**District: GASABO**

**Academic Year: 2022-2023**

**School:**

**Subject: BIOLOGY**

**Teacher:**

**Class: S5 MCB, BCG & PCB**

**No of period per week: 7**

**TERM 1**

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| Dates | Unit title | Lesson title and evaluation | Learning objectives(copied or adapted from the syllabus depending on the bunch of lesson)+ key unit competence | Teaching methods& techniques evaluation procedures | Resources&  References | Observation |
| **WEEK 1.**  **26-30/09/2022** | **Unit 1:** Interdependence between organisms within their environment. | 1. Interrelationships among organisms and their effects. 2. Inter and intraspecific relationships between organisms 3. Significance of organisms’ interactions in nature.   ***Evaluation procedures such as oral, written quizzes, practical’s*…** | * Students can explain the various interactions of organisms in nature. * Students can state the significance of organisms’ interactions in nature. * Students can explain the terms interspecific and intraspecific competition. | Lecturing  Explanation using groups, discuss and  interpret the graphical  illustrations for relationships between predators and prey. | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence**: To be able to explain complex relationships between organisms within their environment. | | | | | | |

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| **WEEK 2.**  **03-07/10/2022**  **WEEK 3**  **10-14/10** | **Unit 2:** Transport across the cell membrane. | 1. Diffusion and factors affecting the process of diffusion. 2. Significance of process of diffusion in organisms. 3. Osmosis and significance in organisms. 4. Process of osmosis including: turgidity, plasmolysis, and water potential, osmotic potential and wall pressure. 5. Osmosis in animal cells. 6. Active transport. Process of active transport.   ***Evaluation procedures such as oral, written quizzes, practical’s*…** | * Student can describe and explain the processes and significance of movement in and out of the cell mentioned in the content. * Student can explain the movement of water between cells and solutions with different water potentials and explain the effects on plant and animal cells. | Lecturing Explanation using plant tissues, non-living materials such as glucose solutions and visking tubing.  In groups, investigate and present the effects of immersing plant tissue in solutions of different water potentials. | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 4**  **17-21/10** | 1. Factors affecting the process of active transport. 2. Significance of active transport in organisms. 3. Endocytosis: phagocytosis, pinocytosis, exocytosis.   ***Evaluation procedures such as oral, written quizzes, practical’s*…** |  |
| **Key Unit Competence**: To be able to explain the physiological processes by which materials move in and out of cells and the  significance of these processes in the life of organisms | | | | | | |

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| **WEEK 5**  **24-28/10** | **Unit 3:** Chromosomes and nucleic acids. | 1. Composition of chromosomes. 2. Structure of nucleotides. 3. Structure of nucleic acids: DNA and RNA. | * Student can describe the composition of chromosomes and the structure of nucleotides. * Student can describe the structure of DNA and RNA. * Student can explain the Watson-Crick hypothesis of the nature of DNA. | Lecturing  Explanation in groups use microscopic slides of prophase during mitosis to observe and draw a typical structure of a chromosome.  Using charts and diagrams compare DNA and RNA and then make a group presentation. | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 6**  **31/10-04/11** | 1. The Watson- Crick hypothesis of the nature of DNA. 2. Nature of genes. 3. Structure of a genetic code   ***Evaluation procedures such as oral, written quizzes, practical’s*…** |  |
| **Key Unit Competence:** To be able to describe the structure of a chromosome and how DNA is folded into a chromosome. | | | | | | |

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| **WEEK 7**  **07-11/11** | **Unit 4:** DNA replication. | 1. Mechanism of DNA replication. 2. Experimental evidence of DNA replication. 3. Semiconservative replication. 4. Enzymes involved in replication limited to: helicase, DNA binding proteins, DNA polymerase, and DNA ligase.   ***Evaluation procedures such as oral, written quizzes, practical’s*…** | * Student can determine how the structure of DNA enables it to reproduce itself accurately. * Student can state semiconservative replication as a process by which DNA unzips and each new molecule of DNA (daughter DNA) contains one intact strand from the original DNA (parent DNA) and one newly synthesized strand. | Lecturing  In groups, discuss and present the process of replication of DNA. Use models, illustrations, charts and simulations stages. | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence:** To be able to explain the process of DNA replication and its significance to living organisms. | | | | | | |

