6ucleic acids – D6A, types of R6A.

(ii) Enzymes: molecular structure, general properties, classification, mechanism of enzyme action, allosteric modulation, factors affecting enzyme activity.
General properties, nomenclature and classification of enzymes. Lock and key hypothesis and Induced Fit Theory should be explained with diagram to give a clear concept of enzyme action. Factors affecting enzyme activity should be taught. A brief idea of allosteric modulation, isozymes and zymogens should be given.

(iii) Cell membranes: unit membrane concept, fluid mosaic model, membrane transport, passive and active transport, exocytosis and endocytosis. Facilitated diffusion.Description of fluid mosaic model; experiment to show fluidity of plasma membrane should be discussed. Functions of the plasma
membrane, active and passive transport, endocytosis and exocytosis should be explained. Brief explanation of facilitated diffusion (uniport, symport and antiport) with one example.

(iv) Structural organisation of the cell: cell wall, nucleus, mitochondria, plastids, endoplasmic reticulum, Golgi complex, lysosomes, ribosomes, microfilaments, microtubules, cilia and flagella, vacuoles and cell inclusions. Prokaryotic cell and eukaryotic cell – a comparison Structural organisation of the cell: light and electron microscopic view of the cell should be explained by means of diagrams or charts to give a clear picture of the internal structure
of the cell.Structure and functions of the cell organelles mentioned in the syllabus to be taught with diagrams. General structure of eukaryotic cell; differences and similarities between prokaryotic cell and eukaryotic cell.

(v) Cellular respiration: aerobic and anaerobic, fermentation, glycolysis, Kreb’s cycle, oxidative phosphorylation and respiratory quotient. Amphibolic pathway.
Types of respiration; mechanism of respiration: glycolysis, oxidation of pyruvate, Kreb's cycle. Brief idea of fermentation and. Amphibolic pathway.

5. Continuity of Life

(i) Cell reproduction: cell cycle, mitosis and meiosis.Different stages with diagrams should be explained to give a clear concept of the changes taking place at each step. Significance of mitosis and meiosis should be discussed.

(ii) Fundamentals of Genetics: concept of alleles:dominant and recessive; phenotype and genotype, homozygous and heterozygous, mono and dihybrid crosses. Homologous chromosomes, autosomes and sex chromosomes; alleles – dominant and recessive; phenotype; genotype; homozygous; heterozygous, monohybrid and dihybrid crosses; back cross and test cross, definitions to be taught with simple examples.

(iii) Mendel’s experiments with peas; Mendel’s Principles of inheritance, incomplete dominance, co-dominance, multiple alleles and epistasis. Explanation of the terms heredity and variation; Mendel's Principles of inheritance; reasons for Mendel's success; incomplete dominance and co-dominance, epistasis, multiple alleles –e.g blood groups, polygenic inheritanc.

(iv) Genes: packaging of hereditary material in prokaryotes, bacterial chromosome; plasmid and eukaryotic chromosomes; gene interaction, cytoplasmic inheritance, viral genes, complementary genes, linkage maps, sex determination and sex linkage; gene manipulation, genetic code, protein synthesis. Human genome project. DNA finger printing. Chromosomal theory of inheritance; chromosomes in eukaryotic organisms, autosomes and sex chromosomes, sex-linked traits, sex-linked inheritance,extra chromosomal inheritance, complete and incomplete linkage, chromosomal mapping and its significance; replication of genetic material, functions of genes - expression of genetic information, one gene one enzyme hypothesis, viral gene expression, gene expression in prokaryotes and eukaryotes, ultrastructure of eukaryotic chromosome, genetic code. Transcription, translation, protein synthesis and its
regulation.Human genome project: goal, methodologies,salient features and applications. D6A finger printing – technique, application and ethical issues to be discussed briefly.

(v) Mutation: chromosomal and gene mutations,somatic and heritable mutations, spontaneous and induced mutations; role of mutations in speciation.Mutations - chromosomal, gene, spontaneous and induced mutation. Chromosomal aberrations.

(vi) Recombinant DNA technology and its applications.Restriction enzymes, D6A insertion by vectors and other methods, regeneration of recombinants. In human health – production of insulin, vaccines and growth hormones, gene therapy. In industry – production of expensive enzymes, strain improvement to scale up bioprocesses. In magriculture – GM crops by transfer of genes for nitrogen fixation, herbicide-resistance and pestresistance including Bt crops. Brief idea about Transgenics and GMO with special reference to Bt cotton.

