

Biology Syllabus

UNIT 1 : DIVERSITY IN THE LIVING WORLD

1. Characters of Living organisms,
2. Biosystematics,
3. Binomial nomenclature (guidelines and merits),
4. Taxonomic categories,
5. Taxonomical Aids,
6. Systems of classification – Two Kingdom and Five Kingdom classification – (brief description with emphasis on criteria, merits and demerits).
7. Descriptive features of kingdoms: Monera, Protista, Fungi, Plantae and Animalia; viruses, Virioids and Lichens.

UNIT 2 : PLANT KINGDOM

Brief description of Artificial, natural and phylogenetic classification.

2.1 PLANT GROUPS :

Algae –

Salient,

comparative features of Rhodophyta, Phaeophyta and Chlorophyta with examples.

Bryophyta –

General features with special mention on aquatic to terrestrial evolution, alternation of generation of Liverworts and Mosses.

Pteridophytes –

General features with examples Gymnosperms – General features with examples

Angiosperms – Unique features with examples Plant Life Cycle and alternation of generation

2.2 Morphology of Angiosperms

Morphological structures of root, stem and leaf, their structural and functional modifications with examples,

Inflorescence – Racemose, Cymose, morphological characters of flower, fruit and seed.

2.3 Taxonomy of Angiosperms

Description of taxonomical types, families such as Fabaceae, Solanaceae and Liliaceae with examples.

2.4 Anatomy of flowering plants

Tissue:

Meristematic (Classification based on origin, position and plane of division); Permanent (Simple and complex types);
Tissue systems (epidermal, ground and vascular);
Anatomy of root and stem (primary structure) of monocot and dicot;
Anatomy of leaf of monocot and dicot;
Normal secondary growth of stem and root.

UNIT 3 : CELL AND CELL DIVISION

3.1 Cell as a basic unit of life;

Cell theory;

Cell as a self-contained unit,
unicellularity and multicellularity,
prokaryotic and eukaryotic systems.

3.2 **Ultra Structure:**

Prokaryotic and eukaryotic cell,
cell wall,

cell membrane (Fluid Mosaic Model),
membrane transport,

description of cell organelles and their function (nucleus, mitochondria, plastids, endoplasmic reticulum, golgi bodies, lysosomes, cytoskeletal structures, cilia and flagella, centriole, ribosomes).

3.3 **Biomolecules of cell:**

Inorganic and organic materials (carbohydrates, lipids, proteins, nucleic acids - RNA, DNA),

enzymes (properties, chemical nature and mechanism of action).

3.4 **Cell cycle:**

Cell division,

mitosis and meiosis – their significance.

UNIT 4 : PHYSIOLOGY OF PLANTS

4.1 **Transport in plants –**

Means of transport (imbibition, diffusion, osmosis, plasmolysis, permeability, water potential),

absorption and movement – active and passive.

Transpiration:

Mechanism of opening and closing of stomata,
guttation,
significance of transpiration.

Uptake and transport of mineral nutrients.

4.2 Mineral nutrition:

Functions of minerals,
macro and micro elements,
deficiency symptoms of elements.

Toxicity of micronutrients,

Nitrogen metabolism:

Nitrogen cycle,
biological nitrogen fixation,
mechanism,
synthesis of amino acids (reductive amination, transamination).

4.3 Photosynthesis:

Significance,
photosynthetic apparatus,
functional aspects of chlorophyll structure,
action spectra and absorption spectra.

Mechanism:

Photochemical phase,
photo phosphorylation (cyclic and non cyclic electron transport system),
chemiosmotic hypothesis,
biosynthetic phase (C3, C4);
Photorespiration and its mechanism;
Factors affecting photosynthesis (Blackmann's law of limiting factor).

4.4 Respiration:

Significance,
site of respiration,
mechanism:

Glycolysis,
Kreb's cycle,
electron-transport system and oxidative phosphorylation, amphibolic pathway;
Respiratory quotient;
Anaerobic respiration,
fermentation.