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| **WEEK 8**  **14-18/11**  **WEEK 9**  **21-25/11** | **Unit 5:** Cell and nuclear division. | 1. Haploid and diploid conditions of the cell cycle. 2. Mitosis and role of mitosis in living organism.   ***Evaluation procedures such as oral, written quizzes, practical’s*…** | * Student can describe the main stages of the cell cycle. * Student can describe the meaning of the terms haploid and diploid. * Student can describe the process of mitosis and meiosis. * Student can describe the significance of mitosis and meiosis | Lecturing  Explanation using flow chart that shows the process of mitosis and meiosis | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 10**  **28/11-02/12** | 1. Meiosis and its role in living organism and the significance of cell division 2. Comparison of mitosis and meiosis   ***Evaluation procedures such as oral, written quizzes, practical’s*…** |  |
| **Key Unit Competence:** | | | | | | |

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| **WEEK 11**  **05-09/12** | **Revision** |
| **WEEK 12**  **12-16/12** | Examinations periodand supervision of examinations |
| **WEEK 13**  **19-23/12** | Marking, making school reports period and closing the first term. |

**SECOND TERM**

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| Dates | Unit title | Lesson title& evaluation | Learning objectives(copied or adapted from the syllabus depending on the bunch of lesson)+ key unit competence | Teaching methods& techniques evaluation procedures | Resources&  References | Observation |
| **WEEK 1**  (09-13/01) | **Unit 6:** Protein synthesis. | 1. The genetic code. 2. Process of protein synthesis.   ***Evaluation procedures such as oral, written quizzes, practical’s…***   * Students can explain the relationship between a gene and the sequence of nucleotides in DNA and describe the steps involved in protein synthesis in eukaryotes.   Lecturing  Explanation using flow chart that shows protein synthesis.  Group discussion   1. Transcription 2. Translation   ***Evaluation procedures such as oral, written quizzes, practical’s…***   * Student can describe how the information in DNA is used during transcription and Translation to construct polypeptides. * Student can state the roles played by mRNA, tRNA and the ribosomes in the formation of the polypeptide.   Lecturing  Explanation using flow chart that shows protein synthesis.  Group discussion | | | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 2**  (16-20/01) | 1. Effects of alteration of nucleotide   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can state that gene mutation is a change in the sequence of nucleotides that may result in an altered polypeptide. | Lecturing  Explanation using group work to construct the model of protein synthesis. |  |
| **Key unit Competences***:* To be able to explain the relationship between a gene and the sequence of nucleotides in DNA and to describe the process of protein synthesis in eukaryotes. | | | | | | |
| **WEEK 3**  (23-27/01) | **Unit 7:** Autotrophic nutrition. | 1. Types of Autotrophic nutrition. 2. Structure of the chloroplast. 3. Adaptations for photosynthesis.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can state and explain the types of autotrophic nutrition. * Student can explain the role of light in autotrophic nutrition. * Student can state the pigments involved in light absorption. * Student can describe the relationship between the structure and function in the chloroplast, using diagrams and electron micrographs. | Lecturing Explanation using the plant leaf.  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 4**  (30/01-03/02) | 1. Calvin cycle and   the process of photosynthesis in C3 plants.   1. Other carbon dioxide fixation pathways (C4 CAM). 2. Rate of photosynthesis: limiting factors of photosynthesis.   ***Evaluation procedures such as oral, written quizzes, practical’s…***   1. Importance of autotrophic nutrition. 2. Tests for starch in terrestrial plants and for oxygen in aquatic plants   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can relate the anatomy and physiology of the leaves of C4 and CAM plants to high rates of carbon fixation and low rates of transpiration. * Explain the term limiting factor in relation to photosynthesis and the effects of the changes in the limiting factors on the rate of photosynthesis. * Students can describe the importance of photosynthesis and explain the various environmental factors that influence the rate of photosynthesis. | Lecturing  Explanation using the different plant leaves.  Group discussion  Lecturing  Group discussion by identifying various importance of autotrophic nutrition |  |
| **Key Unit Competence:** To be able to describe the structure of the transport tissues in plants and the mechanisms by which substances are moved within the plant. | | | | | | |
| **WEEK 5**  (06-10/02) | **Unit 8:** Transport in Plants. | 1. Need for a transport system. 2. Structure of transport tissues. 3. Transport mechanisms of plants: xylem sap and phloem sap.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can explain the movement of water between plant cells, and between them and their environment, in terms of water potential. * Student can explain how hydrogen bonding is involved with the movement of water in the xylem by cohesion-tension in transpiration pull and adhesion to cellulose cell walls. | Lecturing  Explanation using the drawn structures  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 6**  (13-17/02) | 1. Transpiration: water stress, adaptations of Xerophytes to reduce water loss by transpiration.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can experimentally investigate and explain the factors that affect transpiration rate using simple potometers, leaf impressions, epidermal peels, and grids for determining surface area. | Lecturing  Demonstration using experimental investigations in group discussion |  |
| **Key Unit Competence:** To be able to describe the structure of the transport tissues in plants and the mechanisms by which substances are moved within the plant. | | | | | | |

