UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title	Practical Chemistry 1
Module Code	CFS4026-D
Academic Year	2022/3
Credits	40
School	School of Chemistry and Biosciences
FHEQ Level	FHEQ Level 4

Contact Hours	
Type	Hours
Interactive Learning Objects	16
Tutorials	8
Laboratories	168
Directed Study	196
Online Lecture (Synchronous)	12
Online Lecture (Synchronous)	Assessment: Students will submit laboratory handbooks and post-lab reports towards a summative assessment of their progress. Opportunities for formative feedback will be given to guide the student's progress. Each laboratory session will involve students being asked to answer questions on the experiment they are completing (preset questions). These questions will be procedure based, rather than theory, to ensure the student understands their actions in the experiment. A Skill Set Assessment will be completed by the student at the end of the academic year, assessing the competency of the student to work safely, and where possible, independently. This will include assessment of the student conducting basic laboratory procedures such as a recrystallisation or separation of an organic molecule. A closed book exam will be held to assess the Mathematics component of the module. NOTE: There is an attendance requirement for this module. A minimum of 70% attendance at practical labs is required to gain sufficient laboratory experience and skills training. This is a PASS/FAIL component of the module and students MUST PASS this requirement to pass the module.

Availability	
Occurrence	Location / Period
BDA	University of Bradford / Academic Year

Module Aims

This module will introduce the fundamental techniques required to work safely and efficiently in the laboratory and will cover the following key areas:

Health and Safety: You will develop your skills in the safe handling of chemicals, in making accurate qualitative observations, quantitatively analysing compounds prepared in the laboratory, and in reporting and interpreting experimental results.

Synthetic Chemistry: You will gain experience and knowledge in the synthesis of organic compounds and coordination complexes, including reactions involving main group chemistry. You will learn synthetic techniques and purification methods, including, but not limited to, refluxing, recrystallisation, distillation and biphasic separations of organic compounds. Principles of Green Chemistry will be introduced to allow you to learn how to assess the environmental impact of laboratory work.

Analytical and Physical Chemistry: You will learn about spectroscopic techniques (1H Nuclear Magnetic Resonance, Infrared and UV-Visible Spectroscopy and Mass Spectrometry) and use these methods in the analysis of what you synthesise in the lab. You will use measurements of physical parameters to investigate aspects of physical chemistry, including determination of activation energies and enthalpies of solution.

Record Keeping and Presentation of Results: You will learn how to record experiments accurately in your laboratory notebook, in line with standard industrial specifications. Through preparing laboratory reports you will be introduced to the standard formats and drawing packages used by professional chemists to share their results. You will also be taught how to use Microsoft Excel for the analysis and interpretation of your results.

Mathematics: You will be tutored in the basic numeracy skills necessary to study a degree in the chemical sciences and will apply these skills to your experimental work.

Outline Syllabus

Health and Safety:
- Chemical hazards and risk assessments
- Sources of safety data, online databases
- Definitions and safety terms, exposure limits, legislation, COSHH.

Synthetic Chemistry:
- Synthesis of organic and coordination compounds
- Separation of organic compounds from solids and liquid mixtures
- Thin layer chromatography
- Purification of single and mixed substances
- Green chemistry.

Analytical and Physical Chemistry:
- 1H NMR Spectroscopy
- IR Spectroscopy
- UV-Vis Spectroscopy
- Mass Spectrometry
- Melting Points.

Record Keeping and Presentation of Results:
- Data manipulation, interpretation and presentation of results.
- Chemical structure drawing.

Mathematics:
- Experimental errors and calibration
- Precision, accuracy, sensitivity, linear regression, units
- Validation of data
- Statistical methods
- Reporting and interpreting experimental results
- Quantitative and qualitative measurements
- Algebra, Differential calculus, Integral calculus, Trigonometry

Learning Outcomes	
Outcome Number	Description
01	Classify types of chemical hazard and implement safe working practices based on this analysis.
02	Apply appropriate standards of reporting for recording and then disseminating experimental data and results.
03	Record and interpret analytical data, combining the data to help answer experimental questions.
04	Understanding and conduct basic laboratory procedures in a safe and efficient manner.
05	Explain the role of Green Chemistry in measuring, and then minimising the environmental impact of practical chemistry.
06	Manipulate numerical data and equations and will be able to identify and quantify errors.
07	Apply theory and concepts taught in Organic, Inorganic and Physical Chemistry 1 to the practices carried out in Practical Chemistry 1

Learning, Teaching and Assessment Strategy

Delivery of Laboratory Practicals: Students will complete laboratory experiments supported by weekly online pre-lab and post-lab learning packages. Teaching labs will be held on-campus to ensure essential practical skills are developed. Laboratory-based work will include staff-led demonstration of practical and manipulative skills at the bench and supervision of student's experimental work. Teaching of health and safety and laboratory skills will be delivered in workshops and the ability to work to health and safety standards will be monitored and assessed throughout this module.

Online Learning Packages (OLPs): In addition, there will be 16 hours of OLPs to complete, which will cover topics such as basic chemistry calculations, using computer software and data interpretation. Also provided are short videos that demonstrate key skills and a set of structured activities (reading, and online VLE quizzes) that 'scaffold' the students learning. Workshops will be used to teach the fundamental spectroscopic techniques used in the lab and to give instruction in the use of specialist software for the preparation of laboratory reports.

Mathematics: Data analysis and mathematics will be taught and practised through problem-based learning, workshops and small-group tutorials.

Assessment: Students will submit laboratory handbooks and post-lab reports towards a summative assessment of their progress. Opportunities for formative feedback will be given to guide the student's progress. Each laboratory session will involve students being asked to answer questions on the experiment they are completing (preset questions). These questions will be procedure based, rather than theory, to ensure the student understands their actions in the experiment. A Skill Set Assessment will be completed by the student at the end of the academic year, assessing the competency of the student to work safely, and where possible, independently. This will include assessment of the student conducting basic laboratory procedures such as a recrystallisation or separation of an organic molecule.

A closed book exam will be held to assess the Mathematics component of the module.

NOTE: There is an attendance requirement for this module. A minimum of 70% attendance at practical labs is required to gain sufficient laboratory experience and skills training. This is a PASS/FAIL component of the module and students MUST PASS this requirement to pass the module.

Mode of Assessment			
Type	Method	Description	Weighting
Summative	Attendance requirement	70% attendance of practical labs to gain sufficient laboratory experience and skills training PASS/FAIL	0%
Summative	Examination - Closed Book	Closed book maths exam and data handling (1.5 Hrs) exercise	30%
Summative	Laboratory Report	Postlab reports comparing experimental practices (6 reports, 6000 words)	55%
Summative	Laboratory Report	Laboratory notebooks and viva on experimental procedures (2 Hrs)	5%
Summative	Examination - practical/laboratory	Skill Set Assessment at end of year - 'technical challenge' (6 Hrs)	10%

Reading List
To access the reading list for this module, please visit https://bradford.rl.talis.com/index.html

Please note:
This module descriptor has been published in advance of the academic year to which it applies. Every effort has been made to ensure that the information is accurate at the time of publication, but minor changes may occur given the interval between publishing and commencement of teaching. Upon commencement of the module, students will receive a handbook with further detail about the module and any changes will be discussed and/or communicated at this point.

---

https://bradford.ac.uk