

# LEARNING OUTCOMES

## BIOLOGY (G9 to G12)

## Grade 9 Learning Outcomes

- Describe the respiratory system.
- State the cell theory.
- Name the major organelles found in a eukaryotic cell and identify their functions.
- Relate the role of each of the six classes of nutrients in maintaining a healthy body.
- Describe the process of photosynthesis
- Summarize the events taking place in the Calvin cycle
- Compare aerobic and anaerobic cellular respirations
- Describe the different phases of the cell cycle.
- Describe each phase of mitosis and meiosis.
- Describe how Mendel's results can be explained by scientific knowledge of genes and chromosomes.
- Use a Punnett square to predict the result of monohybrid crosses in case of autosomal dominance, co-dominance, non-dominance and sex-linked genes.

## Brevet Learning Outcomes

- Explain the role of different enzymes in the digestion of food.
- Explain the molecular simplification of complex food into simpler nutrients.
- Describe the organization of the respiratory system.
- Explain gas exchange between the lungs and blood.
- Identify the anatomy of the heart.
- Describe the cardiac cycle.
- Explain the causes for cardiovascular disease.
- Identify DNA as the hereditary material in all living organisms.
- Describe the cell cycle.
- Identify Mendel's principles of segregation and independent assortment.
- Deduce the pattern of inheritance of hereditary characters based on pedigree analysis.

## Grade 10 Learning Outcomes

- Identify structures and processes that allow the cell to interact with its environment and to maintain homeostasis.
- Describe the structure and functions of the plasma membrane.
- Identify and compare the different types of transport across the plasma membrane according to molecule nature and concentration gradients
- Identify the anatomical distribution and functions of, the organs and cells of the urinary system.
- Identify trends in the evolution of plants, and describe the main plant phyla.
- Describe the plant life cycle.

- Describe the process of photosynthesis.
- Explain how the efficiency of energy transfers between trophic levels affects ecosystem structure and dynamics.
- Describe biogeochemical cycles.
- Describe the immune system.

### Grade 11 Learning Outcomes

- Identify DNA as the hereditary genetic material in all living organisms.
- Explain the “central dogma” of protein synthesis.
- Identify Mendel’s principles of segregation and independent assortment.
- Deduce the pattern of inheritance of hereditary characters based on pedigree analysis.
- Explain the principles of biogenesis and spontaneous generation.
- Identify and explain the main lines of evidence that corroborate the occurrence of evolution.
- Explain the principles of natural selection, and its driving forces.
- Describe the principle of Hardy-Weinberg equilibrium.
- Identify the importance of classification and determine the most recent system of classification
- Determine the functions, and anatomy of the nervous system.
- Determine the functions and anatomy of the endocrine system.

### Grade 12 Learning Outcomes

- Identify the different types of animal behavior. (Learning, movement, communication and feeding.)
- Identify population characteristics and dynamics.
- Identify the different biomes and their characteristics.
- Describe evolutionary relationships of taxa.
- Describe the structure of a virus
- Describe the main groups of bacteria
- Identify fungal characteristics
- Identify characteristics of porifera
- Identify characteristics of cnidarians and their groups
- Identify characteristics of ctenophores
- Identify characteristics of chordates
- Identify characteristics of mammals
- Describe the anatomical distribution, organs, structures and cells of the supportive and locomotory systems (the skeletal system and the muscular system)

### SE Learning Outcomes

- Define biotechnology and explain its impact on medicine specifically its use in recombinant vaccines and monoclonal antibodies.
- Describe the basic structure of a neuron, and compare the functions of the three classes of neurons.

- Explain how a nerve impulse is transmitted across a chemical synapse.
- Identify the consequences of chemical perturbation of the synapse such as in Parkinson's and Alzheimer's disease.
- Describe the steps in a reflex arc.
- Describe the relationship between the hypothalamus and the pituitary gland.
- List the functions of the major endocrine glands and hormones.
- Explain the role of feedback mechanisms in maintaining homeostasis.
- Identify different physical and psychological stress-causing agents and explain the behavioural and hormonal changes they might cause.
- Classify drugs.
- Identify characteristics of drug addicts.
- Compare and contrast the specific mechanisms whereby the most common illicit drugs affect the nervous system.

### LS Learning Outcomes

- Identify the organs and glands of the female and male reproductive systems.
- Explain the segregation of alleles into gametes, and the fusion of gametes during fertilization.
- Identify Mendel's principles of segregation and independent assortment.
- Deduce the pattern of inheritance of hereditary characters based on pedigree analysis.
- Describe cyclical variations of female hormones and their effect on reproductive cycles.
- Identify the organs and hormones involved in the regulation of glycemia.
- Describe the cells of the immune system.
- Describe the structure and functions of antibodies.
- Describe the types of immune responses.
- Identify the processes that occur during resting membrane potential and action potential.
- Describe reflex arcs.