UNIVERSITY of BRADFORD

Module Descriptor

Module Details	
Module Title:	Practical Chemistry for Apprentices 2
Module Code:	CFS5022-C
Academic Year:	2019-20
Credit Rating:	30
School:	School of Chemistry and Biosciences
Subject Area:	Chemistry
FHEQ Level:	FHEQ Level 5
Pre-requisites:	Practical Chemistry for Apprentices 1 2018-19
Co-requisites:	

Contact Hours	
Type	**Hours**
Seminar	2
Work based learning	218
Tutorials	10
Laboratory	40
Directed Study	30

Availability	
Occurrence	**Location / Period**
BDA	University of Bradford / Academic Year (Sept - May)

Module Aims

You will further develop practical skills both within your work environment and during a residential summer school in Bradford.

This module builds on the Practical Chemistry 1 module and aims to enhance your synthetic and analytical techniques. You will further develop your skills for the synthesis of organic and inorganic compounds by employing multi-step reactions. You will also apply advanced spectroscopic techniques for the structure elucidation of reaction products and to gain an understand their physical properties.

You will extend your laboratory skills to using methods required for nanoscience, electrochemistry, colligative properties, crystallisation and computational chemistry. You will develop your professional and transferable skills through the means of group work, presentations and CV workshops. Through pre-laboratory material, MCQ and COSHH assessment, laboratory write-ups, laboratory vivas and group work, you will develop your understanding and appreciation of practical chemistry, enabling you to link these practical skills to the other core curriculum modules and learn their importance within industrial applications.

Outline Syllabus

1. Multi-step reactions: understand organic multi-step reactions in theory and practice

2. Coordination compounds: synthesis, characterisation and analysis of metal complexes

3. UV/Vis spectroscopy: Crystal Field and Ligand Field Theory

4. NMR techniques: analysing nuclear magnetic resonance data by understanding nuclear magnetism and chemical shifts of organic and inorganic compounds.

5. Powder X-ray diffraction: theory, concepts and Bragg's Law.
6. Vibrational spectroscopy: analysing compounds by Raman
spectroscopy and understanding the vibrational characteristics of their functional groups

7. Thermodynamics: states of matter and determination of thermodynamic parameters.

8. Thermodynamic and kinetic control in organic reactions: calculating kinetic parameters for a given reaction; and understanding the concepts of phase equilibria/colligative properties.

9. Metal reduction: reduction of vanadium by various reduction techniques.

10. Separation techniques: concepts of ion exchange.

11. Carbonyl chemistry: synthesis and mass spectrometry

12. Diazo-compounds: manipulation to generate substituted aromatic compounds from commercially available or easily accessible aromatic amines.

13. Computational chemistry: theoretical basis of organic reaction mechanisms

14. Nanoscience: basic concepts, versatility of nano-particles within industrial applications.

15. Electrochemistry: practical introduction to the basic terms and concepts.

16. Short Investigative Task: 4-week group project with a topic relating to either research and/or industry

17. Communication skills: written and oral communication, using problem-solving skills with qualitative and quantitative information.

18. Interpersonal skills: CV and cover letter writing, reflection on professional attributes.

19. Use library resources and bibliographic databases to support your learning

20. Select literature sources to support scientific arguments based on relevance and quality.

Learning Outcomes	
1	Identify and describe types of chemical hazards, state how to minimise risks when using hazardous substances and perform COSHH assessments.
2	Demonstrate breadth and depth of understanding of relevant core chemistry concepts and practical chemistry principles.
3	Apply core chemistry knowledge to solve qualitative and quantitative problems, including the analysis and interpretation of spectroscopic data.
4	Plan and implement efficient and effective modes of working on a range of synthetic and analytical tasks, both alone and in teams, within the laboratory environment.
5	Perform multistep preparative syntheses and characterise products through advanced analytical techniques.
6	Document all laboratory procedures to GLP standards.
7	Demonstrate the use of information technology (IT) and data-processing skills, relating to chemical information and data analysis and interpretation.
8	Critically evaluate, select and perform appropriate analytical methods with the ability to explain associated arguments, assumptions and data used to make judgements and conclusions.
9	Communicate scientific ideas, problems and solutions effectively through written lab write ups and group work.
10	Interact effectively with other people and engage in team working, including presentation of lab work as part of a team.

Learning, Teaching and Assessment Strategy

On-campus laboratory-based work will include staff-led demonstration of practical and manipulative skills at the bench and supervision of students' experimental work. Online material will be provided for each experiment to familiarise students with the concepts and procedures. Students will be asked to reflect on the results and their significance.
Apprentices will evidence the continued development of their practical skills in an inductrial setting through engagment with e-portfolio systems. Support for this will come from the apprentice's supervisory team.
On-line seminars and support materials will be given to help apprentices in their continued professional development. This will be facilitated by meetings of the supervisory team with the apprentice.
On-line seminars and tutorials will help apprentices engage with the management theory of change-management processes.

Apprentices will refine an e-portfolio of skills and knowledge to evidence their progression in the chemical sciences. Laboratory work will be assessed via continous assessment of students' laboratory practices.

Assessment 1 will cover the practical work conducted in the summer school and will assess LO 2, 6 and 7

Assessment 2 will enable apprentices to evidence the practical skills that they have developed during the second year of their apprenticeship and will allow them to continue their reflective skills audit from year 1. LO 1, 4 and 5. Formative feedback on the developing e-portfolio will be provided throughout the year by the supervisory team.

Assessment 3 will be a reflective essay that discusses an area of the apprentice's professional work where change management is required. The essay will identify the issue and discuss the collaborative nature of its resolution. Formative feedback will be provided on a draft. To assess LO 3 and LO 8

Mode of Assessment

Type	Method	Description	Length	Weighting
Summative	Laboratory Report	Lab Report	0-1500 words	25%
Summative	Coursework	Reflective report detailing a change-management process	0-1500 words	25%
Formative	Coursework	Formative assessment of report detailing a change management process		%
Formative	Coursework	Feedback on laboratory record		%
Summative	Computer-based assessment	e-portfolio of Chemistry skills and knowledge developed through year to include continued skills audit.	0-3000 words	50%
Formative	Computer-based assessment	Continuous feedback on e-portfolio		%

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.