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| **WEEK 7**  (20-224/02) | **Unit 9:** Gas exchange in animals. | 1. Gas exchanges in insects and fish. 2. Significance of counter current gaseous exchange in bony fish. 3. Gaseous exchange in amphibians.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can describe the tracheal system of insects and relate to its function. * Student can describe the structure of the gills in relation to function. * Student can explain the significance of counter current flow in bony fish. | Lecturing  Explanation using the drawn structures  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 8**  (27/02-03/03) | 1. Gaseous exchange in human 2. Mechanism of ventilation 3. Gas exchange in the alveoli. 4. Lung volume and capacities.   ***Evaluation procedures such as oral, written quizzes, practical’s…***   1. Use of spirometer to measure ventilation rate. 2. Nervous control of breathing.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can describe the structure of the human gas exchange system. * Student can explain the mechanism of ventilation in humans. * Student can explain the process of gas exchange in alveoli with emphasis on diffusion. * Student can describe the role of the brain in controlling gas exchange in humans. * Student can design a model of the spirometer based on its main features. | Lecturing  Explanation using the drawn structures  Group discussion  Lecturing  Explanation using the drawn structures  Group discussion |  |
| **Key Unit Competence**: To be able to describe structures of gas exchange in different groups of animals | | | | | | |

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| **WEEK 9**  (06-10/03) | **Unit 10:** Smoking and related diseases. | 1. Effects of tar and carcinogens in tobacco smoke on the gas exchange system. 2. Symptoms of lung cancer and chronic obstructive pulmonary diseases (COPD). 3. Effects of nicotine and carbon monoxide on the cardiovascular system.   ***Evaluation procedures such as oral, written quizzes, practical’s…***   1. Contribution of tobacco smoking to atherosclerosis and coronary heart disease. 2. Evidence linking cigarette smoking to disease and early death.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can describe the effects of tar and carcinogens in tobacco smoke on the gas exchange system. * Student can describe the signs and symptoms of lung cancer and chronic obstructive pulmonary diseases (COPD). * Student can explain how tobacco smoking contributes to atherosclerosis and coronary heart disease. | Lecturing  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence:** To be able to describe the effects of tobacco smoking on the gas exchange system. | | | | | | |

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| **WEEK 10**  (13-17/03) | **Revision** |
| **WEEK 11**  (20-24/03) | Examinations periodand supervision of examinations |
| **WEEK 12**  27-31/03 | Marking, making school reports period and closing the first term. |

**THIRD TERM**

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| **Dates** | **Unit title** | **Lesson title& evaluation** | **Learning objectives(copied or adapted from the syllabus depending on the bunch of lesson)+ key unit competence** | **Teaching methods& techniques evaluation procedures** | **Resources&**  **References** | **Observation** |
| **WEEK 1**  (17-21/04) | **Unit 11:** General principles of homeostasis. | 1. Significance of constant internal environment. 2. Factors that must be kept constant in the body: glucose, temperature, pH, water, ions, respiratory gases, and osmotic pressure of blood fluids. 3. Role of the negative feedback mechanism.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Students can explain the significance of a constant internal environment. * Students can explain the feedback mechanism in relation to the endocrine and nervous system. | Lecturing  Explanation using flow chart that shows protein synthesis.  In groups, learners use charts to discuss the mechanism of negative feedback and its role. | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 2**  (24-28/04) | 1. Feedback mechanisms related to the endocrine and nervous systems in homeostatic activities.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** |  |
| **Key unit Competences***:* To be able to explain general principles of homeostatic mechanisms. | | | | | | |
| **WEEK 3**  (01-05/05) | **Unit 12:** Regulation of glucose | 1. Causes of blood sugar imbalances in the body. 2. Diabetes mellitus. 3. Monitoring of blood glucose levels. 4. Detection of glucose in urine.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can explain the principles of the operation of dip sticks and biosensors for quantitative measurements of glucose in the blood and urine. * Student can explain how urine analysis is used in diagnosis with reference to glucose, protein and ketones. | Lecturing and Explanation using the drown diagram.  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence: To be able to explain the mechanism of the regulation of blood glucose levels.** | | | | | | |