6. Applications of Biology

(i) Animal Husbandry: Dairy farm management, poultry farm management, bee keeping and fisheries. Brief idea of inbreeding, outbreeding, crossbreeding, artificial insemination and measures for farm maintenance.

(ii) Plant diseases: rust and smut of wheat, blightof rice, late blight of potato, bean mosaic and root knot of vegetables. Causative agent, symptom and prevention to be discussed for each.

PAPER II

PRACTICAL WORK – 20 Marks

1. Scientific Techniques Study parts of a dissecting microscope and compound microscope. The students should be able to handle the independently.

2. Physiology Students will be required to carry out sequence of instructions or experiments such as:

(i) Food tests: test for starch, glucose, sucrose,proteins and fats. Food tests: tests should be reported in tabular form. Both positive and negative tests should be reported.

(ii) To demonstrate the effect of thawing, heat andalcohol on permeability of beet root cells. To demonstrate the effect of heat on permeability of cell membraneof beet root cells: should record the observations at very low temperature, room temperature and higher temperature to see the degree of leaching and conclude accordingly.

(iii) To demonstrate the action of an inorganic catalyst (MnO_2) and enzyme (catalase) from potato/ liver on hydrogen peroxide and effect of heat on their activity. Living tissue from plant or animal should be used to show the presence of enzyme catalase and its action on hydrogen peroxide. Its activity should also be observed after boiling and killing the cells and compared.

(iv) Demonstration of the effect of temperature on enzyme (diastase) action on starch solution. Self-explanatory

3. Morphology

(i) Study of different modifications in root, stem and leaves.
(ii) Preparation of temporary slide of Mucor / Rhizopus. The teacher should guide the students on the technique of culture, staining and mounting the material and then observing under the microscope. The students should also be able to make labelled diagrams.

4. Cytology Preparation of -

(i) Stages of Mitosis in onion root tips.
(ii) Stages of Meiosis in grasshopper testes. Correct method of selecting the root tip, fixing, staining and mounting. Different stages should be observed first in low power and after locating the area, the students should see it under high power. Various stages should be drawn and labelled.

5. Spotting: (Three minutes to be given for each spot. Separate continuation sheets should be used which need to be collected at the end of spotting).

(a) Comment and identify:
(i) Stages of mitosis.
(ii) Stages of meiosis
.
(b) Study of stained preparations/specimen of the following: Identification of plants -
(i) Bacteria
(ii) Model of TMV
(iii) Model of bacteriophage
(iv) Rust
(v) Liverworts
(vi) Moss
(vii) Fern
(viii)Pinu
(ix) Spirogyra
(x) Mushroom
(xi) Yeast
(xii) Lichen
(c) Identification of animals -
(i) Amoeba
(ii) Paramoecium
(iii) Bath Sponge
(iv) Hydra
(v) Liver Fluke
(vi) Ascaris
(vii) Leech

(viii) Earthworm
(ix) Prawn/Crab
(x) Centipede/ Millipede
(xi) Honey Bee
(xii) Snail (Pila)
(xiii) Octopus
(xiv) Starfish
(xv) Amphioxus / Herdmania
(xvi) Dogfish
(xvii) Rohu fish
(xviii) Frog
(xix) Snake / Garden lizard
(xx) Sparrow / Pigeon
(xxi) Rabbit/ Squirrel
Students should be taught how to identify, draw, label and give significantly visible characteristics as observed in a given time.

PROJECT WORK A0D PRACTICAL FILE –

Project Work – 7 Marks

Candidate is to creatively execute one project/assignment on any aspect of Biology. Following is only a suggestive list of projects. Teachers may assign or students may choose any one project of their choice.

(i) Project related to experiment on any aspect of plant life.
(ii) Project related to any aspect of environment.
(iii) Projects related to modern researches in Biology, e.g. test-tube babies.
(iv) Role of genetics in investigating crimes.
(v) Yeast fermentation and production of alcohol or any other commercial industry dependant on plants and/or animals or their products. In addition, students may be taught how to culture:Earthworms.Protozoans.
Moulds.
Setting up of an aquarium. Practical File – 3 Marks Teachers are required to assess students on the basis of the Biology Practical file maintained by them during the academic year.