8.1.0 PHYSICAL SCIENCE

8.1.1 Introduction

This module unit aims at the fundamentals of Chemistry and Physics which form the basics for practical application in building and civil engineering works. It is also designed to equip the trainee with the basic principles of Chemistry and Physics applicable in building and civil engineering.

8.1.2 General Objectives

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

- a) apply the basic principles of chemistry and physics to practical areas in the field of building and civil engineering.
- b) observe safe working habits in the laboratory

8.1.3 Module Summary and Time Allocation – (66 Hours)

Code	Sub	Content	Time Hours		
	Module Units	let.coll	Thery	Pract	Total
8.1.01	Atomic Structure and Bonding	Description of Atomic Structure Importance of Outermost Electrons in Chemical Bonding Features of Chemical Bond Bond Type	2	3	5
8.1.02	Mole Concept Formulae and Chemical Reactions	Definitions of Terms Chemical Equations Oxidation/Reduction Application in Redox Reactions Role of Water in	2	3	5
8.1.03	Acids, Bases and Salts	Definition of Terms Strength of Acids and Bases Properties of Acids, Bases and Salts Preparation of a Given	2	2	4

Code	Sub	Content	Time F	lours	1
	Module Units	STATEMENT	Thery	Pract	1
8.1.04	Hardness of Water	Meaning of Hard Water and Soft Water Causes of Hardness an Water Process of Softening	4	5	9
8.1.05	Polymers	Hard Water Definitions of Terms Types of Polymers Disposal of Polymers	2	3	5
8.1.06	Nuclear Chemistry	Meaning of Radio Activity Nature of Radio Activity Radio Activity Decay Service Application of Radio ISO type Non Destructive Testing	2	4	6
8.1.07	Optics	 Nature of Light Laws of Reflection Laws of Refraction Types of Mirrors Dispersion of Light Optical Instrument 	4	4	8
8.1.08	Sound	Sources of Sound Propagation of Sound Production of Sound	4	8	11
8.1.09	Mechanics	 Types of Forces Varying Uniformly Distributed Concentrated Movements 	6	6	11
Total	F 15 (C)	1.10 venients	28	38	6

Code	Sub Module	Content	Time H	loure
	Units		Thery	Pract
8.1.04	Hardness of	Salt		
	Water	 Meaning of Hard Water and Soft Water Causes of Hardness an Water Process of Softening Hard Water 	4	5
8.1,05	Polymers	 Definitions of Terms Types of Polymers Disposal of Polymers 	2	3
8.1.06	Nuclear Chemistry	Meaning of Radio Activity Nature of Radio Activity Radio Activity Decay Service Application of Radio ISO type Non Destructive Testing	2	4
8.1.07	Optics	 Nature of Light Laws of Reflection Laws of Refraction Types of Mirrors Dispersion of Light Optical Instrument 	4	4
8.1.08	Sound	 Sources of Sound Propagation of Sound Production of Sound 	4	8
8.1.09	Mechanics	 Types of Forces Varying Uniformly Distributed Concentrated Movements 	6	6
Total			28	38

g.1.01

ATOMIC STRUCTURE AND BONDING

Theory

8.1.01TO

Specific Objectives

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

- a) describe the structure of an atom
- b) explain the importance of outermost electronics in chemical bonding
- c) outline the main features of chemical bonds
- d) explain the effect of bond type and structure on the physical properties of common construction materials

8.1.01C

Competence
The traince should have
the ability to:

- i) apply the atomic structure and bonding in nuclear chemistry
- ii) relate bound type and structure to properties of common construction materials

8.1,01T1

Content

Description of structure of an

atom

8.1.01T2

Importance of outermost electrons in chemical bandin

chemical bonding 8.1.01T3 Main features of

chemical bonds

- ionic

- covalent
- dative

- hydrogen 8.1.01T4 Effect of bond

type and structure on physical properties of common

construction materials

Practice

8.1.01P0

Specific Objective

By the end of the submodule unit, the trainee
should be able to
analyse the effect of
bond type and structure
on the physical
properties of common
construction materials

