

Liverpool John Moores University

Title: Principles of Chemistry
Status: Definitive
Code: **4002CHACAP** (117488)
Version Start Date: 01-08-2012

Owning School/Faculty: Pharmacy & Biomolecular Sciences
Teaching School/Faculty: Pharmacy & Biomolecular Sciences

Team	Leader
Raymond Fox	Y
Sharon Moore	
Phil Riby	
Philip Denton	
Philip Rowe	

Academic Level: FHEQ4 **Credit Value:** 24.00 **Total Delivered Hours:** 72.00

Total Learning Hours: 240 **Private Study:** 168

Delivery Options

Course typically offered: Standard Year Long

Component	Contact Hours
Lecture	42.000
Practical	12.000
Tutorial	4.000
Workshop	14.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Practice	MCQ		30.0	1.00
Report	Essay		30.0	1.00
Test	Prac		30.0	1.00
WoW Skills Bronze	WSB		10.0	1.00

Aims

The aims of the module are to provide Applied Chemical and Pharmaceutical Science students with a basic, practical and relevant mathematical and chemical foundation for the quantitative aspects of all Level 4 chemical and biological modules.

Learning Outcomes

After completing the module the student should be able to:

- 1 Perform basic numerical manipulations, including those with signed quantities.
- 10 To identify and reflect upon the following aspects of personal development: strengths and weaknesses, motivations and values, ability to work with others.
- 2 Perform statistical analysis of data with the aid of appropriate graphical software.
- 3 Demonstrate an understanding of the aspects of scientific report writing, philosophy of science, logic and reasoning, and the concept of errors, and how they are propagated.
- 4 Demonstrate techniques for measuring kinetic data and calculate reaction parameters from this data.
- 5 Represent the Laws of Thermodynamics in mathematical form, and define key parameters.
- 6 Demonstrate an understanding of the fundamentals of mechanisms and stereochemistry.
- 7 Apply the octet rule to rationalise the formula and shape of simple molecules.
- 8 Develop arguments linking spectroscopy to energy transitions at the molecular level.
- 9 Outline the typical chemistry of elements in each of the main periodic groups.

Learning Outcomes of Assessments

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

Practical	2	3	4	5	6	7	8	9
Assignment	1	7	8	9				
MCQ class test	2	3	4					
Bronze Statement & Reflection	10							

Outline Syllabus

Critical Thinking: Aspects of scientific report writing, philosophy of science, logic, and reasoning.

Mathematics and Statistics: Algebra: Simultaneous equations, logarithms and exponentials, equation of a straight line.

Statistics and Data Analysis: Types of data; data presentation (numerical tables, bar charts, pie charts, graphs); descriptive statistics (mean, median, mode, standard deviation, standard error of the mean, coefficient of variation, 95% confidence intervals); sampling techniques; use of Excel and Minitab. Sample, data quality (validation, accuracy and precision, LoD, LoQ).

Quantitative Chemistry: Measurements and their units, manipulating and converting units, dimensional analysis, error analysis, absolute and relative errors, error propagation.

Kinetics: Extension and reinforcement of kinetics taught in Physical Pharmaceutics. Unique rate of reaction, method of initial rate: extended to include graphical deductions of reaction order, integrated rate equation: extended to consideration of product concentrations where starting concentrations are not the same, half-life: extended to include derivation of equations, steady state approximation, rapid reactions, experimental methods.

Thermodynamics: Reinforcement and extension of thermodynamic material taught in Physical Pharmaceutics. Internal energy, First Law and volume expansion, enthalpy, reversible and irreversible change.

Fundamentals of Mechanism and Stereochemistry: Extension and reinforcement of Physical Organic Chemistry taught in Pharmaceutical Chemistry. Cahn-Ingold-Prelog rules R and S diastereoisomers. Case histories of mechanistic types: Further nucleophilic substitution (SN1, SN2, chiral centre, effects of leaving group, solvent etc)). Nucleophilic addition to the carbonyl group. Addition-elimination. Further chemistry of alkenes. Introduction to electrophilic aromatic substitution.

Bonding and Intermolecular Bonding: Covalent, ionic and dative bonding, including hybridisation and molecular shape. Orientation, induction and dispersion forces, including their influence on gas, liquid, and solid phases.

Atomic Structure and Quantum theory: A review of the nucleus and the electron configuration of atoms, including a consideration of quantum numbers and basic electronic transitions. Particle in a box theory, leading to rotational and vibrational transitions in diatomic molecules. Group Chemistry and Periodicity: A brief overview of typical main group chemistry, and the change in chemistry across the periodic table.

Learning Activities

As well as traditional presentation methods, such as lectures and practicals, there will be problem-solving exercises.

References

Course Material	Book
Author	S Bolton
Publishing Year	2004
Title	Pharmaceutical Statistics: Practical and Clinical Applications
Subtitle	
Edition	4th
Publisher	Dekker
ISBN	0824746953

Course Material	Book
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Author	J Miller
Publishing Year	1993
Title	Statistics for Analytical Chemistry
Subtitle	
Edition	3rd
Publisher	Ellis Horwood
ISBN	0130309907

Course Material	Book
Author	P Rowe
Publishing Year	2007
Title	Essential Statistics for the Pharmaceutical Sciences
Subtitle	
Edition	1st
Publisher	John Wiley
ISBN	0470034688

Course Material	Book
Author	D Harris
Publishing Year	2002
Title	Qualitative Chemical Analysis
Subtitle	
Edition	6th
Publisher	W H Freeman
ISBN	0716744643

Course Material	Book
Author	T Kuhn
Publishing Year	2009
Title	The Structures of Scientific Revolutions
Subtitle	
Edition	1st
Publisher	Books LLC
ISBN	1443255440

Course Material	Book
Author	G Priest
Publishing Year	2000
Title	Logic: A very short Introduction
Subtitle	
Edition	1st
Publisher	Oxford Paperbacks
ISBN	0192893203

Course Material	Book
Author	J Ladyman
Publishing Year	2001

Title	Understanding the Philosophy of Science
Subtitle	
Edition	1st
Publisher	Routledge
ISBN	0415221570

Course Material	Book
Author	P Atkins
Publishing Year	2002
Title	Physical Chemistry
Subtitle	
Edition	7th
Publisher	Oxford University Press
ISBN	0198792859

Course Material	Book
Author	R Chang
Publishing Year	2000
Title	Physical Chemistry for the Chemical and Life Sciences
Subtitle	
Edition	3rd
Publisher	University Science Books
ISBN	1891389068

Course Material	Book
Author	J Clayden
Publishing Year	2001
Title	Organic Chemistry
Subtitle	
Edition	1st
Publisher	Oxford University Press
ISBN	0198503466

Course Material	Book
Author	T Solomon
Publishing Year	2004
Title	Organic Chemistry
Subtitle	
Edition	8th
Publisher	Wiley
ISBN	0471448907

Course Material	Book
Author	P Siska
Publishing Year	2006
Title	University Chemistry
Subtitle	

Edition	1st
Publisher	Pearson
ISBN	032130070X

Notes

This module will provide students with a basic, practical and relevant mathematical and chemical foundation for the quantitative aspects of all Level 4 chemical and biological modules.