University of the West of England
BRISTOL

CORPORATE AND ACADEMIC SERVICES

MODULE SPECIFICATION

Part 1: Basic Data						
Module Title	Chemistry in Context					
Module Code	USSJRT-30-1		Level	1	Version	1
Owning Faculty	Health and Applied Sciences		Field	Biological, Biomedical and Analytical Sciences		
Contributes towards	BSc Forensic Science, BSc Forensic Science (Chemistry), BSc Forensic Science (Biology)					
UWE Credit Rating	30	ECTS Credit Rating	15	Module Type	Standard	
Pre-requisites	N/A		Co- requisites	N/A		
Excluded Combinations	N/A		Module Entry requirements	N/A		
Valid From	September 2013		Valid to	September 2019		

CAP Approval Date	28/03/2014

Part 2: Learning and Teaching	
Learning Outcomes	On successful completion of this module students will be able to: • give examples to illustrate how chemical structure and bonding relates to macroscopic properties in simple inorganic and organic molecules (components A1, A2, B1, B2); • use ideas of entropy and enthalpy as a predictive tool to determine stabilities of compounds and yields of reactions (components A1, B1); • analyse simple kinetic data and relate this analysis to reaction mechanisms (components A1, B1); • describe common synthetic strategies and types of reaction relevant to drugs (components A2, B2); • identify important classes of organic functional groups and ring systems, and relate their structure to action as acids or bases in chemical reactions (components A1, A2, B1, B2); • illustrate their knowledge of chirality and configuration in organic molecules using simple examples of drugs, flavours or fragrances (components A2, B2); • explain how underlying bonding in metals and their complexes gives rise to their magnetic, electronic and biological properties (components A2, B2); • carry out some fundamental practical techniques encountered in chemical synthesis and experimental chemistry (components B1, A2).
Syllabus Outline	<u>Winning Combinations.</u> Why do atoms combine into complex molecules and materials, and how does this influence their chemical and physical properties? Chemical combinations - origins of ionic and covalent bonding related to atomic structure and the Periodic Table; electronegativity, polar bonds and intermolecular forces. Nuclear decay processes and

	an introduction to nuclear forensics. Molecular orbital and valence bond theories of sigma and pi bonding in organic and inorganic compounds. Naming and structures of important inorganic compounds and metal coordination compounds, origins of isomerism and biological relevance. Theories of bonding related to electronic and magnetic properties of metals and their complexes. Explosive or Inert? Why do reactions happen? Introduction to stability of atoms, molecules and mixtures, with examples of specific explosives. Entropy, order and disorder. Energy and combustion, enthalpy. Isotopes, radiation and radioactive decay. Elementary kinetics. Definition and factors influencing the rate of a chemical reaction. Classification of reactions according to speed and complexity. Rate equations for first and second order reactions: mention of zero, third and fractional order reactions. Experimental and mathematical methods for determination of order and rate constants. Temperature dependence of reaction rates. Introduction to catalysis and organic synthesis. Dissociation constants and theories of acids and bases. Drugs, Flavours and Fragrances. What are the structures and origins of important drugs? Identifying organic functional groups and ring systems: classes of functional group, unsaturated and aromatic systems. Synthesis and reactivity of aromatic and non-aromatic ring systems. Fundamental stereochemistry in the context of drugs - structural isomers and stereoisomers. Chiral centres, enantiomers and physical properties. Different representations of structure in chiral molecules. Systems containing two chiral centres, diastereoisomers, meso compounds. Specification of relative configurations, absolute configurations, sequence rules for molecules containing one chiral centre. Geometrical isomerism and cis/trans, Z/E specification of configuration. Relevance of stereochemistry to biochemistry. Types of chemical reagent and common synthetic reactions in organic synthesis.
Contact Hours	The contact hours (72) are distributed as follows: 24 hours of lectures, 12 hours of tutorials, 9 hours of workshops, 27 hours of laboratory practicals.
Teaching and Learning Methods	The material will be delivered using a combination of lectures, workshops, tutorials and laboratory work. Lectures will be augmented by directed reading in the recommended text and in selected publications from the scientific literature, e.g. Drug Discovery Today, Journal of Medicinal Chemistry. The topics selected for delivery by workshops and practical work will be designed to enhance problem solving skills and to provide experience of relevant laboratory techniques. Tutorial sessions will be used to allow students to progress at different rates depending on their academic backgrounds and individual needs. Technology enhanced learning will be embedded within teaching materials via links to supplementary electronic online resources of the textbook and other relevant information portals, e.g. http://www.chemspider.com Use will also be made of various in-house electronic resources and flash videos in chemistry for biologists available at http://calcscience.uwe.ac.uk. Student learning will be further supported through a variety of materials posted on the University's E-Learning Environment, Blackboard. Independent learning will take the following forms with an approximate indication of time required for each: • Essential reading to support acquisition of knowledge and completion of problem solving skills exercises relating to lectures, tutorials, workshops or practical classes – 76 hours • Preparation and submission of coursework – 76 hours

	• Revision and preparation for exams – 76 hours
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: 72 | Independent study hours: 228 | Placement study hours: 0 | Allocated Hours: 300 The table below indicates as a percentage the total assessment of the module which constitutes a - **Written Exam**: Two unseen written exams **Coursework**: Two portfolios of written worksheets 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. These include a range of electronic journals and a wide variety of resources available through web sites and information gateways. 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	The following books are recommended for purchase by students as they cover the

Reading List	majority of aspects of the course. Johll, M E, (2009) *Investigating Chemistry, a Forensic Science Perspective*.2nd ed. W.H. Freeman. Lewis, R. and Evans, W. (2011) *Chemistry*. 4th ed. Basingstoke: Palgrave Macmillan Students are also advised to consult related texts on the topic, of which the following are representative: Bell, S. (2013) *Forensic Chemistry*.2nd ed. London: Pearson Press. Crowe, J. and Bradshaw, T. (2010) *Chemistry for the Biosciences*.2nd ed. Oxford: Oxford University Press. Volhardt P. Schore N., (2009) *Organic Chemistry - structure and function*. 6th ed. London: Freeman Palgrave Macmillan, Additional useful texts in the UWE Frenchay library can be accessed at shelf marks 615.1 and 541.22

Part 3: Assessment	
Assessment Strategy	Students will undertake experiments, tutorial sessions and workshops based on the theoretical and practical aspects of chemical reactivity and synthesis applied within a forensic context. The assessed worksheets will contain questions and responses for students to complete during these timetabled sessions and further questions for students to research in their own time. The material will be directed to increase the students' problem solving skills and their use of electronic resources. The examinations will assess the students' knowledge acquired during lectures, tutorials and workshops, and from their own directed, independent learning.

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. 1 hour written examination	33%
2. 2 hour written examination	67%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Portfolio of worksheets	50%
2. Portfolio of worksheets	50%

Resit (further attendance at taught classes is not required)	
Component A (controlled conditions) **Description of each element**	**Element weighting** **(as % of component)**

1. 3 hour written examination	100%
Component B **Description of each element**	**Element weighting** **(as % of component)**
1. Portfolio of worksheets	100%
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.	