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ORGANIC CHEMISTRY I

Introduction

This module unit is intended to equip the trainee with skills, knowledge and attitudes in Organic Chemistry relevant to Analytical Chemistry.

General Objectives

At the end of the module unit the trainee should be able to:

- a) Recognise the principles of Organic Chemistry
- b) Apply the acquired knowledge of Organic Chemistry in Analytical Chemistry
- c) Demonstrate acquired practical Organic Chemistry skills in the use of apparatus in Analytical Chemistry
- d) Acquire sufficient knowledge and skills for further education in the field of Organic Chemistry
- e) Cope with emerging issues and trends in Organic chemistry

Module Unit Summary and Time Allocation

Sub-Module Unit	Content	Time (Hours)		
		T	P	Total
Introduction	<ul style="list-style-type: none">• Uniqueness of carbon• Bonding in organic compounds• Classification and nomenclature of organic compounds• Empirical and molecular formulae of organic compounds	4	3	7
Hydrocarbons	<ul style="list-style-type: none">• Meaning of hydrocarbons• Types of hydrocarbons• Nomenclature of hydrocarbons• Occurrence and preparation• Physical properties• Reactions and reaction mechanisms• Structural isomerism in alkanes and alkenes• Uses of hydrocarbons	8	10	18

**INTRODUCTION
ORGANIC
CHEMISTRY**

Competence

The trainee shall have the ability to:

- Classify organic compounds
- Calculate empirical and molecular formulae of organic compounds

Theory

Specific Object

By the end of the module unit, the trainee should be able to:

- explain the uniqueness of carbon
- explain the role of carbon in organic compounds
- classify and name organic compounds
- explain the empirical and molecular formulae of organic compounds

Content

Uniqueness of carbon
Bonding in organic compounds

- hybridization
- covalent bonding in organic compounds

T3 Classification and nomenclature of organic compounds

Code	Sub-Module Unit	Content	Time (Hours)		
			T	P	T
9.1.03	Haloalkanes (Alkyl Halides)	<ul style="list-style-type: none"> • Meaning of haloalkanes • Primary, secondary and tertiary haloalkanes • Preparation of haloalkanes • Physical properties • Reactions and reaction mechanisms • Uses of haloalkanes 	8	10	
9.1.04	Alkanols and Ethers	<ul style="list-style-type: none"> • Meaning of Alkanols and Ethers • Nomenclature • Preparation of alkanols and ethers • Physical properties of alkanols and ethers • Reactions and reaction mechanisms of alkanols • Uses of alkanols and ethers 	6	10	
9.1.05	Alkanoic Acids	<ul style="list-style-type: none"> • Meaning of Alkanoic Acids • Nomenclature • Preparation • Physical properties • Reactions and reaction mechanisms of alkanoic acids • Uses of alkanoic acids 	6	10	16
9.1.06	Emerging Issues and Trends	<ul style="list-style-type: none"> • Emerging issues and trends • Challenges of emerging issues • Coping with challenges 	1	1	2
Total			33	43	77

Time (Hours)	
P	Total
10	18

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INTRODUCTION TO ORGANIC CHEMISTRY

Competence

The trainee should have the ability to:

- i) Classify organic compounds
- ii) Calculate empirical and molecular formulae of organic compounds

Theory

Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

- a) explain the uniqueness of carbon
- b) explain the bonding in organic compounds
- c) classify and name organic compounds
- d) explain the empirical and molecular formulae of organic compounds

Content

- Uniqueness of Carbon
- Bonding in organic compounds
- Hybridization
- Covalent bonds in organic compounds
- Classification and nomenclature of organic compounds

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- i) functional groups and homologous series
- ii) common names
- iii) IUPAC

9.1.01T4 Empirical and molecular formulae of organic compounds

Practice

Specific Objectives

By the end of this sub-module unit, the trainee should be able to:

- a) demonstrate types of bonding in hydrocarbons using models
- b) calculate empirical and molecular formula of organic compounds
- c) calculate degree of unsaturation

