Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

APPLIED BIOLOGY

GENAB402 DEMONSTRATE KNOWLEDGE OF GENERAL BIOLOGY

Competence

RQF Level: 4

Learning Hours 30

Credits: 3

Sector: Agriculture and Food Processing, Hospitality and Tourism

Trade: Agriculture, Food Processing, Animal Health, Forestry, Wood Technology, Water and Irrigation, Leather Technology, Food and beverage operations, Tourism.

Module Type: General

Curriculum: TVET Certificate 4 in Agriculture, Food Processing, Animal Health, Forestry, Wood Technology, Water and Irrigation, Leather Technology, Food and beverage operations, Tourism.

<table>
<tr><td>Purpose statement</td><td colspan="5">This module describes the knowledge, skills and attitudes required to demonstrate basic knowledge of Biology. At the end of this module, the learner will be able to describe biological macromolecule’s structure and function, illustrate patterns of genetic inheritance and distinguish various microorganisms’ structure and their importance</td></tr>
<tr><td rowspan="6">Delivery modality</td><td colspan="2">Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group project and presentation</td><td>20%</td></tr>
<tr><td>• Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. **Describe biological macromolecule’s structure and function**	1.1. The function of carbohydrates is clearly explained based on their structure
	1.2. The function of lipids is properly discussed based on their structure
	1.3. The function of nucleic acids is correctly illustrated in reference to their structure
	1.4. The function of proteins is effectively explained in reference to their structure
2. Illustrate patterns of genetic inheritance	2.1. Genetics is clearly explained basing on its importance
	2.2. Genetic inheritance is properly discussed based on Mendel's Laws and non-Mendel inheritance
	2.3. Genetic mutations are correctly explained based on phenotype modifications
3. Distinguish various microbial	3.1. Microbiology is clearly explained referring to its historical development
	3.2. Microbes are correctly characterised based on their diversity

structures and their importance	3.3. Microbial nutrition is effectively discussed based on their growth requirements

Course content

Learning outcomes	At the end of the module the learner will be able to: 1. Describe biological macromolecule's structure and function 2. Illustrate patterns of genetic inheritance 3. Distinguish various microbial structures and their importance
Learning outcome 1: Describe biological macromolecules structure and function	**Learning hours: 10**

Indicative content

- **Explanation of the function of carbohydrates**
  - ✓ Structural classification of carbohydrates
  - ✓ Carbohydrates metabolism
  - ✓ Functions of carbohydrates
- **Explanation of lipids' function**
  - ✓ Structural classification of lipids
  - ✓ Functions of lipids
- **Explanation of Nucleic acids' function**
  - ✓ Structure of nucleotides
  - ✓ Types of nucleic acids
    - DNA
    - RNA
  - ✓ DNA replication and its importance
  - ✓ DNA transcription
- **Explanation of proteins' function**
  - ✓ Protein structure and function
  - ✓ Protein synthesis

Resources required for the learning outcome

Equipment	Computer, Projector, White board/ Chalkboard
Materials	Flipcharts, Papers, Wallcharts
Tools	Markers, Chalks, Tutorial videos, Pictures

Facilitation techniques	Brainstorming, Demonstration and simulation, Individual and group work, Group discussion
Formative assessment methods	Written assessment, Oral presentation

Learning outcome 2: Illustrate patterns of genetic inheritance	**Learning hours: 10**
Indicative content	

- **Genetic significance explanation**
  - ✓ Introduction to genetics
    - Etymology
    - Genotype and phenotype
    - History of Genetics
  - ✓ Importance of genetics
- **Genetic inheritance explanation**
  - ✓ Concept of genetic inheritance
  - ✓ Mendel's Laws and experiments
  - ✓ Chromosomal Theory
- **Introduction to Genetic mutations**
  - ✓ Concept of genetic mutations
  - ✓ Causes of genetic mutations
  - ✓ Types of genetic mutations
  - ✓ Effects of genetic mutations

Resources required for the indicative content	
Equipment	Computer, Projector, White board/ Chalkboard
Materials	Flipcharts, Papers, Wall charts
Tools	Markers, Chalks, Tutorial videos, Pictures
Facilitation techniques	Brainstorming, Demonstration and simulation, Individual and group work, Group discussion
Formative assessment methods	Written assessment, Oral presentation

Learning outcome 3: Distinguish various microbial structures and their importance	Learning hours: 10

Indicative content

- **Introduction to Microbiology**
  - ✓ History of microbiology
  - ✓ Importance of microbes
    - Benefits of microbes
    - Harmfulness of microbes
- **Characterisation of microbes**
  - ✓ Bacteria
  - ✓ Virus
  - ✓ Fungi
  - ✓ Algae
  - ✓ Protozoa
- **Explanation of Microbial growth**
  - ✓ Microbial growth requirements
  - ✓ Bacterial growth phases
  - ✓ Culturing and observation of microbes in the laboratory

Resources required for the indicative content	
Equipment	Incubator, microscopy, computer, projector, white board/ chalkboard
Materials	Flipcharts, papers, wallcharts, reagents (agar, nutrients, etc.)
Tools	Slides, cover slides, plates, markers, chalks, tutorial videos, pictures
Facilitation techniques	Brainstorming, demonstration and simulation, individual and group work, group discussion
Formative assessment methods	Written assessment, oral presentation

References:

1. Mohammed, A., A. (2006). Molecular Biology and Applied Genetics for Medical Laboratory Technician: Students. Jimma University.
2. MUHAYIMANA, O., Uwibambe, J., Philip, W., Y. & Alistair, C. (2017). Biology for Rwanda schools: Student Book, Secondary 5. Laxmi Publications Pvt. Ltd113, Golden House, Daryaganj, New Delhi-110002.
3. Frank Lowy. (2008). Bacterial Classification, Structure and Function.
4. Glen Sonder J & Karen W Post.(2005). Veterinary Microbiology: Bacterial & Fungal Agents of Animal Diseases. Cold Spring
5. D. S. Weiss. (2004). Molecular Microbiology-Bacterial cell division and the septal ring. vol. 54, pp. 588-597.
6. Chenn Peter, Murray John, 1999. Microorganisms and Biotechnology
7. Michael Robert, Michael Jonathan Reiss, Grace Monger; Advanced Biology, Nelson Publishers, UK
8. https://sites.ualberta.ca/~enoch/Resources/Genetics.pdf
9. https://nios.ac.in/media/documents/SrSec314NewE/Lesson-22.pdf