University of the West of England
BRISTOL

CORPORATE AND ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data						
Module Title	Chemistry for Forensic Science and Data Analysis					
Module Code	USSKC5-30-1		Level	1	Version	1
Owning Faculty	Health and Applied sciences		Field	Biological, Biomedical and Analytic sciences		
Contributes towards	FdSc Forensic Science @ UCY					
UWE Credit Rating	30	ECTS Credit Rating	15	Module Type	Standard	
Pre-requisites	None		Co- requisites	None		
Excluded Combinations	None		Module Entry requirements			
Valid From	September 2014		Valid to	September 2020		

CAP Approval Date	28/03/2014

Part 2: Learning and Teaching	
Learning Outcomes	On successful completion of this module students will be able to: **Chemistry** • Demonstrate knowledge of chemical principles underlying atomic structure and bonding; • Name elements, simple molecules and organic functional groups; • Use basic chemical terminology to describe commonly encountered chemical reactions; • Explain how electromagnetic radiation interacts with matter; • Relate three-dimensional molecular geometry to macroscopic properties; • Carry out simple laboratory techniques in chemistry; • Recognise and describe a range of routine analytical techniques available for the chemical analysis of molecules; • Describe the functions of the components of basic analytical instruments and operate analytical instruments at a basic level; • Record experimental data in an appropriate manner; use it for the calculation of concentrations and other parameters of simple test samples and in the calibration of instruments. **Data Analysis**

	• Demonstrate an appreciation of the importance for quantification, together with an estimation of associated uncertainties, when presenting scientific information. •Use appropriate software to display and analyse scientific information: drawing graphs, using formulae, functions and appropriate formatting. • Address scientific problems using appropriate mathematical and statistical skills • Use electronic resources that will also support their problem solving skills throughout their undergraduate course. • Demonstrate an appreciation of the importance for quantification, together with an estimation of associated uncertainties, when presenting scientific information.
Syllabus Outline	**Structure and Bonding:** The periodic table, atoms, stable electron configurations, covalent and ionic bonding. Electronegativity, polar bonds and intermolecular forces. Formation of hybrid orbitals, sigma and pi bonds and non-bonding electron pairs. Lewis structures. Chemical terms and calculations of mass and concentration – moles, relative atomic and molecular mass, molarity, reaction yields. Names and formulae of important inorganic compounds and their ions. Classification of hydrocarbons and organic functional groups. **Principles of Chemical and Physical Reactivity.** Bond and lattice energies. Basic kinetic theory, activation energy, order of reaction and simple rate equations. Introduction to radiochemistry and sources of radioactivity. **Fundamental Stereochemistry:** Stereoisomers and structural isomers. Optical isomers. Molecules containing a chiral centre, enantiomers and their physical properties. Perspective formulae, sawhorse representations. **Basics of Chemical Analysis:** Spectroscopy (UV, Vis, IR), chromatography (TLC, GC, HPLC), electrophoresis (e.g. SDS-page), electrochemistry (e.g. pH measurement) **Scientific Investigation:** Testing of hypotheses. Making decisions. Use of standards: internal and external calibration. uncertainty, combining uncertainty, linear calibration **Introduction to hypothesis testing:** T-test, F-test, Chi-squared test. Testing for Normality. Modelling scientific systems **Relationships in science**: equations, formulae. Theoretical modelling: analytical, graphical. Linear relationships and regression. Exponential and logarithmic functions. Equations of growth and decay. Variability in science - system variations, **Experimental uncertainty**: Probability, frequency. Use of normal distribution, Z-scores, confidence interval. Combining probabilities. Binomial and Poisson distributions. **Use of IT:** recording, presenting, analysing and interpreting data. Use of EXCEL to display and analyse scientific information: formatting, graphs, use of formulae and functions, absolute and relative addressing. Descriptive statistics. Differentiation and integration in science using EXCEL.
Contact Hours	Students will have 2 hours of lectures per week to cover the Chemistry based learning objectives. In addition they will also have 1 hour for Data Analysis. Sessions will run throughout the year.
Teaching and Learning Methods	**Scheduled learning** includes lectures, seminars, tutorials, demonstration, practical classes and workshops. **Independent learning** includes hours engaged with essential reading, assignment preparation and completion. These sessions constitute an average time per level as indicated in the table below. In addition to scheduled learning, the students will be expected to work independently to widen their own knowledge base in particular areas of the syllabus having been given specific direction; problems relating to this material and that in