UNIT 5 : REPRODUCTION, GROWTH AND DEVELOPMENT

5.1 Modes of reproduction in flowering plants Vegetative propagation (natural and artificial),
micropropagation,

significance.

Sexual reproduction:

Development of male and female gametophytes,
pollination types and factors,
double fertilization,
incompatibility;
seed and fruit development,
parthenogenesis and parthenocarpy,
polyembryonic.

5.2 Plant Growth

Characteristic features,
measurement of growth,
growth curve, growth rate,
differentiation and growth regulators (phytohormones):
auxins,
gibberellins,
cytokinines,
ethylene,
abscisic acid (ABA) and their role.
photoperiodism and vernalisation.

UNIT 6 : ECOLOGY AND ENVIRONMENT

6.1 Organisms and population –

1. Organism and its environment: Factors: biotic, abiotic (air, water, soil, temperature and light);
2. responses to abiotic factors, adaptations, population, population attributes, population growth, Interactions, predation, competition, parasitism, commensalism and mutualism.

6.2 Ecosystem:

1. Structure and function,
2. productivity,
3. decomposition,
4. energy flow,
5. ecological pyramids,
6. ecological succession,
7. nutrient cycling,
8. brief descriptions of major biomes.

6.3 Environmental Issues:

1. Sources of air, water, soil and noise pollution;
2. Major pollutants, their effects and methods of control.

3. Pollution due to radioactive substance, disposal of nuclear wastes.
4. effect and control of radiation pollution,
5. agrochemical and their effects,
6. Green house effect and global warming,
7. ozone depletion,
8. deforestation.

UNIT 7 : BIOTECHNOLOGY

1. Principles of biotechnology,
2. tools of recombinant DNA technology,
3. process of recombinant DNA technology,
4. biotechnological application in agriculture,
5. genetically modified crops,
6. biotechnological applications in medicine,
7. genetically engineered insulin,
8. gene therapy,
9. molecular diagnosis,
10. transgenic animals and ethical issues.

UNIT 8 : ORIGIN AND EVOLUTION OF LIFE

- 8.1 Origin of life, Big bang theory, various theories, panspermia, abiogenesis, chemical evolution – OparinHaldane Hypothesis, Harold Urey & Stanley Miller experiment, Theories of Evolution – Lamarckism, Theory of Inheritance of Acquired Character, Theory of Use and Disuse, Darwinism – Natural selection theory, Example of natural selection – Industrial Melanism, Geological timescale.
- 8.2 Evidences of Evolution – Palaentological, Morphological and Anatomical evidences of evolution
- 8.3 Population Genetics & Evolution – Hardy Weinberg's Equilibrium, genetic drift, founder effect.
- 8.4 Adaptive radiation – Adaptive radiation of marsupials of Australia
- 8.5 Origin and Evolution of Man

UNIT 9 – ANIMAL KINGDOM

- 9.1 Salient features of different Phyla with examples, Grades of organization and body plan, body symmetry, germ layers (diploblastic & triploblastic organization), segmentation, coelom

