Unit 09 Microbiology (50 Periods)

9.1.0	**Investigate diversity and handling of micro-organisms**
9.1.1	Explores the diversity and nature of micro- organisms
9.1.2	explores some basic laboratory techniques in microbiology
9.2.0	**Investigates microorganisms as human pathogens**
9.2.1	Explores the concepts, principles relevant to infectious diseases
9.2.2	Explores the methods of controlling microbial population
9.3.0	**Investigates the use of micro –organisms in industry, agriculture , Environment and contribution of soil micro-organisms for agriculture**
9.3.1	Investigates and explores the use of microorganisms in industry, agriculture and Environment
9.3.2	Uses the functions of soil micro- organisms to maintain soil health
9.4.0	**Utilizes the microbiological concepts and principles to maintain the quality of water**
9.4.1	Uses the microbiological concepts and principles in potable water and waste water management
9.5.0	**Explores the impact of microbes on food**
9.5.1	Contributes to the prevention of diseases that are caused by spoiled food

Unit 10 Applied Biology (24 Periods)

10.1.0	**Uses biological concepts and principles to promote the living standards**
10.1.1	Investigates ornamental fish culture systems
10.1.2	Investigates on opportunities related to horticultural practices
10.1.3	Uses biological knowledge and understanding in minimizing damage caused By vector - borne diseases
10.1.4	Utilizes the knowledge on food preservation and postharvest losses for successful applications in day to day life
10.1.5	Gets updated in applications of emerging technologies related to biology

Important Websites …….

- **National Institute of Education: https://nie.lk/showom**
- **https://advanceonlineclass.com**
- **https://kuppiyastore.lk/**

BIOLOGY

SYLLABUS

(Implemented from 2017)

Department of Science
National Institute of Education
Sri Lanka
www.nie.lk

- Biology as the scientific study of living organisms is essential for all individuals to co-exist successfully with biotic and abiotic environment.
- Study of Biology is important in a number of aspects;
  1. To have a broad view of concepts, principles and theories related to organisms
  2. To seek solutions and alternatives for the current issues faced by mankind such as HIV pandemic , cancers, reduced agricultural production, environmental degradation etc
  3. To develop awareness to foster values related to nature and to conserve environment.

- The Biology syllabus for G.C.E. (A/L) has been developed with the intention of developing personal skills, interpersonal skills and thinking skills of the target student populations. This syllabus is in par with international syllabi of this subject at this level.
- Revision of the Biology syllabus has been done taking in to consideration the requirements of students who enter tertiary level education as well as the majority which follow other carrier paths. Apart from that, the enhanced knowledge of biological principles and their applications are beneficial in day to day life pursuits and the needs of the society.

1.1 National goals

1. Based on the concept of respecting human values and understanding the differences between the Sri Lankan multicultural society, building up the nation and confirming the identity of Sri Lanka by promoting national integrity, national unity, national coherence and peace.
2. While responding to the challenges of the dynamic world, identifying and conserving the national heritage.
3. Creating an environment which comprises the conventions of social justice and democratic life to promote the characteristics of respecting human rights, being aware of the responsibilities, concerning each other with affectionate relationships.
4. Promoting a sustainable life style based on the people's mental and physical wellbeing and the concept of human values.
5. Promoting positive feelings needed for a balanced personality with the qualities of creative skills, initiative, critical thinking and being responsible.
6. Developing the human resources, needed for the progress of the wellbeing of an individual, the nation as well as the economic growth of Sri Lanka, through education.
7. Preparing the people for the changes that occur in a rapidly changing world by adapting to it and controlling them; developing abilities and potentialities of people to face the complex and unexpected occasions.
8. Sustaining the skills and attitudes based on justice, equality, mutual respect which is essential to achieve a respectable place in the international community.
9. National Education Commission Report (2003).

1.2 Basic Competencies

- The competencies promoted through the education mentioned below help to achieve the above mentioned National Goals.

i. Competencies in Communication

- This first set of competencies is made up of four subsets - Literacy, Numeracy, Graphics and Information Communication skills:
- Literacy : Listening, carefully speaking clearly, and reading for comprehension, writing clearly and accurately.
- Numeracy: Using numbers to count, calculate, code and to measure, matter, space and time.
- Graphics : Making sense of line and form, expressing and recording essential data, instructions and ideas with line, form, colour, two and three-dimensional configurations, graphic symbols and icons.
- ICT Competencies: Knowledge on computers, and the ability to use the information communication skills at learning or work as well as in private life.

ii. Competencies relating to personality development

- Generic skills such as creativity, divergent thinking, initiative, decision making, problem-solving, critical and analytical thinking, team work, inter-personal relationships, discovering and exploring
- Values such as integrity, tolerance and respect for human dignity.
- Cognition

iii. Competencies relating to the environment

- This is the second set of competencies related to the Social, Biological and Physical Environments.
- **Social Environment**: Awareness, sensitivity and skills linked to being a member of society, social relationship, personal conduct, general and legal conventions, rights, responsibilities, duties and obligations.