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| **WEEK 4**  (08-12/05) | **Unit 13:** Regulation of temperature | 1. Importance of temperature regulation. 2. Morphological, physiological and behavioral adaptation to temperature changes in the environment. 3. Response to cold and hot conditions by endothermic and ectothermic animals.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student explain the importance of temperature regulation. * Students can describe the morphological, physiological and behavioral adaptations to temperature changes in the environment. | Lecturing  Explanation using the drawn diagram.  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **WEEK 5**  (15-19/05) | 4. The role of the brain: hypothalamus and thermo receptors in temperature regulation.   1. Effect of temperature conditions on animal behavior. 2. Temperature control in plants.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Students can explain the importance of temperature regulation. * Student can describe the morphological, physiological and behavioral adaptations to temperature changes in the environment. | Lecturing  Group discussion by identifying various importance of brain in temperature regulation |  |
| **Key Unit Competence**: To be able to explain the importance and ways by which organisms regulate body temperature. | | | | | | |

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| **WEEK 6**  (22-26/05) | **Unit 14:** Behaviour and response in mammals. | 1. Behavior: Simple responses. 2. Learning: habituation and imprinting. 3. Conditioning and latent learning. Social behavior. 4. Courtship, territoriality and dominance hierarchies.   5. Behavioral rhythms and biological clocks.  6. Animal migration.  ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can explain the different types behavior in terms of stimulus, nerves and effectors. * Student can explain can how types of behavior result from sequential responses. * Student can discuss the advantages and disadvantages to organisms living in societies. * Student can describe how birds and mammals maintain their territory. * Students can explain the significance of behavioral rhythms. | Lecturing  Explanation using the drawn structures  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence:** To be able to describe the immune system and apply knowledge gained in familiar and unfamiliar contexts. | | | | | | |
| **WEEK 7**  (29/05-02/06) | **Unit 15:** Immune system, vaccination and antibiotics. | 1. Origin and mode of action of phagocytes. 2. Immune responses. 3. Types of immunity. 4. Allergy as an immune response. 5. Asthma and hay fever. 6. Antibiotics.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can explain the role of memory cells in long-term immunity. * Student can distinguish between active and passive, natural and artificial immunity and explain how vaccination can control disease. * Student can explain the role of antibodies in allergies. * Student can explain how antibiotics work. * Student can explain the reasons for antibiotic resistance. | Lecturing  Explanation using the drawn structures  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence:** To be able to describe the immune system and apply knowledge gained in familiar and unfamiliar contexts. | | | | | | |

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| **WEEK 8**  (05-09/06) | **Unit 16:** Human reproductive system and gametogenesis | 1. Reproduction in humans. 2. Male and female   Reproductive systems.   1. Gametogenesis:   Spermatogenesis and oogenesis.  ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Student can describe the structure of human male and female reproductive systems. * Students can state where female and male gametes are produced. * Students can describe the histology of mammalian ovary and testis. | Lecturing and explanation using drawn diagram  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key unit competence:** To be able to relate the structures of the human reproductive system to their functions and describe gamete formation. | | | | | | |
| **WEEK 9**  (12-16/06) | **Unit 17:** Genetics. | 1. Definition of genetic terms. 2. Mendel’s laws   of inheritance   1. Co-dominance,   multiple alleles and lethal  alleles.   1. Dihybrid inheritance. 2. Linkage and crossing over. 3. Sex determination 4. Sex linkage. 5. Genetic disorders.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Students can explain how to conduct a test cross. * Students can explain why   monohybrid ratios of  1:2:1 occur.   * Student can describe an example of inheritance involving multiple alleles. | Lecturing and explanation using drawn diagram  Group discussion | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |

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| **WEEK 10**  (19-23/06) | **Unit 18:** Mutations. | 1. Types of mutations 2. Causes of   Mutation   1. Effect of mutations on the phenotype. 2. Effect of environment on the phenotype. 3. Significance of mutations.   ***Evaluation procedures such as oral, written quizzes, practical’s…*** | * Define mutation. * Describe types of mutation and causes of mutations. * Explain the significance of mutations. * Explain that gene mutation occurs by substitution, deletion, inversion and insertion of base pairs in DNA. * Outline how such mutations may affect the phenotype. | Lecturing  Explanation using flow chart illustrating and  Summarizing different kinds of gene and  Chromosomal mutations. | 1. Biology 8th ed by Campbell and Reece  2. Certificate biology for Rwanda schools, book6  3. Principles of Biology volume 3 and 4  4. Online references  5. Other documents |  |
| **Key Unit Competence:** To be able to describe the types, causes and effects of mutation in organisms. | | | | | | |

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| **WEEK 11**  (26-30/06) | **REVISION** |
| **WEEK 12**  (03-07/07) | **EXAMINATION PERIOD** |
| **WEEK 13**  (10-14/07) | **MARKING AND PREPARATION OF SCHOOL REPORT** |