

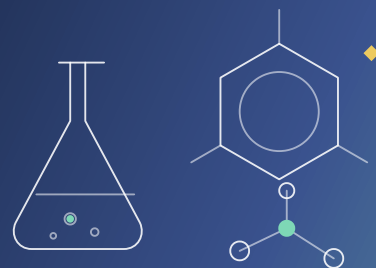
Module code

SPC-1203

Type of module

Undergraduate: Chemistry – Major Core

Fundamentals of Physical and Spectroscopic Chemistry



Modular credits

4

Total student
engagement

56 hours

Prerequisite

None

Anti-requisite

None

Aims

To introduce the fundamental principles of physical and analytical chemistry and introduce essential spectroscopic techniques. Students will develop quantitative problem-solving skills, understand key spectroscopic techniques, and apply statistical tools for chemical data analysis and interpretation.

Module learning outcomes (MLO)

On successful completion of this module, a student will be expected to be able to:

MLO 1

Apply fundamental principles of physical chemistry to explain states of matter, gas behaviour, thermodynamic processes, and perform quantitative chemical calculations involving moles, concentrations, and stoichiometry.

MLO 2

Interpret and evaluate chemical data using appropriate analytical and statistical methods, including accuracy, precision, confidence intervals, calibration techniques, and quality control procedures.

MLO 3

Analyse the fundamental principles and instrumentation of key analytical techniques, including UV-Visible, IR and NMR spectroscopy, mass spectrometry, as well as titrimetric and gravimetric methods.

MLO 4

Analyse basic quantum mechanical concepts, such as wave-particle duality, quantization, and energy levels, and explain how these underpin energy transitions and absorption phenomena in spectroscopy.

Module contents

States of matter, physical quantities, units, and dimensions	The mole concept, concentration units, chemical calculations and stoichiometry	Properties of gases
Basic thermodynamics	Data analysis and statistical treatment	Introduction to spectroscopic and spectrometric techniques: UV-Visible, IR, NMR and MS
Introduction to quantum mechanics and application to spectroscopy	Overview of instrumental analysis: Instrument types, components, calibration, figures and signal-to-noise	Acid-base equilibria, precipitation equilibria and solubility calculations
Titrimetric and gravimetric methods		

Assessment

60% Examination
40% Coursework



■ Examination — 60% ■ Assignments — 20% ■ Class tests — 20%

Formative assessment

Weekly discussion and feedback

Summative assessment

COMPONENT	WEIGHTING
Examination	60%
Coursework	40%
Individual	40%
Assignments	20%
Class tests	20%

Graduate attributes and skills

Programme learning objectives (PLO) addressed

1 PLO 1 (Fundamental Knowledge in Chemistry)	3 PLO 3 (Critical Thinking and Problem-Solving Skills)
6 PLO 6 (Digital Literacy and Lifelong Learning Skills)	

Sustainability concept addressed

4

SDG 4 Quality Education

9

SDG 9 Industry, Innovation and Infrastructure

12

SDG 12 Responsible Consumption and Production

Digital skills/software used (not limited to)

- Word processing software (e.g. Microsoft Word)
- Data processing software (e.g. Microsoft Excel)
- Organisational tools (e.g. Outlook calendar)
- Spectral Analysis (e.g. ChemSketch or ChemDraw)
- Learning management system (e.g. Canvas)

Micro-credentialling option

No

Stackable towards GenBESTARI Undergraduate Degree Programme or other relevant Lifelong Learning Programmes

No

Document details

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