Content

8.1.01P1

Bond type and structure on physical properties of common construction materials

8.1.02	MOLE CONCEPT	8.1.02T1	Content Definition of
	FORMULAE AND	0.1.0	terms of
	CHEMICAL	8.1.02T2	Chemical
	REACTIONS	0.1.02	equations
		8.1.02T3	Oxidation/
	Theory	0.1.0	Reduction
		8.1.02T4	Application
8.1.02TC	Specific Objectives	0.1.02	TOUGH TPane
	By the end of the sub-	8.1.02T5	The role of wa
	module unit, the trainee	0.1.023	in ionization
	should be able to:		111 101112d(101)
	a) define the terms	Prac	tice
	mole, molar solution	114	dec
	and standard	a toopo Chac	ific Ohiana
	solution	8.1.02P0 Spec	ific Objectives
	b) write balanced	by to	ne end of the sal
	chemical equations	mod	ule unit, the han
	c) explain the process		ld be able to:
	of oxidation and		arry out the
	reduction		process of oxide
	d) apply redox		and reduction
		b) a	pply redox
	corrosion/reduction	1	reactions to
	of ores	(corrosion/reduc
	e) explain the role of	(of ores
	h ₂ o in ionization	c) a	nalyse the role
0.1.000	a markana mana a sana		water in ionizat
8.1.020	p or or too		. a.c. in tollian
	The trainee should have		Content
	the ability to:	8.1.02P1	
	i) explain the process	0.1.0211	Oxidation/
	of oxidation/	0.1.0000	Reduction
- 100	reduction	8.1.02P2	Application
1	ii) apply redox		redox reaction
	reactions to	8.1.02P3	The role of w
	corrosion/reduction		in ionization
	OI ores		CASE A MATERIAL CO.
	iii) perform experiment		
	on electrolysis of		
	water		
	T. Marie		

8.1.03	ACIDS, BASES AND SALTS		Practice
	Theory	8.1.03P0	Specific Objectives By the end of the sub-
8.1.03TO	Specific Objectives By the end of the submodule unit, the traince should be able to: a) define the terms acid, base and salt and ph b) explain the strength of acids and bases c) explain the properties of	8.1.03P1 8.1.03P1	bases
	- acids - bases - salts d) describe the preparation of a given salt	8.1.03F1	given salt HARDNESS OF WATER
8.1.03C	Competence The trainée should have the ability to: i) determine the degree of acidity/basicity of a given substance ii) perform acid/base titrations in the laboratory	8.1.04T0	Specific Objectives By the end of the submodule unit, the trainee should be able to: a) explain the terms hard water and soft water b) outline the causes of temporary and permanent hardness
8.1.03T1 8.1.03T2			 explain the process of softening hard water
8.1.03T3	Bases and salts	8.1.04C	Competence The trainee should
8.1.03T4	Preparation of a given salt		have the ability to:

	i) differentiate between hard and soft water ii) identify the causes of temporary and		c) differentiate by natural and sin polymers d) explain dispose polymers
	permanent hardness	8.1.05C	Competence
100	of water iii) soften hard water	0.1.00	The trainee should
	111) SOHEH Hard water		the ability to-
	Content		i) distinguish
8.1.04T	40. (C. 190.		natural and on
****	and soft water		polymers
8.1.047			11) observe Safe
	water		disposal methy
8.1.04T			
	hard water		Content
	23357760736776	8.1.05T1	Definition of terms
	Practice		- monomers
8.1.04P0	Carrier Objective	•	- polymers
8.1.0410		O T OCTO	- polymerizahi
	By the end of the sub- module unit, the trainee	8.1.05T2	Types of polymers
	should be able to soften		- natural
	hard water	9.1 OST2	- synthetic
	V	8.1.05T3	Disposal of polymen
8.1.04P1	Content		40
	Process of softening		Practice
	hard water	8.1.05P0	0 10 011 1
0 1 00	A CONTRACTOR OF THE CONTRACTOR	0.1.03.00	Specific Objective
8.1.05	POLYMERS		By the end of the sub
			module unit, the train
	Theory		should be able to:
8.1.05TO	A CONTRACTOR		a) differentiate bent
0.1.0310	Specific Objectives		natural and synthe
	Dy the end of the to-		polymers
	July 11100001 the		b) observe safe dispo
	trainee should be able		of polymers
	10.		
	a) define terms used in	8.1.05P1	Content
	polymerization b) explain the t	0.1.03P1	Types of polymers
	b) explain the types of polymerization		- natural
	Jacob	8.1.05P2	 synthetic Disposal of polymers
	20		

