

Liverpool John Moores University

Warning: An incomplete or missing proforma may have resulted from system verification processing

Title: INTRODUCTION TO ANALYTICAL, BIOLOGICAL AND CHEMICAL PRINCIPLES
Status: Definitive
Code: **4001CHACAP** (113153)
Version Start Date: 01-08-2011

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

Team	Leader
Raymond Fox	Y
Sharon Moore	
Phil Riby	
Fyaz Ismail	
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	32.000
Practical	12.000
Seminar	5.000
Tutorial	5.000
Workshop	18.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Test	AS1	Coursework: MCQ classroom tests	40.0	
Practice	AS2	Coursework: Assignments	30.0	

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	AS3	Coursework: Practicals reports	30.0	

Aims

The aims of the module are to provide Applied Chemical and Pharmaceutical Science students with a basic, practical and relevant mathematical and analytical foundation for the quantitative aspects of all Level 1 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, in all Level 1 chemistry modules.
- 2 Perform statistical analysis of data with the aid of appropriate graphical software.
- 3 Demonstrate an understanding of the nature and scope of kinetics, and an ability to calculate both the order and rate of a chemical reaction
- 4 Understand the aspects of scientific report writing, philosophy of science, logic and reasoning
- 5 Understand the concept of errors, and how they are propagated
- 6 Understand the fundamentals of mechanisms and stereochemistry
- 7 Appreciate some of the basic principles of analytical chemistry.
- 8 Describe selected analytical methods.

Learning Outcomes of Assessments

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

In-class test	1	2	3	4	5	6	7	8
Assignment	2	4	6					
Practical	3	5	7					

Outline Syllabus

1. 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.

2. Kinetics:

Nature and scope of kinetics. Meaning and definition of rate of reaction. Factors influencing rate of reaction. Concept of order of reaction. Examples of reactions with simple orders. Pseudo-order reactions. Order and stoichiometry. Integrated rate equations for first and second order processes. Experimental methods in kinetics. Determination of reaction order and rate coefficients. Kinetics and reaction mechanism. Concepts of elementary processes and molecularity. Effect of temperature on the reaction rate (Arrhenius equation). Theories of reaction rates. Collision theory and transition state theory. Catalysts.

3. Critical Thinking:

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

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

4. Fundamentals of Mechanism and Stereochemistry:

Nucleophiles and electrophiles. Inductive effect; resonance and valence bond structures. Reactive intermediates: carbocations-shape and relative stability; carbanions: shape and reactivity. Neutral free radicals. Case histories of mechanistic types: nucleophilic substitution (SN1, SN2, chiral centre, and Cahn-Ingold-Prelog rules). Nucleophilic addition to the carbonyl group. Electrophilic aromatic substitution; addition-elimination. Electrophilic addition: The chemistry of alkenes, diastereoisomers and geometric isomers.

5. Introduction to Analytical Chemistry and Separation Science:

Sampling, data quality (validation, accuracy and precision, LoD, LoQ), qualitative analysis versus quantitative analysis (spot testing for organics/inorganics, basic titration and gravimetric techniques), basic spectroscopy (UV/vis and IR), basic chromatography.

Learning Activities

Lectures, tutorials, laboratory practicals, and seminars.

References

Course Material	Book
Author	Bolton, S.
Publishing Year	2004
Title	Pharmaceutical Statistics: Practical and Clinical

	Applications,
Subtitle	
Edition	4th edition,
Publisher	Dekker,
ISBN	ISBN 0824746953

Course Material	Book
Author	Rowe P. H.
Publishing Year	2007
Title	'Essential Statistics for the Phramceutical Sciences"
Subtitle	
Edition	1st edition,
Publisher	John Wiley and Sons,
ISBN	

Course Material	Book
Author	Harris, D. C.
Publishing Year	1998
Title	'Quantitative Chemical Analysis',
Subtitle	
Edition	6th edition,
Publisher	W H Freeman,
ISBN	ISBN 0716744643

Course Material	Book
Author	Atkins, P. W., De Paula, J.
Publishing Year	2002
Title	'Physical Chemistry',
Subtitle	
Edition	7th,
Publisher	Oxford University Press,
ISBN	0198792859.

Course Material	Book
Author	Clayden, J., Greeves, N., Warren, S., Wothers, P.
Publishing Year	2001
Title	'Organic Chemistry',
Subtitle	
Edition	1st,
Publisher	Oxford University Press,
ISBN	0198503466.

Course Material	Book
Author	Chang, R
Publishing Year	2000
Title	'Physical Chemistry for the Chemical and Life Sciences',
Subtitle	

Edition	3rd
Publisher	University Science Books,
ISBN	1891389068

Notes

This module is intended to provide Applied Chemical and Pharmaceutical Science students with a basic, practical and relevant mathematical and analytical foundation for the quantitative aspects of all Level 1 chemical and biological modules.