Liverpool John Moores University

Title:	STRUCTURE AND REACTIVITY
Status:	Definitive
Code:	**3201FNDSCI** (113129)
Version Start Date:	01-08-2016
Owning School/Faculty:	Pharmacy & Biomolecular Sciences
Teaching School/Faculty:	Pharmacy & Biomolecular Sciences

Team	Leader
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Academic Level:	FHEQ3	**Credit Value:**	12	**Total Delivered Hours:**	48
Total Learning Hours:	120	**Private Study:**	72		

Delivery Options
Course typically offered: Semester 1

Component	Contact Hours
Lecture	12
Practical	6
Workshop	30

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	MCQ Test	50	
Report	AS2	Assessed Practical	50	

Aims

The aim of this module is to introduce students to the concepts of sub-atomic and molecular structure, and to appreciate its relationship to the chemical reactivity of both atoms and molecules. In this module sub-atomic structure is considered together with ideas of chemical bonding. The relationship between atomic structure,

chemical reactivity and the position an element occupies in the Periodic Table is developed using the elements of Period 3 and Group II. Periodic trends and the influence of structure on reactivity are reinforced by practical work.

Learning Outcomes

After completing the module the student should be able to:

1	Describe the properties of sub-atomic particles.
2	Describe the operation of a simple mass spectrometer.
3	Calculate physical quantities, e.g. concentration, using laboratory data.
4	Account for the behaviour of matter, and changes of state, in terms of the constituent particles.
5	Relate bonding and structure to physical properties.
6	Describe and account for trends in properties of elements.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

Computer MCQ Test	1	2	4	5	6
Assessed Practical Report	3				

Outline Syllabus

The properties of protons, neutrons and electrons, in terms of relative charge and relative mass. Meaning of mass number (A) and atomic (proton) number (Z). Existence of isotopes. The electronic structures of atoms and ions up to Z = 36 in terms of levels and sub-levels s, p and d, considered as energy levels not quantum numbers. Ionisation energies in Group II (Be -Ba) and in Period 3 (Na -Ar).

Principles of a simple mass spectrometer, limited to ionisation, acceleration, deflection and detection. Simple mass spectra of elements and calculations of relative atomic mass from isotopic abundance, limited to mononuclear ions.

Ionic, covalent, co-ordinate and metallic bonding. Electronegativity and polar covalent bonds. Polarisation of ions e.g. chlorides of Period 3 and Group II. Permanent dipole-dipole, induced dipole-dipole (van der Waals') forces and hydrogen bonding.

Behaviour of gases, liquids and solids in terms of the particles, their motion and the forces acting between them. Energy changes associated with changes of state.

Crystals: ionic, metallic, molecular and giant covalent (macromolecular). Relationship between physical properties of materials and the type of structure and bonding present. Bonding and lone (non-bonding) pairs of electrons and the shapes of molecules.

Trends in atomic radius, first ionisation energy, electronegativity, electrical conductivity, melting and boiling points of the elements Na -Ar. Trends in atomic radius, first ionisation energy, electronegativity and melting point of the elements Be -Ba. Reactions of the elements Be -Ba with water and the relative solubilities of the hydroxides of these elements.

Learning Activities

Computer aided learning, lecture, laboratory work, tutorial work.

Notes

This module will give students a basic introduction to pre-degree chemistry that is built upon in other foundation level chemistry modules. The module is supported by three practical exercises that will reinforce concepts associated with structure and periodicity.