

# SECTION 1: BIOLOGY

## 1.1. Content List for Biology

#	Content
1	Biodiversity (acellular life/ variety of life)
2	Bio-energetic
3	Biological Molecules
4	Cell Structure and function
5	Coordination and control/ nervous & chemical Coordination
6	Diversity among Animals
7	Enzymes
8	Evolution
9	Life process in Animals & Plants (nutrition/ gaseous exchange/ transport)
10	Prokaryotes
11	Reproduction
12	Support & movement
13	Variation & genetics/ inheritance

## 1.2. Subtopics & Learning Objectives

<p><b>1- BIODIVERSITY (ACELLULAR LIFE/ VARIETY OF LIFE)</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Classification of viruses</li> <li>• Discovery of viruses</li> <li>• Structure of viruses</li> <li>• Viral disease (for example AIDS)</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <ol style="list-style-type: none"> <li>1.1 Trace the discovery of virus</li> <li>1.2. Classify viruses on basis of their structure/ number of strands/ diseases/ host etc.</li> <li>1.3. Identify symptoms, mode of transmission and cause of viral disease (AIDS)</li> </ol>
<p><b>2- BIOENERGETICS</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Anaerobic respiration (respiration without oxygen)</li> <li>• Electron transport chain</li> <li>• Glycolysis/glycolytic pathway/aerobic respiration</li> <li>• Light dependent and light independent phases/reactions,</li> <li>• Oxidative phosphorylation /cyclic and non- cyclic phosphorylation,</li> <li>• Photosynthesis,</li> <li>• Production of ATP</li> <li>• Role of light, water, CO<sub>2</sub>, /factors effecting photosynthesis</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <ol style="list-style-type: none"> <li>2.1. Explain the process of photosynthesis</li> <li>2.2. Explain the role of factors (light, water, CO<sub>2</sub>) affecting photosynthesis</li> <li>2.3. Explain light dependent and independent phases/reaction</li> <li>2.4. Differentiate among Electron transport chain, phosphorylation, glycolysis, aerobic and anaerobic respiration</li> </ol>
<p><b>3- BIOLOGICAL MOLECULES</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Introduction to biological molecules</li> <li>• Water</li> <li>• Carbohydrates</li> <li>• Proteins</li> <li>• Lipids</li> <li>• Conjugated molecules (glycolipids, glycoproteins)</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <ol style="list-style-type: none"> <li>3.1. Define and classify biological molecules.</li> <li>3.2. Discuss the importance of biological molecules</li> <li>3.3. Describe biologically important properties of water (polarity, hydrolysis, specific heat, water as solvent and reagent, density, cohesion/ionization)</li> <li>3.4. Discuss carbohydrates: monosaccharides (glucose), oligosaccharides (cane sugar, sucrose, lactose), polysaccharides (starches, cellulose, glycogen)</li> <li>3.5. Describe proteins: amino acids, structure of proteins</li> <li>3.6. Describe lipids: phospholipids, triglycerides, alcohol and esters (acylglycerol)</li> <li>3.7. Give an account of RNA</li> <li>3.8. Discuss conjugated molecules (glycol lipids, glycol proteins)</li> </ol>

#### 4- CELL STRUCTURE & FUNCTION

##### SUBTOPICS

- Cell wall,
- Cytoplasm and cell organelles
  - Nucleus
  - Endoplasmic reticulum
  - Mitochondria
  - Golgi apparatus/ golgi complex / golgi bodies
  - Lysosomes
  - Plastids/chloroplasts
  - Vacuoles
- Prokaryote and eukaryote
- Fluid mosaic model

##### LEARNING OBJECTIVES

- 4.1. Compare the structure of typical animal and plant cell
- 4.2. Compare and contrast the structure of prokaryotic cells with eukaryotic cells
- 4.3 Outline the structure and function of the following organelles: nucleus, endoplasmic reticulum, golgi apparatus, mitochondria
- 4.4. Discuss fluid mosaic model of cell membrane

#### 5- COORDINATION & CONTROL/ NERVOUS & CHEMICAL COORDINATION

##### SUBTOPICS

- Nervous system
  - Nerve impulse
  - Steps involved in nervous coordination
  - Neurons (Structure and Types)
- Transmission of action potential between cells–synapse
  - Electrical synapses
  - Chemical synapses
  - Transmission of nerve impulse across synapse
- Hormones
- Endocrine glands
- Feedback mechanism
  - Positive feedback mechanism
  - Negative feedback mechanism
- Reflexes and reflex arc
- Levels of the spinal cord and its main functions
- Parts of the brain with their main functions

##### LEARNING OBJECTIVES

- 5.1. Recognize receptors as transducers sensitive to various stimuli.
- 5.2. Define neurons
- 5.3. Explain the structure of a typical neuron (cell body, dendrites, axon and myelin sheath and schwann cells)
- 5.4. Define nerve impulse
- 5.5. List the levels of the spinal cord
- 5.6. List the functions of the spinal cord
- 5.7. Classify reflexes
- 5.8. Briefly explain the functions of components of a reflex arc
- 5.9. List the main parts of the brain (e.g., components of brain stem, mid brain, cerebellum, cerebrum)
- 5.10. Describe the functions of each part