Content

9.1.01P1 Demonstrating types of bonding in hydrocarbons using models

9.1.01P2 Calculating empirical and molecular formula of organic compounds

9.1.01P3 Calculating degree of unsaturation

Suggested Teaching/Learning Activities

- Lecture
- Demonstration
- Discussion

	<i>Suggested Teaching/ Learning Resources</i>	
	<ul style="list-style-type: none"> - Text books - Computer generated atomic models - E-books - Computer - Chemicals - Laboratory facility 	
	<i>Suggested Assessment Methods</i>	
	<ul style="list-style-type: none"> - Written tests - Supervised exercises - Continuous assessment tests 	
9.1.02	HYDROCARBONS	
9.1.02C	Competence The trainee should have the ability to identify and prepare hydrocarbons	
	Theory	
9.1.02T0	Specific Objectives By the end of the sub-module unit, the trainee should be able to:	
	<ol style="list-style-type: none"> a) explain the term hydrocarbon b) describe types of hydrocarbons c) explain the nomenclature of hydrocarbons d) describe the preparation of hydrocarbons e) describe the physical properties of hydrocarbons 	
		<p>f) describe reactions and reaction mechanisms of hydrocarbons</p> <p>g) describe structural isomerism in alkanes and alkenes</p> <p>h) state the uses of hydrocarbons</p>
		<i>Content</i>
		9.1.02T1 Meaning of hydrocarbon
		9.1.02T2 Types of hydrocarbons
		<ul style="list-style-type: none"> i) alkanes ii) alkenes iii) alkynes
		9.1.02T3 Nomenclature of hydrocarbons
		9.1.02T4 Occurrence and preparation of hydrocarbons
		9.1.02T5 Physical properties of hydrocarbons
		9.1.02T6 Reactions and reaction mechanisms of hydrocarbons
		9.1.02T7 Structural isomerism in Alkanes and Alkenes
		9.1.02T8 Uses of hydrocarbons
		Practice
		9.1.02P0 Specific Objectives By the end of the sub-module unit, the trainee should be able to:
		<ol style="list-style-type: none"> a) describe types of hydrocarbons b) perform substitution and addition reactions c) prepare simple hydrocarbons

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- d) name and draw structures of hydrocarbons

9.1.03

HALOALKANES

9.1.03C

Competence

The trainee should have the ability to identify and prepare haloalkanes

Content

Describing types of hydrocarbons

CP1

Performing substitution and addition reactions

CP2

Preparing simple

CP3

hydrocarbons

CP4

Naming and drawing structures of hydrocarbons

Suggested Teaching/ Learning Activities

- Lecturing
- Preparation of hydrocarbons
- Practical
- Demonstration
- Discussion

Suggested Teaching/ Learning Resources

- Text books
- E-books
- Computer
- Chemicals
- Laboratory

Suggested Assessment Methods

- Written tests
- Supervised exercises
- Continuous assessment tests
- Examination

9.1.03T0

Specific Objectives

By the end of the sub-module unit, the trainee should be able to:

- a) explain the meaning of haloalkanes
- b) explain primary, secondary and tertiary haloalkanes
- c) describe the preparation of haloalkanes
- d) explain the properties of haloalkanes
- e) describe reactions and reaction mechanisms of haloalkanes
- f) state the uses of haloalkanes

Content

9.1.03T1 Meaning of haloalkanes

9.1.03T2 Primary, secondary and tertiary haloalkanes

9.1.03T3 Preparation of haloalkanes

9.1.03T4 Physical properties

9.1.03T5 Reactions and reaction mechanisms

9.1.03T6 Uses of haloalkanes

Practice**9.1.04 ALKANOLS AND ETHERS**

9.1.03P0 Specific Objectives
By the end of the sub-module unit, the trainee should be able to:
a) prepare alkyl halides
b) tests for alkyl halides

Content
9.1.03P1 Preparing alkyl halides
i) addition of halogens to alkenes
ii) addition of hydrogen halides
iii) halogenation of hydrocarbons
9.1.03P2 Testing for alkyl halides

*Suggested Teaching/
Learning Activities*

- Lecturing
- Preparation of alkyl halides
- Practical
- Industrial visit
- Demonstration

*Suggested Teaching/
Learning Resources*

- E-books
- Computer
- Chemicals
- Laboratory

Suggested Assessment Methods

- Written tests
- Supervised exercises
- Continuous
- Assessment Tests
- Assignments
- Examination

9.1.04C Competence
The trainee should have the ability to identify and prepare alkanols and ethers

