Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

APPLIED CHEMISTRY

GENAC402

APPLY BASIC KNOWLEDGE OF ORGANIC CHEMISTRY

Competence

RQF Level: 4

Learning Hours: 30

Credits: 3

Sector: Building and construction services, Agriculture and food processing, Transport and logistics, Manufacturing and mining, Hospitality tourism, Art and craft.

Trade: Building construction, public works, Land surveying, Plumbing Technology, Interior design, Agriculture, Animal health, Wood Technology, Leather technology, Forestry, Water and Irrigation, Food processing, Automobile technology, Heavy machinery, Manufacturing technology, Mining technology, Food and baverage operations, Fine and plastic arts.

Module Type: General

Curriculum: TVET Certificate 4 in Building construction, public works, Land surveying, Plumbing Technology, Interior design, Agriculture, Animal health, Wood Technology, Leather technology, Forestry, Water and Irrigation, Food processing, Automobile technology, Heavy machinery, Manufacturing technology, Mining technology, Food and beverage operations, Fine and plastic arts.

Issue Date: May 2023

<table>
<tr><td>Purpose statement</td><td colspan="5">This module describes the knowledge, skills and attitudes required to introduce organic chemistry. At the end of this module, the learner will be able to explain organic compounds, discuss biochemical molecules and describe polymers.</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>
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Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Explain organic compounds	1.1. Classes of organic compounds are properly identified according to their structure
	1.2. Organic compounds are correctly discussed based on their functional groups
	1.3. Applications of organic compounds are clearly discussed based their functional groups
2. Discuss biochemical molecules	2.1. Carbohydrates are correctly characterized based on their structures
	2.2. Lipids are clearly described according to their structures
	2.3. Nucleic acids and proteins are properly explained in reference to their structures
3. Describe polymers	3.1. Classes of polymers are properly explained according to their origin/source
	3.2. Physical and chemical properties of polymers are clearly explained according to their origin/source
	3.3. Applications of polymers are correctly discussed based on their source/origin

Course content

Learning outcomes	At the end of the module the learner will be able to: 1. Explain organic compounds 2. Discuss biochemical molecules 3. Describe polymers
Learning outcome 1: Explain organic compounds	**Learning hours: 10**

Indicative content

- **Identification of classes of organic compounds**
  - ✓ Introduction to organic compounds
    - Inorganic vs organic compounds
    - Saturated vs unsaturated hydrocarbons
  - ✓ Classes of organic compounds
    - Aliphatic
    - Alicyclic
    - Aromatic
- **Discussion of organic compounds**
  - ✓ Functional groups and nomenclature of organic compounds
  - ✓ Characteristics of homologous series
  - ✓ Isomers
- **Application of organic compounds**
  - ✓ Petrochemicals (methane, ethane, gasoline, essence)
  - ✓ In steel welding (ethyne)
  - ✓ Nail polish (acetone)
  - ✓ In food (vanilla, vinegar)
  - ✓ Saponification
  - ✓ Drugs synthesis
  - ✓ Plastic production
  - ✓ Disinfectors

Resources required for the learning outcome

Equipment	- White/black board, projector, computer, chalkboard, DVD players, molecular model kit/set
Materials	- Reference books, marker pen, flip chalks, chart, oil, NaOH, NaCl
Tools	- Internet connection, beakers, conical flask, measuring cylinders
Facilitation techniques	- Lectures, demonstration and simulation, individual and group work, practical exercise, laboratory experiment, individualized, trainer guided and group discussion.

Formative assessment methods	- Written assessment, oral presentation, performance assessment, product based assessment, project based assessment.

Learning outcome 2: Discuss biochemical molecules	**Learning hours: 10**

Indicative content

- **Description of carbohydrates**
  - ✓ Sources
  - ✓ Properties
  - ✓ Classes
  - ✓ Functions

- **Description of lipids**
  - ✓ Sources
  - ✓ Physical properties
  - ✓ Classes
  - ✓ Functions

- **Description of nucleic acids**
  - ✓ Structures
  - ✓ Types and roles

- **Description of proteins**
  - ✓ Sources
  - ✓ Functions

Resources required for the indicative content

Equipment	- White/black board, projector, computer, chalkboard, DVD players
Materials	- Reference books, marker pen, flip chalks, chart
Tools	- Internet connection,
Facilitation techniques	- Lectures, demonstration and simulation, individual and group work, practical exercise, individualized, trainer guided, group discussion
Formative assessment methods	- Written assessment, oral presentation, project-based assessment

Learning outcome 3: Describe polymers	**Learning hours: 10**

Indicative content

- **Introduction to polymers**
  - ✓ Key terms definitions
    - Monomer
    - Polymer

- Polymerization

- **Classification of polymers**
  - ✓ Natural polymers (Starch, cellulose, resin)
  - ✓ Synthetic polymers (Polyethylene, Polyvinylchloride (PVC), Nylon)

- **Explanation of properties of polymers**
  - ✓ Physical properties
    - Natural polymers (Starch, cellulose, resin)
    - Synthetic polymers (Polyethylene, Polyvinylchloride (PVC), Nylon)
  - ✓ Chemical properties
    - Polyethylene

- **Applications of polymers**
  - ✓ Plastic production
  - ✓ Paint production
  - ✓ Cloth production

- **Management of wastes from polymers**
  - ✓ Polymer reuse
  - ✓ Polymer recycling
  - ✓ Polymer disposal

Resources required for the indicative content	
Equipment	- White/black board, projector, computer, chalkboard, DVD players
Materials	- Reference books, marker pen, flipcharts, wallcharts, chalks chemical reagents
Tools	- Internet connection, laboratory apparatus
Facilitation techniques	- Lectures, demonstration and simulation, individual and group work, practical exercise, individualized, trainer guided, group discussion
Formative assessment methods	- Written assessment, oral presentation, performance assessment, product based assessment, project based assessment

References:

1. Schmitz, A. (2018, March 25). Introduction to Chemistry: General, Organic, and Biological (v. 1.0). Retrieved from 18.1 Properties of Amino Acids: https://2012books.lardbucket.org/books/introduction-to-chemistry-general-organicand-biological/s21-01-properties-of-amino-acids.ht

2. Daniel R.Bloch (2012), Organic chemistry DeMYSTiFieD, second edition, McGrawHill.

3. GRAHAM HILL, J. H. (2000). Chemistry in context,fifth edition. Nerson Thornes. Obot, K. (2003). Organic chemistry for Advanced level. Rwanda Education Board. (2015). Advanced level chemistry syllabus. Kigali: PRINTEX. Bruice, P. Y. (n.d.). Organic Chemistry Fourth Edition.

4. Andrady A. L. and Neal M. A. (2009). Applications and societal benefits of plastics.

5. Phil. Trans. R. Soc. B 364, 1977–1984 Bahl, A. (2010). Advanced Organic Chemistry. S Chand & Company Limited.