Unit 06 Genetics (22 Periods)

6.1.0	**Explores the basic principles of genetics for applications**
6.1.1	Inquires the Scientific basis of Mendel's Experiments
6.1.2	Examines the patterns of inheritance of Mendelian characters in human.
6.1.3	Uses concepts and principles to explain genetic patterns that deviate from Mendel's laws.
6.1.4	Investigates evolution of life by using changes in gene frequencies.
6.1.5	Explore the basic concepts in plant and animal breeding

Unit 07 Molecular Biology & Recombinant DNA Technology (42 Periods)

7.1.0	**Investigate the molecular basis of genetic materials**
7.1.1	Examines the structures and functions of genetic materials
7.1.2	Examine genes and how they work
7.1.3	Examine the molecular basis of mutations
7.2.0	**Gets updated on gene technology**
7.2.1	Gets updated on tools, techniques and methods of gene technology
7.2.2	Gets updated on DNA analysis
7.2.3	Updates on the applications of gene technology

Unit 08 Environmental Biology (41 Periods)

8.1.0	Engages in a biological analysis on relationships between organisms and their environment.
8.1.1	Investigates components of an ecosystem
8.1.2	Investigates major processes of an ecosystem
8.2.0	**Explores the heterogeneous nature of the biotic component of global and local environment**
8.2.1	Investigates main biomes of,the world
8.2.2	Investigates ecosystems of Sri Lanka
8.3.0	**Explore biodiversity as a component of the environment**
8.3.1	Explores biodiversity and threats due to human actions
8.3.2	Gets updated on the global environmental problems
8.4.0	**Explores methods of Biodiversity and environmental conservation**
8.4.0	explores global issues related to environment
8.4.1	Investigates how biodiversity and environment can be conserved at global and national level

5.3.4	Explores the diversity of respiratory structures in the animal kingdom
5.3.5	Relates the structure of the human respiratory system to its functions.
5.4.0	**Explores immunity**
5.4.1	Explores types of immunity
5.5.0	**Explores osmoregulatin and excretion**
5.5.1	Examines the relationship between metabolism and excretory substances
5.5.2	Investigate the diversity of excretory structures of organisms
5.5.3	Investigates the gross functioning of the human urinary system
5.6.0	**Investigates the structures & functions involved in nervous coordination**
5.6.1	Inquires in to the processes and systems involved in coordination.
5.6.2	Investigates the gross structure & functions of the human nervous system.
5.6.3	Explores how nerve impulses are generated and transmitted.
5.6.4	Explores the injuries and common disorders of the nervous system
5.6.5	Explores the functions of different sensory structures in human
5.6.7	Relates the structures of the eye and ear to their functions.
5.6.8	Investigates the basic structure and functions of the human skin
5.7.0	**Explores endocrinal regulation and homeostasis**
5.7.1	Analyses the role of human endocrine system
5.7.2	Investigates how a constant Internal environment is maintained within a range
5.8.0	**Inquires into the reproductive process in animals**
5.8.1	Inquires into different types of reproduction in animals
5.8.2	Inquires structure and functions of male reproductive system
5.8.3	Inquires in to structure and functions of female reproductive system.
5.8.4	Inquires into the processes involved in fertilization up to birth
5.8.5	Develops an awareness on reproductive health.
5.9.0	**Inquires into the types of supporting systems and movement in organisms.**
5.9.1	Inquires into the structure and functions of the Skeletal systems and movement of animals.
5.9.2	Investigates the structure and functions of the axial skeleton of man.
5.9.3	Investigates the structure and functions of the appendicular skeleton of man.
5.9.4	Investigates on the main types of joints and mechanism of skeletal muscle movement

- **Biological Environment**: Awareness, sensitivity and skills linked to the living world, man and the ecosystem, the trees, forests, seas, water, air and life - plant, animal and human life.
- **Physical Environment**: Awareness, sensitivity and skills relating to space, energy, fuel, matter, materials and their links with human living, food, clothing, shelter, health, comfort, respiration, sleep, relaxation, rest, waste and excretion, media of communication and transport.

(*Included here are the skills in using tools to shape and for materials for living and learning)*.

iv. Competencies relating to preparation for the world of work

- Employment related skills to maximize their potential and to enhance their capacity to contribute to economic development; to discover their vocational interests and aptitudes; to choose a job that suits their abilities and to engage in a rewarding and sustainable livelihood.

v. Competencies relating to religion and ethics

- Develop competencies pertaining to managing environmental resources intelligently by understanding the potential of such resources.
- Develop competencies related to the usage of scientific knowledge to lead a physically and mentally healthy life.
- Develop competencies pertaining to becoming a successful individual who will contribute to the development of the nation in collaboration, engage in further studies and undertake challenging job prospects in the future.
- Develop competencies related to understanding the scientific basis of the natural phenomena and the universe.
- Use appropriate technology to maintain efficiency and effectiveness at an optimum level in utilizing energy and force.

