



REPUBLIC OF KENYA

COMPETENCY BASED MODULAR CURRICULUM

FOR

ANALYTICAL CHEMISTRY TECHNOLOGY

KNQF LEVEL 6

(CYCLE 3) PROGRAMME ISCED CODE: 0531 554A



TVET CDACC
P.O. BOX 15745-00100 NAIROBI

INSTRUMENTAL ANALYSIS

ISCED UNIT CODE: 0531 551 11A

TVET CDACC UNIT CODE: ASC/OS/ACHEM/CR/03/6/MA

Relationship to Occupational Standards

This unit addresses the Unit of Competency: Perform Instrumental Analysis.

Duration: 210 Hours

Unit Description

This unit covers the competencies required in performing instrumental analysis. It involves performing colorimetric analysis, UV-Vis analysis, FT-IR analysis, AES analysis, AAS analysis and conductometric analysis

Summary of Learning Outcomes

S/No	Learning Outcomes	Duration (Hours)
1.	To perform colorimetric analysis	35
2.	To perform UV-VIS analysis	35
3.	To perform FT-IR analysis	35
4.	To conduct AES analysis	25
5.	To perform AAS analysis	50
6.	To perform conductometric analysis	30
Total		210

Learning Outcomes, Content and Suggested Assessment Methods

Learning Outcome	Content	Suggested Assessment Methods
1. To perform colorimetric analysis	1.1 Set up colorimetric instrument 1.2 Prepare standard solution 1.2.1 Buffer solutions 1.2.2 Working standards. 1.2.3 Stock solutions 1.3 Calibrate colorimeter 1.4 Prepare samples 1.5 Analyse samples and standards 1.6 Quantify analyte concentration	<ul style="list-style-type: none"> • Practical Assessment • Project-Based Assessment • Portfolio of Evidence • Written Assessment
2. To perform UV-VIS	2.1 Set up UV-VIS spectrometer 2.2 Prepare standard solution 2.3 Calibrate UV-VIS spectrometer 2.4 Prepare samples solutions 2.5 Measure absorbance of sample and standards 2.6 Quantify analyte concentration	<ul style="list-style-type: none"> • Practical Assessment • Project-Based Assessment • Portfolio of Evidence • Written Assessment
3. To perform FT-IR analysis	3.1 Set up FT-IR spectrometer 3.2 Prepare standard solution 3.3 Calibrate FT-IR spectrometer 3.4 Prepare samples 3.5 Measure molecular vibration	<ul style="list-style-type: none"> • Practical Assessment • Project-Based Assessment • Portfolio of Evidence

	<p>3.5.1 Stretching</p> <p>3.5.2 Bending</p> <p>3.6 Identify functional groups</p>	<ul style="list-style-type: none"> • Written Assessment
4. To conduct AES analysis	<p>4.1 Set up AES spectrometer</p> <p>4.2 Prepare standard solution</p> <p>4.3 Calibrate AES spectrometer</p> <p>4.4 Prepare samples solutions</p> <p>4.5 Measure emission of samples and standards</p> <p>4.6 Quantify analyte concentration</p>	<ul style="list-style-type: none"> • Practical Assessment • Project-Based Assessment • Portfolio of Evidence • Written Assessment
5. To perform AAS analysis	<p>5.1 Set up AAS spectrometer</p> <p>5.2 Prepare standard solution</p> <p>5.3 Calibrate AAS spectrometer</p> <p>5.4 Prepare samples solutions</p> <p>5.5 Measure absorbance of samples and standards</p> <p>5.6 Quantify analyte concentration</p>	<ul style="list-style-type: none"> • Practical Assessment • Project-Based Assessment • Portfolio of Evidence • Written Assessment
6. To perform conductometric analysis	<p>6.1 Set up Conductometer.</p> <p>6.2 Prepare standard solution</p> <p>6.3 Calibrate Conductometer</p> <p>6.4 Prepare samples solutions</p> <p>6.5 Prepare electrolytes.</p> <p>6.6 Prepare buffers</p> <p>6.7 Quantify analyte conductance</p>	<ul style="list-style-type: none"> • Practical Assessment • Project-Based Assessment • Portfolio of Evidence • Written Assessment

Suggested Methods of Instruction

- 1 Practical
- 2 Projects
- 3 Demonstrations
- 4 Group discussion
- 5 Direct instructions

Recommended Resources for 25 Trainees

S/No.	Category/Item	Description/Specifications	Quantity	Recommended Ratio (Item: Trainee)
A	Learning Materials			
1.	Power point presentations	For trainer's use	1	1:25
2.	Desktop computer/laptop	For trainer's use	1	1:25
3.	Projector	For trainer's use	1	1:25
4.	Standard manuals/SOPs	For trainer's use	1	1:25
5.	Flip charts	For trainer's use	1	1:25
6.	Whiteboard	For trainer's use	1	1:25
7.	Assorted reference materials	For trainer's and trainee use	5	5:25
	Learning Facilities & infrastructure			
1.	Lecture/theory room	For trainer's and trainee use	1	1:25
2.	standard Science laboratory	For trainee use	1	1:25
3.	Internet connection	For trainee use	Enough	
4.	Assorted analytical instruments	For trainer's and trainee use	1	1:25
	Consumable materials			
1.	Stationeries	For trainee use	25	1:1
2.	Gloves	For trainee use	25	1:1
3.	Laboratory coats	For trainee use	25	1:1
4.	Masks	For trainee use	25	1:1
5.	Covers slips	For trainee use	5	1:5
6.	Assorted whiteboard markers	For trainer's	enough	
7.	Assorted Glassware	For trainee use	enough	1:1
8.	Assorted equipment	For trainee use	enough	1:5
9.	Pestle and mortars	For trainee use	12	1:2
10.	Droppers/teat pipettes	For trainee use	25	1:1
11.	Assorted chemicals [acids, bases, solvents, salts]	For trainee use	enough	1:1
12.	Calibration standards	For trainer and trainee use	enough	1:1

Tools and Equipment				
1.	Analytical balances	For trainee use	5	1:5
2.	First aid kit	For trainee use	5	1:25
3.	Muffle Furnace	For trainee use	1	1:25
4.	oven	For trainee use	2	1:12
5.	centrifuges	For trainee use	4	1:6
6.	refrigerator/freezer	For trainee use	1	1:25
7.	Water bath	For trainee use	3	1:8
8.	hot plate	For trainee use	6	1:4
9.	colorimetric	For trainer and trainee use	1	1:25
10.	Ultraviolet -Visible spectrophotometer	For trainer and trainee use	1	1:25
11.	Fourier Transform-Infrared spectrophotometer	For trainer and trainee use	1	1:25
12.	Atomic Emission spectrophotometer	For trainer and trainee use	1	1:25
13.	Atomic Absorption spectrophotometer	For trainer and trainee use	1	1:25
14.	Conductometer	For trainer and trainee use	1	1:25
15.	Sample storage apparatus	For trainee use	25	1:1
16.	Magnetic stirrers	For trainee use	5	1:5