Theory

9.1.04T0 Specific Objectives
By the end of the sub-module unit, the trainee should be able to:
a) explain the meaning of alkanols and ethers
b) explain the nomenclature of alkanols and ethers
c) describe the preparation of alkanols and ethers
d) explain physical properties of alkanols and ethers
e) describe reactions and reaction mechanisms of alkanols
f) explain uses of alkanols and ethers

Content

- 9.1.03T1** Meaning of Alkanols and Ethers
- 9.1.03T2** Nomenclature
- 9.1.03T3** Preparation of alkanols and ethers
- 9.1.03T4** Physical properties of alkanols and ethers
- 9.1.03T5** Reactions and reaction mechanisms of alkanols

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	ST6	Uses of and ethers alkanols		Suggested Assessment Methods
		Practice		- Written tests - Supervised exercises - Assignments - Examination
	4P0	Specific Objectives By the end of the sub- module unit, the trainee should be able to: a) prepare alkanols and ethers b) distinguish between primary, secondary and tertiary alkanols c) carry out reactions of alkanols	9.1.05	ALKANOIC ACIDS
		Content	9.1.05C	Competence The trainee should have the ability to: i) Prepare alkanoic acids ii) Identify alkanoic acids
	4P1	Preparing alkanols and ethers	9.1.05T0	Theory
	4P2	Distinguishing primary, secondary and tertiary alkanol		Specific Objectives By the end of the sub- module unit, the trainee should be able to: a) explain the meaning of alkanoic acids b) explain the nomenclature of alkanoic acids c) explain the preparation of alkanoic acids d) explain the physical properties of alkanoic acids e) explain reactions and reaction mechanisms of alkanoic acids f) state the uses of alkanoic acids
	4P3	Reactions of alkanols i) substitution ii) elimination iii) oxidation		
		Suggested Teaching/ Learning Activities		
		- Lecturing - Preparation of alkanols and ethers - Practical - Industrial visits - Demonstration		
		Suggested Teaching/ Learning Resources		
		- Text books - E-books - Computer - Chemicals - Laboratory	9.1.05T1	Content Meaning of Alkanoic Acids
			9.1.05T2	Nomenclature

9.1.05T3	Preparation	- Supervised exercises	Pract
9.1.05T4	Physical properties	- Continuous	
9.1.05T5	Reactions and reaction mechanisms of alkanoic acids	Assessment tests	1.06PO Speci
9.1.05T6	Uses of alkanoic acids	- Examination	By th modu
	Practice		shoul ways emer;
9.1.05PO	<i>Specific Objectives</i> By the end of the sub module unit, the trainee should be able to: a) prepare alkanoic acids b) identify alkanoic acids	9.1.06 C Competence The trainee should have the ability to cope with challenges posed by emerging issues and trends	Cont Sugg copir issue
	<i>Content</i>	Theory	Sugg Lear.
9.1.05P1	Preparation of alkanoic acids	9.1.06T0 <i>Specific Objectives</i> By the end of the sub-module unit, the trainee should be able to: a) explain the emerging issues and trends b) discuss challenges posed by emerging issues c) discuss ways of managing challenges posed by emerging issues and trends	- I
9.1.05P2	Identification of alkanoic acids		
	<i>Suggested Teaching/ Learning Activities</i>		
	- Demonstration - Lecturing - Preparation of alkanoic acids - Practical - Demonstration		
	<i>Suggested Teaching/ Learning Resources</i>	Content	
	- Text books - E-books - Computer - Chemicals - Laboratory	9.1.06T1 Emerging issues and trends 9.1.06T2 Challenges posed by emerging issues and trends 9.1.06T3 Ways of managing challenges posed by emerging issues and trends	
	<i>Suggested Assessment Methods</i>		
	- Written tests		

Practice

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Specific Objective

By the end of the sub-module unit, the trainee should be able to suggest ways of coping with emerging issues

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Content
Suggesting ways of coping with emerging issues and trends

Suggested Teaching/ Learning Resources

- Textbooks
- Training manual
- Handouts

- Magazines

Suggested Teaching/ Learning Activities

- Discussions
- Interactive lectures
- Field trips
- Interview
- Guest speaker

Suggested Assessment Methods

- Assignments
- Written examinations
- Oral tests
- Report writing