2. 0 Aims of the syllabus

At the end of this course students will be able to;

1. develop an interest and desire to expand and deepen the knowledge in the field of Biology
2. understand the concepts , phenomena, principals and processes in Biology through collaborative learning practices
3. adjudicate our place in nature ; understand our interactions and impact upon the natural and social environment
4. develop the ability to plan investigative processes and to solve problems in the field of Biology.
5. develop a sense of belonging to the environment and identify the country's natural habitats, together with a positive attitude towards fauna and flora, in order to foster responsibility and involvement in preserving and protecting nature and the quality of the environment.
6. develop sensitivity to current practical problems of everyday life
7. develop an awareness of good habits for maintaining hygiene, health and quality of life

List of topics and allocated number of periods

Topic	**Number of periods**
Unit 01 Introduction to Biology	05
Unit 02 Chemical & cellular basis of life	85
Unit 03 Evolution and diversity of organisms	61
Unit 04 Plant form and function	77
Unit 05 Animal form and function	193
Unit 06 Genetics	22
Unit 07 Molecular Biology & Recombinant DNA Technology	42
Unit 08 Environmental Biology	41
Unit 09 Microbiology	50
Unit 10 Applied Biology	24
Total	**600**

Proposed term wise breakdown of the syllabus

Grade	Term	Competency levels
Grade 12	First Term	From 1.1.1 to 3.2.3 (16 Competency Levels)
	Second Term	From 3.2.4 to 4.5.1 (17 Competency Levels)
	Third Term	From 5.1.1 to 5.5.3 (12 Competency Levels)
Grade 13	First Term	From 5.6.1 to 6.1.5 (23 Competency Levels)
	Second Term	From 7.1.1 to 8.5.1 (14 Competency Levels)
	Third Term	From 9.1.1 to 10.1.5 (12 Competency Levels)

Unit 01—Introduction to Biology (05 Periods)

1.0	**Conducts investigations from a biological perspective.**
1.1.1	Elaborates on the nature, scope and importance of biology with reference to challenges faced by the mankind
1.1.2	Reviews the nature and the organizational patterns of the living world

Unit 02—Chemical & cellular basis of life (85 Periods)

2.1.0	**Investigates the chemical basis of life.**
2.1.1	Inquires into the elemental composition of living organism
2.1.2	Investigates the physical and chemical properties of water important for life
2.1.3	Examines the chemical nature and functions of main organic compounds of organisms

2.2.0	**Examines cell as the basic functioning unit of life**
2.2.1	Elaborates on the contribution of microscopes to the expansion of knowledge on cells and cellular organization.
2.2.2	Describes the historical background of cell and analyses the structure and functions of the sub cellular units.

2.3.0	**Investigates the importance of cell cycle and cell division.**
2.3.1	Describe the cell cycle and the process of cell division

2.4.0	**Investigates energy relationships in metabolic processes of organisms.**
2.4.1	Analyses the energy relationships in metabolic processes.
2.4.2	Investigates the role of enzymes in regulating metabolic reactions.
2.4.3	Examines photosynthesis as an energy fixing mechanism
2.4.4	Examines cellular respiration as a process of obtaining energy

Unit 3 – Unit 3 –Evolution and diversity of organisms (61 Periods)

3.1.0	**Explores evolution of life**
3.1.1	Uses the theories of origin of life and natural selection to analyze the process of evolution of life
3.2.0	**Explores the diversity of organisms**
3.2.1	Constructs hierarchy of taxa on scientific basis
3.2.2	Explores the diversity of organisms within Domain Bacteria
3.2.3	Explores the diversity of organisms within the kingdom Protista.
3.2.4	Explores the diversity of organisms within the kingdom Plantae
3.2.5	Explores the diversity of organisms within the kingdom Fungi.
3.2.6	Explores the diversity of organisms within the kingdom Animalia
3.2.7	Uses the characteristic features to study organisms belonging to phylum Chordata

Unit 4 – Plant form and function (77 Periods)

4.1.0	**Explores structure, growth and development of plants**
4.1.1	Examines different types of tissues and relates the structure of plant tissues to their functions
4.1.2	Examines the changes taking place in the growth and development process of a plant
4.2.0	**Examines resource acquisition and transport in vascular plants**
4.2.1	Investigates the shoot architecture and light capture
4.2.2	Investigates the process of gaseous exchange in plants
4.2.3	Investigates the concepts of acquisition of water and minerals
4.2.5	Investigates the process involved in transport of materials in plants
4.2.6	Investigates the processes of water loss in plants

Unit 5 - Animal form and function (193 Periods)

5.1.0	**Explores structure, growth and development of animals**
5.1.1	Relates the structure of animal tissues to their functions
5.2.0	**Explores nutrition in animals**
5.2.1	Explores heterotrophic nutrition in animals
5.2.2	Relates the structure of the human digestive system to its functions.
5.3.0	**Investigates on circulation and gas exchange of animals**
5.3.1	Investigates the organization of circulatory systems in animals
5.3.2	Relates the structure of the human circulatory system to its functions.
5.3.3	Inquires into the role of blood.