Liverpool John Moores University

Title:	PHYSICAL AND INORGANIC CHEMISTRY
Status:	Definitive
Code:	**3202FNDSCI** (113130)
Version Start Date:	01-08-2011
Owning School/Faculty:	Pharmacy & Biomolecular Sciences
Teaching School/Faculty:	Pharmacy & Biomolecular Sciences

Team	Leader
Linda Seton	Y
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Academic Level:	FHEQ3	**Credit Value:**	12.00	**Total Delivered Hours:**	49.00
Total Learning Hours:	120	**Private Study:**	71		

Delivery Options
Course typically offered: Semester 2

Component	Contact Hours
Lecture	12.000
Practical	12.000
Workshop	24.000

Grading Basis: 40 %

Assessment Details

Category	Short Description	Description	Weighting (%)	Exam Duration
Report	prac	Laboratory exercise	25.0	
Exam	exam	Examination MCQ and short answer questions	50.0	1.00
Test	tests	Phase tests	25.0	

Aims

The aim of this module is to introduce chemical energetics and kinetics. An understanding of the factors affecting the rate of reaction is essential in order to control rates to economic advantage. This module considers the way in which adjustment of conditions may be used to favour a particular, desired, chemical

outcome. The module also aims to introduce students to the methods used for the extraction of metals from natural sources, including social and economic aspects. The principles of energetics and kinetics will be supported by associated practical work.

Learning Outcomes

After completing the module the student should be able to:

1	Recall the definition of standard enthalpy changes and calculate enthalpy changes using the heat change in a reaction, Hess's Law and bond enthalpies.
2	Describe how concentration, pressure, temperature and the presence of a catalyst can influence reaction rates, in terms of collision theory and the Maxwell-Boltzmann distribution of molecular energies.
3	Use Le Chatelier's principle to predict the effects of changes of temperature, pressure, concentration, catalyst on the position of equilibrium in homogeneous reactions.
4	Apply the concepts of oxidation number and half equations to the oxidation and reduction reactions of s and p block elements.
5	Identify the trends in the properties of the halogens and their ions.
6	Describe how Fe, Al, Ti are extracted from their ores, and the chemical principles underlying each strategy.
7	Know the cost implications and pollution problems associated with metal extraction.

Learning Outcomes of Assessments

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

practical exercises	1	4				
EXAM	2	3	4	5	6	7
phase tests	2	3	4	5	6	7

Outline Syllabus

Classification of reactions as endothermic or exothermic and enthalpy change. Standard enthalpy changes and standard conditions. Standard enthalpy changes of combustion and formation. Calculation of enthalpy change from the heat change in a reaction, Hess's Law and mean bond enthalpies.

Collision theory and Maxwell-Boltzmann distribution of molecular energies in gases. Effect of changes in concentration (or pressure for gases), surface area, temperature changes, catalysis, on the rate of reaction. Activation energy.

Reversible chemical reactions and dynamic equilibrium. Le Chatelier's principle and the prediction of the effects of changes of pressure, in temperature, pressure and concentration on the position of equilibrium in homogeneous reactions. Use of compromise temperature and pressures in industry.

Oxidation and reduction. Rules for assigning oxidation states. Oxidation and reduction reactions of s and p block elements. Half-equations. Combination of half-equations to give an overall redox equation.

Trends in electronegativity, boiling point, and oxidising ability of the halogens. Trends in the reducing ability of the halide ions: reaction of NaX and sulphuric acid. Use of silver nitrate solution as a test to distinguish between F-, Cl-, Br- and I-. Solubility of the silver halides in ammonia. Reactions of chlorine with water and with cold, dilute, aqueous NaOH. Reactions of NaOCl (e.g. bleaches). Determination of iodine by thiosulphate titration.

Extraction of Fe by carbon reduction at high temperature, and purification strategies (limestone, basic oxygen converter, Mg). Pollution problems arising from the use of carbon as reductant and the use of sulphide ores. Limitations of carbon reduction. Manufacture of Al from purified bauxite (energy considerations, electrode equations and conditions). Extraction of Ti from TiO2 via TiO4 in a batch process (equations and conditions only). Cost of the reductant, energy requirements and the required purity of the metal. Recycling and associated problems/benefits.

Learning Activities

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

References

Course Material	Book
Author	Evans W., Lewis R.,
Publishing Year	1999
Title	Chemistry
Subtitle	
Edition	
Publisher	Palgrave, formerly Macmillan Press
ISBN	0333962575

Course Material	Book
Author	Conoley C., Hills P.,
Publishing Year	1998
Title	Advanced Science:Chemistry
Subtitle	
Edition	
Publisher	Collins Educational
ISBN	0003223299

Course Material	Book
Author	Hunt A.,

Publishing Year	2000
Title	AS Chemistry
Subtitle	
Edition	
Publisher	Hodder and Stoughton
ISBN	0340757965

Notes

This module builds upon the basic principles covered in PACCH0001. Studies of energetics, kinetics and the properties of halogens will be supported by practical work. The module will utilise formative assessments in the form of two practicals and two MCQ tests.