	other areas will form the basis of some of the tutorial sessions. Seminar sessions offer students support focussed on their individual needs. Resources include direct tutorial material, and references to published material, software, internet and intranet resources. Where possible, and appropriate, the mathematical and statistical topics are presented and tested in the context of scientific problems. Specific use is made of computer workshop exercises to provide the broad context of scientific inquiry. The learning processes of the students are based on: A clear knowledge of expected performance through indicative questions associated with the tutorial material. Weekly lectures/tutorials which establish the core direction of the module (syllabus content) and provide navigation for the students through the learning resource material. Extensive tutorial support via VLE, including video learning. Drop-in' and individual support to address specific problems.
Key Information Sets Information	Key Information Sets (KIS) are produced at programme level for all programmes that this module contributes to, which is a requirement set by HESA/HEFCE. KIS are comparable sets of standardised information about undergraduate courses allowing prospective students to compare and contrast between programmes they are interested in applying for. **Key Information Set - Module data** *Number of credits for this module*: 30 Hours to be allocated: 300 Scheduled learning and teaching study hours: 69 Independent study hours: 231 Placement study hours: Allocated Hours: 300 The table below indicates as a percentage the total assessment of the module which constitutes a - **Written Exam**: Unseen written exam. **Coursework**: Laboratory reports, data analysis portfolio. Please note that this is the total of various types of assessment and will not necessarily reflect the component and module weightings in the Assessment section of this module description: Total assessment of the module: Written exam assessment percentage: 40% Coursework assessment percentage: 60% Practical exam assessment percentage: 0% 100%
Reading Strategy	All students will be encouraged to make full use of the print and electronic resources available to them through membership of the University and UCY. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways, including ForensicNetBase. The University Library's web pages provide access to subject relevant resources and services, and to the library catalogue. Many resources can be accessed remotely. Students will be presented with opportunities within the curriculum to develop their information retrieval and evaluation skills in order to identify such resources effectively. Any **essential reading** will be indicated clearly, along with the method for accessing it, e.g. students may be expected to purchase a set text, be given or sold a print study pack or be referred to texts that are available electronically, etc. This guidance will be

	available either in the module handbook, via the module information on Blackboard or through any other vehicle deemed appropriate by the module/programme leaders. If **further reading** is expected, this will be indicated clearly. If specific texts are listed, a clear indication will be given regarding how to access them and, if appropriate, students will be given guidance on how to identify relevant sources for themselves, e.g. through use of bibliographical databases.
Indicative Reading List	The resources below or updated editions of: **Core texts for chemistry:** Atkins, P. and Jones, L. (2004) *Chemical Principles*: *The Quest for Insight.* 3rd Ed. Virginia (USA): W H Freeman and Co. Johll, M. (2011) *Investigating Chemistry: Introductory Chemistry from a Forensic Science Perspective*. Virginia (USA): W.H Freeman & Co. Lewis, R. and Evans, W. (2011) *Chemistry*. 4th Ed. Hampshire: Palgrave Macmillan. **Supporting texts for chemistry:** Students may be directed to sections of supporting texts, which provide accessible accounts of fundamental topics in chemistry e.g. the Oxford Chemistry Primer series published by the Oxford University Press. Also: Crowe, J., Bradshaw, T. and Monk, P. (2006) *Chemistry for the Biosciences*. Oxford: Oxford University Press Higson, S.P.J. (2003) *Analytical Chemistry*. Oxford: Oxford University Press. **Core texts for Mathematics:** Cann, A. (2002) *Maths from Scratch for Biologists*. Chichester: John Wiley & Sons Ltd. Croft, A. and Davison R. (2006) *Foundation Maths*. 4th Ed. Essex: Pearson Education Ltd. Currell, G. and Dowman, A. (2009) *Essential Mathematics and Statistics for Science*. 2nd Ed. Chichester: Wiley-Blackwell. Monk, P. (2006) *Maths for Chemistry: A Chemist's Toolkit of calculations*. Oxford: Oxford University Press.

Part 3: Assessment	
Assessment Strategy	**Examination (40%):** 1 hour- AP1 (33%) and 2 hours AP2 (67%) Module teams at both UWE and UCY note that L1 students to find chemistry modules especially challenging at level 1. The greater weighting placed on the second exam is intended to reduce any disadvantage to those learners who enter the course with minimal prior knowledge of the subject. **Coursework (60%):** The coursework is comprised of two parts, equally weighted. **CW1** An assessment of work undertaken in the practical sessions, to include

	processing of images and data produced in the laboratory and answering of questions designed to test understanding of significance of experimental results. Students will also keep a laboratory notebook, which will be formatively assessed at the end of each practical session. The completed book will be handed in as part of the assessment. **CW2** The data analysis element of the module is carefully structured to link to elements covered within the Science parts, students will be assessed to include explicit performance attainment targets identified by indicative questions and self-assessment tests. The testing of progress through self-assessment questions is part of the portfolio assessment.

Identify final assessment component and element		
% weighting between components A and B (Standard modules only)	**A:** **40%**	**B**: **60%**

First Sit	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Exam 1 (1 hours)	33%
2. Exam 2 (2 hours)	67%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Portfolio of worksheets / practical reports for Chemistry	50%
2. Portfolio for Data Analysis	50%

Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**
1. Exam (3 hours)	100%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Extended Portfolio of rewritten practical reports for Chemistry	50%
2. Written numerical assignment	50%
If a student is permitted an **EXCEPTIONAL RETAKE** of the module the assessment will be that indicated by the Module Description at the time that retake commences.	