8.1.06	NUCLEAR CHEMISTRY		Practice
	Theory	8.1.06P0	Specific Objective By the end of the sub-
8,1.06TO	Specific Objectives By the end of the sub- module unit the trainee should be able to: a) define radioactivity		module unit, the trainee should be able to apply the principles of radio activity in non- destructive testing
	b) explain the nature of radioactivity c) outline a given radioactive decay services	8.1.06P1	Content Apply the principles of radioactivity in non-destructive testing
	d) state the application of radio isotopes e) apply the principles	8.1.07	OPTICS Theory
	of radio activity in non-destructive testing	8.1.07T0	Specific Objectives By the end of the sub- module unit, the trainee
8.1.06C	Competence The trainee should have the ability to apply the principles of radioactivity in non- destructive testing	easylvet.com	should be able to: a) describe the nature of light b) state the laws of reflection and refraction c) describe types of
8.1.06T1	Content Meaning of		mirrors and images formed d) describe dispersion
8.1.06T2 8.1.06T3	radioactivity Nature of radioactivity Radioactivity decay services		of light e) operate optical instruments
8.1.06T4 8.1.06T5	Application of radio isotopes Apply the principles of radioactivity in non-destructive testing	8.1.07C	Competence The trainee should have the ability to use common optical instruments

			c) explain the
			production of
	Content Nature of light		Marin Construction of the
8.1.0771	a - of reflection	8.1.08C	Competence
8-1-07T2	Laws of refraction	0.74	The traince should
8.1.07T3	Types of mirrors		the ability to regul
8.1.07T4	- plane		sound on the sile
	- curved Dispersion of light		Content
8.1.07T5	Dispersion of the	0.0001	Sources of sound
	- fluids	8.1.08T1	Propagation of some
	 prisms rectangular blocks 	8.1.08T2	
200	Optical instruments		- air
8.1.07T6	- cameras		- liquids
	- projector		- sounds
	- magnifying glass	8.1.08T3	Production of sound
	- magmiyme 8.		- pitch
	Practice		- loudness
	Practice		- intensity
8.1.07P0	Specific Objective		993 SA
0.1.017	By the end of the sub-		Practice
	module unit, the trainee		
	should be able to	8.1.08P0	Specific Objectives
	operate optical		By the end of thes
	instruments	7.1	module unit, the tri
			should be able to:
	Content		a) describe how so
8.1.07P1	Optical instruments	20	is propagated
	- cameras		b) analyse the
	- projector		production of s
	 magnifying glass 		For
1200203250			Content
8.1.08	SOUND	8.1.08P1	Propagation of soul
			- air
	Theory		- liquids
	0.20 0.00 0.00		
8.1.08T0	Specific Objectives	8.1.08P1	- sounds
	By the end of the sub-	0.1.VoF1	Production of
	module unit, the trained		sound
	should be able to:		- pitch
	a) describe the sources		- loudness
	01 Sound		- intensity
	 b) describe how sound 		
	is propagated		300
	The state of the s		

8.1.09	MECHANICS
	Theory
8.1.09TO	Specific Objectives By the end of the submodule unit, the traince should be able to: a) describe type of loads b) define moments c) apply the principle of moments d) apply principles of circular motion
8.1.09C	Competence The trainee should have the ability to: i) distinguish the type of loads ii) apply principle of moments iii) apply principles of circular motion
8.1.09T1	Content Types of loads - Varying - Uniformly distributed - Concentrated
8.1,09T2 8.1.09T3 8.1.09T4	Moments Principle of moments Circular motion
	Practice
8.1.09P0	Specific Objectives By the end of the sub- module unit, the trainee should be able to:

- a) apply the principle of moments
- b) apply principles of circular motion

Content

8.1.09P1

8.1.09P1

Principle of moments Principles of circular motion

Suggested Teaching/Learning Methods

- Discussion
- Demonstration
- Field visits
- Practical exercises

Suggested Learning Resources

- Modern Inorganic Chemistry by F. Liptrot
- Charts
- Internet
- Newspapers and magazines

Suggested Assessment Methods

- Oral tests
- Written tests

Tools and Equipment

- Plane mirrors
- Curved mirrors
- Prisms
- Rectangular blocks
- Camera projectors
- Magnifying glass