University of the
West of England

MODULE SPECIFICATION

Code: USSJRT-30-1 **Title:** Chemistry in Context **Version:** 1

Level: 1 **UWE credit rating:** 30 **ECTS credit rating:** 15

Module type: Standard

Owning Faculty: Health and Life Sciences **Field:** Applied Sciences

Faculty Committee approval: Quality and Standards Committee **Date:** March 2011

Approved for Delivery by: N/A

Valid from: September 2011 **Discontinued from:**

Pre-requisites:
None

Co-requisites:
None

Entry Requirements:
N/A

Excluded Combinations:
None

Learning Outcomes:

The student will be able to:

• give examples to illustrate how chemical structure and bonding relates to macroscopic properties in commonly encoutered compounds and materials, such as drugs and polymers;
• explain how underlying bonding in metals and their complexes gives rise to their magnetic, electronic and biological properties;
• use ideas of entropy and enthalpy as a predictive tool to determine stabilities of compounds and yields of reactions;
• analyse simple kinetic data and relate this analysis to reaction mechanisms;
• describe common synthetic strategies and types of reaction relevant to drugs, flavours, fragrances, polymers and ceramics;
• identify important classes of organic functional groups and ring systems, and relate their structure to action as acids or bases in chemical reactions;
• illustrate their knowledge of chirality and configuration in organic molecules using simple examples of drugs, flavours or fragrances;
• carry out a range of practical techniques encountered in chemical synthesis and experimental chemistry.

Syllabus Outline:

Winning Combinations.

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. Structures of common ionic compounds and their properties. 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. Classification of solids - the underlying molecular structures of materials, properties of

crystalline and amorphous polymers and ceramics, examples of composites. Case studies of polymers and materials based on group 13-15 elements, such as polyphosphates, ceramics, zeolites and glass.

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, flavours and fragrances? 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, flavours and fragrances - 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.

Teaching and Learning Methods:

In addition to lectures, tutorials and online video materials (http://science.uwe.ac.uk/ls/orgchem/), a series of workshops will be used to deliver the syllabus. These will blend practical work and development of key skills in experimental chemistry with student focussed assessed worksheets. Students will be expected to use these worksheets as a basis to widen their own knowledge in particular areas of the syllabus having been given direction. Tutorial sessions will be used to allow students to progress at different rates depending on their academic backgrounds and individual needs.

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 Reading List:

Aspects of the syllabus are covered in books such as:

• Housecroft C E and Constable E C, Chemistry (4th edn), Pearson (2010)
• Johll M, Investigating Chemistry, W H Freeman (2009)
• Lewis R. and Evans W., Chemistry (3rd edn), Palgrave Foundations (2006)
• Atkins P and Jones L, Chemical Principles, (4th edn), W H Freeman and Co, (2008)
• McMurry J E, Fay R C and Fantini J, Chemistry (6th edn), Pearson (2008)

Suitable textbooks can be found in Section 540 of the library.

Assessment:

Weighting between components A and B (standard modules only) A: 40% B: 60%

FIRST ATTEMPT

First Assessment Opportunity

Component A *(controlled)*		**Element Wt (Ratio)**
Description of each element		*(within Component)*
EX1 Exam (1.0 hour) (Assessment Period 1)		1
EX2 Exam (2.0 hours) (Assessment Period 2)	***Final Assessment***	2

Component B	**Element Wt (Ratio)**
Description of each element	*(within Component)*
CW1 Portfolio of practical worksheets and exercises.	1
CW2 Portfolio of practical worksheets and exercises.	1

Second Assessment Opportunity (Resit) further attendance at taught classes is not required

Component A *(controlled)*		**Element Wt (Ratio)**
Description of each element		*(within Component)*
EX3 Exam (3 hours)	***Final Assessment***	1

Component B	**Element Wt (Ratio)**
Description of each element	*(within Component)*
CW3 Extended portfolio of worksheets and exercises.	

EXCEPTIONAL SECOND ATTEMPT Attendance at taught classes is required.

Specification confirmed by ……Date ……
(Associate Dean/Programme Director)