Phylum Porifera eg: Sycon, Leucosolenia, Spongilla
Phylum Cnidaria eg: Hydra, Obelia, Physalia, Aurelia, Sea Anemone, Corals
Phylum Ctenophora eg: pleurobrachia, etenoplana
Phylum Platyhelminthes eg.: Taenia, Fasciola, Planaria
Phylum Aschelminthes eg: Ascaris, Rhabditis, Wuchereria, Ancylostoma
Phylum Annelida eg: Nereis, Aphrodite, Pheretima, Hirudinaria
Phylum Arthropoda eg: Honeybee, Silkworm, Lac insect, Anopheles, Locust, Limulus
Phylum Mollusca eg: Pila, Pinctada, Sepia, Loligo, Octopus, Aplysia, Deutalium, Chaetopleura
Phylum Echinodermata eg: Asterias, Echinus, Antedon, Sea cucumber, Ophiura.
Phylum Hemichordata eg: Balanoglossus, Saccoglossus
Phylum Chordata – Urochordata eg: Ascidia, Salpa doliolum Cephalochordata eg: Amphioxus
Vertebrata – Classification up to classes
Super class I. Agnatha. Class – Cyclostomata eg: Petromyzon and Myxine.
Super class II. Gnathostomata Class a – Chondrichthyes (Cartilaginous fishes) eg: Scoliodon, Pristis, carcharodon, Trygon.
Class b. Osteichthyes (Bony fishes) eg.: Exocoetus, Hippocampus, Rohu, Catla, Clarius, Betta, Pterophyllum. Class c. Amphibia – eg: Bufo, Rana, Hyla, Salamander, Ichthyophis.
Class d. Reptilia eg: Chelone, Chameleon, Testudo, Hemidactylus, Calotes, Naja, Krait, Viper, Crocodile, Alligator.
Class e. Aves – eg: Corvus, Columba, Psittacula, Struthio, Pavo, Penguin, Vulture.
Class f. Mammalia eg: Platypus, Kangaroo, Whale, Macaca, Panthera, Elephus, Horse, Rat, Dolphin, Cat, Camel, Pteropus.

UNIT 10 : STRUCTURAL ORGANISATION OF THE BODY :

10.1 Animal Morphology: External and internal morphology, Earthworm, Cockroach, Frog.

10.2 ANIMAL TISSUES – Definition, Types of tissues – Epithelial tissue – different types with examples, specialized epithelial tissue with examples, Connective tissue with examples, Muscular tissue with examples, Nervous tissue with examples, Structure and functions of these tissues.

UNIT 11 : GENETICS

11.1 Heredity and variation – Mendel's experiments, Laws of Mendel, Chromosome theory of inheritance, Pattern of inheritance, Incomplete dominance, Codominant chromosomes, Prokaryotic & Eukaryotic Chromosomes, Nucleosomes, Chromosome theory of inheritance, Concept of linkage and crossing over, Principle of gene mapping, sex linked inheritance, sex determination, sex limited and sex influenced inheritance, Mutation, Gene mutation, Chromosomal aberration, Polyploidy, aneuploidy and

Euploidy, Mutation causing agents, Human Genetics, Pedigree Analysis, Genetic Disorders, Sickle cell anaemia, Phenylketonuria, Alzheimer's disease, Down's Syndrome, Klinefelter's Syndrome.

11.2 Nature of Genetic Material: DNA and its structure, Different types of DNA, RNA and its structure, Experiments to prove genetic nature of DNA. DNA and Gene, DNA Replication, Gene expression- Gene and Protein, Biosynthesis of Protein, Genetic code, Regulation of Gene expression in prokaryotes and eukaryotes, Human genome project and DNA finger printing.

UNIT 12 : PHYSIOLOGY OF ANIMALS :

12.1 Nutrition, Different types of nutrition, Different types of nutrients, Malnutrition, Under nutrition, Disorders related to nutrition. Digestion – Human digestive system, Structure of alimentary canal, Glands associated with alimentary canal, Different enzymes secreted by the alimentary canal, Functions of various enzymes, Role of various regions of alimentary canal in absorption, Process of ingestion and digestion, Mechanism of absorption and assimilation of digested food components.

12.2 Respiration – Aerobic and Anaerobic Respiration, Mechanism of gas exchange, Human Respiratory system, Respiratory organs and mechanism involved in pulmonary respiration, Gas exchange and transport of respiratory gases, Respiratory pigments involved, Regulation of respiration, Respiratory disorders, Bronchitis, Bronchial Asthma, Emphysema, Occupational lung diseases, Causes of these disorders – symptoms, prevention and cure.