<p><b>6- DIVERSITY AMONG ANIMALS (THE KINGDOM ANIMALIA)</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Characteristics and diversity among the animals (animal phyla, characteristics)</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>6.1. Describe general characteristic of animals</p>
<p><b>7- ENZYMES</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Introduction/characteristics of enzymes</li> <li>• Mechanism of action of enzymes</li> <li>• Factors effecting rate of enzyme action</li> <li>• Enzyme inhibition</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>7.1. Describe the distinguishing characteristics of enzymes 7.2. Explain mechanism of action of enzymes 7.3. Describe effects of factor on enzyme action (temperature, pH, concentration) 7.4. Describe enzyme inhibitors</p>
<p><b>8- EVOLUTION</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Concepts of evolution</li> <li>• Inheritance of acquired characteristics</li> <li>• Darwinism'</li> <li>• Darwin's theory evolution</li> <li>• Neo-Darwinism's</li> <li>• Evidence of evolution</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>8.1. Explain origin of life according to concept of evolution 8.2. Describe the theory of inheritance of acquired characters, as proposed by Lamarck. 8.3. Explain the theory of natural selection as proposed by Darwin</p>
<p><b>9- LIFE PROCESSES IN ANIMALS &amp; PLANTS (NUTRITION/ GASEOUS EXCHANGE/ TRANSPORT)</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Carnivorous plants/parasitic nutrition (pitcher plant, venus fly trap, sundew)</li> <li>• Water and mineral uptake by roots, xylem and phloem</li> <li>• Osmotic pressure/potential</li> <li>• Cardiovascular system (including human heart structure, blood vessels)</li> <li>• Respiratory system</li> <li>• Digestive system</li> <li>• Immune &amp; system</li> <li>• Lymphatic system</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>9.1. Discuss the examples of carnivorous plants (pitcher plant, venus fly trap, sundew) 9.2. Describe osmotic pressure and its importance in life processes in animals and plants 9.3. Describe water and minerals uptake by roots, xylem and phloem 9.4. List general structure of human heart 9.5. Define the phases of a cardiac cycle 9.6. List the differences and functions of capillaries, arteries and veins 9.7. Describe lymphatic system (organs, nodules, vessels)</p>

	<p>9.8. Define and discuss the functions and importance of main components of immune system</p> <p>9.9. Discuss the functions of main part of respiratory system</p> <p>9.10. Discuss the role of surfactant in gas exchange</p> <p>9.11. Discuss the process of gas exchange in human lungs</p> <p>9.12. List the parts of human digestive system</p> <p>9.13. Explain the functions of the main parts of the digestive system including associated structures and glands</p>
<p><b>10- PROKARYOTES (KINGDOM MONERA)</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Cellular Structure of bacteria</li> <li>• Shape and size of bacteria</li> <li>• Importance and control of bacteria</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>10.1. Describe cellular structures of bacteria</p> <p>10.2. Explain diversity in shape and size in bacteria</p> <p>10.3. Highlight the importance of bacteria and control of harmful bacteria</p>
<p><b>11- REPRODUCTION</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Male reproductive system</li> <li>• Female reproductive system (including menstrual cycle)</li> <li>• Sexually transmitted diseases</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>11.1. Describe the functions of various parts of the male &amp; female reproductive systems and the hormones that regulate those functions</p> <p>11.2. Describe the menstrual cycle (female reproductive cycle) emphasizing the role of hormones</p> <p>11.3. List the common sexually transmitted diseases along with their causative agents and main symptoms</p>
<p><b>12- SUPPORT &amp; MOVEMENT</b></p>	<p><b>SUBTOPICS</b></p> <ul style="list-style-type: none"> <li>• Cartilage</li> <li>• Types of muscles                         <ul style="list-style-type: none"> <li>- Skeletal muscles</li> <li>- Cardiac muscles</li> <li>- Smooth muscles</li> </ul> </li> <li>• Structure of skeletal muscles</li> <li>• Mechanism of skeletal muscle contraction</li> <li>• Types of joints</li> <li>• Arthritis</li> </ul> <p><b>LEARNING OBJECTIVES</b></p> <p>12.1. Define cartilage, muscle and bone</p> <p>12.2. Explain the main characteristics of cartilage and bone along with functions of both</p> <p>12.3. Compare characteristics of smooth muscles, cardiac muscles and skeletal muscles</p> <p>12.4. Explain the ultra-structure of skeletal muscles</p> <p>12.5. Describe in brief the process of skeletal muscle contraction</p> <p>12.6. Classify joints</p> <p>12.7. Define arthritis</p>

## 13- VARIATION & GENETICS/ INHERITANCE

### SUBTOPICS

- Mendel's law of inheritance
  - Gregor John Mendel and his work
  - Mendel's experiment
  - Inheritance of single trait
  - Mendel's principles of inheritance
  - Inheritance of two traits
  - Law of independent assortment
  - Scope of independent assortment in variation
  - Statistics and probability relevant to genetics
- Multiple alleles
- Gene linkages and crossing over
- Sex linkages in drosophila
- Sex linkage in human
  - Genetics of hemophilia

### LEARNING OBJECTIVES

- 13.1. Associate inheritance with the laws of Mendel.
- 13.2. Explain the law of independent assortment, using a suitable example.
- 13.3. Describe the terms gene linkage and crossing over
- 13.4. Explain how gene linkage counters independent assortment and crossing-over modifies the progeny
- 13.5. Describe the concept of sex-linkage.
- 13.6. Briefly describe Inheritance of sex –linked traits
- 13.7. Analyze the inheritance of hemophilia.