Module Definition Form (MDF)

Module code: MOD002746	**Version:** 11 **Date Amended:** 20/Apr/2022

1. Module Title
Physical and Quantitative Chemistry for Analytical Scientists

2a. Module Leader
Peace Nwafor

2b. School
School of Life Sciences

2c. Faculty
Faculty of Science and Engineering

3a. Level
4

3b. Module Type
Standard (fine graded)

4a. Credits
15

4b. Study Hours
150

5. Restrictions

Type	Module Code	Module Name	Condition
Exclusions:	None		
Courses to which this module is restricted:	Forensic Science courses and BSc (Hons) Laboratory Science Degree Apprenticeship		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description

Forensic and other laboratory sciences rely heavily on the analytical identification of substances. You will be introduced to some of the fundamental concepts of physics and chemistry used in analytical science, with a focus on chemical analysis and quantification. You will undertake basic chemical analysis and calculations with an emphasis on the acquisition of accurate and precise laboratory results demonstrating good laboratory practice. Examples will be drawn from throughout the forensic and analytical sciences. We will also be exploring chemical equilibria, energy transfer, thermodynamics, thermochemistry and kinetics. You will therefore be able to explain why chemical changes occur, essential for later topics in the course.

You will be taught by a range of methods, including lectures, tutorials and practicals, where you will use actual forensic and laboratory samples which will enhance your competency in the laboratory and ability to interpret practical results. The tutorials will be focussed on problem solving based on the topics covered. You will also carry out laboratory competency-based tests to show your practical skills, awareness of good laboratory practice and avoidance of contamination. The employability skills you will develop include problem solving, data interpretation, communication, the ability to work in a group, time management and numeracy and literacy, all essential skills in a forensic/analytical scientist.

6b. Outline Content

- Quantitative analysis: concentration units; relevant calculations; random and systematic errors.
- Quantitative techniques including visible and ultraviolet spectroscopy, thin layer chromatography and volumetric analysis.
- Thermodynamics/thermochemistry: heat transfer in relation to fire investigation; internal energy; enthalpy; combustion reactions; Hess's Law and explosive thermodynamics.
- Reaction kinetics and equilibria: chemical reactions; activation energy; ionic equilibria; pKa; pH and buffer solutions and extraction using ion suppression.
- Good Laboratory skills.

6c. Key Texts/Literature

The reading list to support this module is available at: https://readinglists.aru.ac.uk/

6d. Specialist Learning Resources

Laboratories and analytical software

7. Learning Outcomes (threshold standards)		
No.	**Type**	**On successful completion of this module the student will be expected to be able to:**
1	Knowledge and Understanding	Apply a fundamental understanding of chemical changes, chemical equilibrium, basic concepts in thermochemistry and thermodynamics to analysis of forensic samples.
2	Knowledge and Understanding	Implement methods of quantitative analysis, good laboratory skills, and applications of chemical analysis, and be able to interpret simple quantitative data.
3	Intellectual, practical, affective and transferrable skills	Perform experiments and interpret data to calculate physical constants and quantify analytes.
4	Intellectual, practical, affective and transferrable skills	Demonstrate good laboratory practice and an awareness of contamination issues.

8a. Module Occurrence to which this MDF Refers				
Year	**Occurrence**	**Period**	**Location**	**Mode of Delivery**
2026/7	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence			
Learning Activities	**Hours**	**Learning Outcomes**	**Details of Duration, frequency and other comments**
Lectures	22	1-4	11 x 2 hrs lectures/active learning
Other teacher managed learning	14	1-4	Practicals (2 x 2 hr); Tutorials (5 x 1 hr); practical test (1 x 1 hr); Revision (1 x 2 hrs); Test (1 x 2 hrs)
Student managed learning	114	1-4	Background reading, online activities, preparation for lectures and practicals, and completion of assessments
TOTAL:	150		

9. Assessment for the above Module Occurrence

The assessment for some modules includes a presentation (see below for details on how this particular module is assessed). We recognise that presenting, especially to a large group, can cause significant anxiety or distress for some students. If this may affect you, please contact your Module Leader or the Disability and Neurodiversity Service as early as possible. We will work with you to consider appropriate reasonable adjustments. Depending on your individual needs, these might include, for example, presenting to a smaller group or presenting only to a member of academic staff.

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Coursework	1-4	50 (%)	Fine Grade	30 (%)
In-Class Test (1000 Words Equivalent)					
Assessment No.	**Assessment Method**	**Learning Outcomes**	**Weighting (%)**	**Fine Grade or Pass/Fail**	**Qualifying Mark (%)**
011	Practical	1-4	50 (%)	Fine Grade	30 (%)
Laboratory write up (1500 words) and competency-based practical test (500 words)					

Assessment components for Element 011

Component No.	Assessment Title	Submission Method	Weighting (%)	Components needed for Mark Calculation?
011/1	1500 word Laboratory Report	Canvas	75 (%)	All
011/2	Competency Based Test (500 word equivalent)	Scheduled Activity: Timetabled assessment task	25 (%)	

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:
(a) achieve the qualifying mark for each element of fine graded assessment as specified above
(b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]