12.3 Circulation – composition of blood, structure and functions of different types of blood cells, Blood groups, Structure and working of heart, pulmonary, systemic and portal circulation, Pulse, heart beat and blood pressure, Rhythmicity of heart, Regulation of heart beat, Blood related disorders – hypertension, atherosclerosis and arteriosclerosis, Electro cardio gram, Heart failure, Lymph and its functions.

12.4 Excretion – Definition, Different types of excretory organs – Skin, lungs and liver as excretory organs, Nitrogenous excretion, Different types of Nitrogenous excretion with examples, Ammonotelism, ureotelism and uricotelism, Excretory system in man, Structure of kidney, Composition and formation of urine, Role of Kidney in osmoregulation, Hormonal regulation of excretory system, Dialysis.

12.5 Locomotion and Movement – Human skeleton, Axial and appendicular skeleton, Joints, Types of joints with examples, Bone and cartilage, Structure of Bone and Cartilage, Disorders of bone and cartilage – Arthritis and Osteoporosis, Muscles, Different types of muscles, Structure of skeletal muscles, Mechanism of muscle contraction, Role of red and white muscles in movement, Role of muscles and bones in

movement.

12.6 Nervous Co-ordination, Human nervous system, Morphology of functional subsystems of nervous system, Different types of nerve cells, Structure and functions of brain and spinal cord, Nerve impulse, Synapse, Transmission and conduction of nerve impulse, Reflex action, Reflex arc, Sensory receptors, Structure and functions of eye and ear.

12.7 Hormones, Different types of hormones, Hormones produced by human endocrine glands and their functions, Hormone imbalance and disorders, Role of hormones as messengers and regulators, Feed back control of various hormones. Mechanism of hormone action.

UNIT 13 : REPRODUCTION AND DEVELOPMENT IN ANIMALS

13.1 Reproduction, Different types of asexual reproduction with examples, Sexual reproduction, Reproductive organs, Structure and function of human male and female reproductive system, Reproductive cycle in human female, Gametogenesis, fertilization (Physical and chemical events), Development of zygote up to 3 germinal layers and their derivatives, Extra embryonic membranes, Structure and functions of placenta, parturition and lactation.

13.2 Reproductive health – Population explosion and birth control, Medical termination of pregnancy, sexually transmittable diseases, Infertility.

UNIT 14 : BIODIVERSITY AND CONSERVATION

1. Biodiversity definition,
2. Significance of biodiversity,
3. Magnitude of biodiversity,
4. Levels of biodiversity,
5. gradients of biodiversity,
6. Uses of biodiversity,
7. Threats of biodiversity,
8. Endangered species,
9. Extinction,
10. Causes of extinction,
11. Conservation of biodiversity, protected areas, National and International efforts,
12. Role of Governmental and non-governmental organizations in conservation of bio-diversity,
13. Environmental ethics,
14. Responsibility of individual in biodiversity conservation.

UNIT 15 : BIOLOGY IN HUMAN WELFARE

15.1 Human Health and Diseases – common diseases in humans – Typhoid, pneumonia, common cold, malaria, amoebiasis, ascariasis, elephantiasis. Immunity – innate and acquired, active and passive immunity, vaccination and immunization, allergies, autoimmunity, immune system in the body, AIDS, cancer, drugs and alcohol abuse, common problems of adolescence, Social and moral implications, Problems associated with drugs, smoking and alcoholism, prevention and control.

15.2 Strategies for enhancement in food production, Animal husbandary, dairy farming, poultry farming, animal breeding, bee keeping, pisciculture, plant breeding, breeding for disease resistance and tissue culture, single cell protein.

15.3 Microbes in human welfare – Microbes in household projects, microbes in industrial products, fermented beverages, antibiotics, chemicals, enzymes and other bioactive molecules – microbes in sewage treatment, microbes in production of biogas, microbes as biocontrol agents and microbes as biofertilizers.