FP085-30 Foundations of Chemistry

26/27

Department
Warwick Global Academy
Level
Foundation
Module leader
Harnak Rayat
Credit value
30
Module duration
25 weeks
Assessment
60% coursework, 40% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module develops both theoretical knowledge and practical skills in chemistry, focusing on the application of core chemical principles to real-world scientific problems. Students will explore key concepts in chemical analysis, reactivity, and structure, while also gaining hands-on experience in laboratory techniques and safe working practices. The module is designed to prepare students for undergraduate study in chemistry and related disciplines by combining conceptual learning with applied laboratory work. By the end of the module, students will be able to apply chemical concepts, conduct experiments safely, and interpret and communicate findings effectively.

Module web page

Module aims

The aim of this module is to support your academic and practical development to prepare for undergraduate study in chemistry and related disciplines.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Physical Chemistry

- Atomic structure:
- Atoms consist of protons, neutrons, and electrons; isotopes affect relative mass, mass spectrometry detects ions, electronic configurations explain properties, and ionisation energies show trends.
- Formulae, balanced equations, and mole amounts (Amount of substance): The mole and Avogadro's constant allow calculation of formulae, balanced equations, reacting masses, gas/solution volumes, yields, atom economy, limiting reagents, and ideal gas behaviour.
- Chemical bonding and intermolecular forces: Ionic, covalent, metallic, and dative bonding determine properties, VSEPR predicts shapes, electronegativity and polarity affect bonds, and intermolecular forces include van der Waals, dipole–dipole, and hydrogen bonding.
- Energetics: Reactions are exothermic or endothermic, standard enthalpy changes are calculated, calorimetry measures ΔH, Hess's Law applies, and bond enthalpies are used.
- Thermodynamics: Enthalpy changes, Born–Haber cycles, enthalpy of solution/hydration, entropy, and Gibbs free energy predict feasibility and spontaneity.
- Kinetics (including rates of reaction, rate equations, and the effect of mechanisms on rate-determining steps): Collision theory explains rates, concentration, pressure, temperature and catalysts affect reaction, rate equations and orders describe kinetics, mechanisms link to rates, and activation energy is calculated.
- Chemical equilibria (Le Chatelier's principle and Kc): Dynamic equilibrium occurs when forward and reverse rates are equal, Le Chatelier predicts shifts, and Kc is calculated and interpreted.
- Acids, bases, and buffers: Acids, bases, alkalis and salts are defined, pH and Ka/pKa/Kw are calculated, buffers maintain pH, and titration curves show strong/weak acid-base reactions.
- Oxidation, reduction, and redox equations: Oxidation states are assigned, redox and ionic equations are written and balanced, and redox titrations are performed.

Inorganic Chemistry

- Periodicity: Period 3 elements show trends in radius, ionisation energy and melting points, oxides react with O_2, Cl_2, H_2O, and acid–base behaviour varies.
- Group 1 – the alkali metals: Reactivity increases down the group, metals react with water, oxygen and chlorine, forming oxides, peroxides and hydroxides.
- Group 2 – the alkaline earth metals: Trends in reactivity, ionisation energy and solubility occur, compounds have practical uses, and carbonates/nitrates show thermal stability patterns.
- Group 7 – the halogens: Electronegativity, boiling points and oxidising ability decrease down the group, reactions include hydrogen, displacement and disproportionation. chlorine is used in water treatment, and halides form precipitates with $AgNO_3$.

Organic Chemistry

- Introduction to organic chemistry (nomenclature, isomerism, formulae)
- Alkanes – free-radical substitution mechanism
- Alkenes – electrophilic addition mechanisms
- Halogenoalkanes – nucleophilic substitution (SN1 & SN2) and elimination mechanisms
- Alcohols – oxidation, dehydration (elimination), and substitution reactions

- Reaction mechanisms and energy profiles (link to kinetics, rates, and activation energy)
- Synthetic routes – present multi-step synthesis routes from selected starting materials, reagents, and conditions, predicting reactions to reach a target molecule.
- Organic analysis (test-tube reactions, functional group identification)
- Spectroscopy (IR, Mass spectrometry, NMR, where applicable)

Learning outcomes

By the end of the module, students should be able to:

- Demonstrate foundational knowledge of key chemical concepts including atomic structure, bonding, energetics, kinetics, equilibria, redox, and chemical analysis.
- Apply chemical principles and mathematical methods (e.g., algebra, logarithms, stoichiometry, equilibrium constants, energetics, and rates) to solve structured and unfamiliar problems.
- Interpret and evaluate experimental and theoretical data, drawing logical conclusions, recognising error and uncertainty, and using scientific reasoning to support explanations and predictions.
- Carry out laboratory investigations safely and effectively, using appropriate apparatus and techniques to generate, record, and analyse data, while maintaining accurate and professional laboratory records.
- Communicate chemical information clearly and accurately in written, oral, and visual forms, employing correct scientific terminology, conventions, and referencing with academic integrity.
- Demonstrate transferable skills including independent learning, teamwork, problem-solving, and preparation for university-style assessments such as exams, reports, problem-solving tasks, and presentations.

Indicative reading list

Reading lists can be found in Talis

Interdisciplinary

Students will be able to develop a broad understanding of chemical concepts and understand how they can be applied to biological, environmental and engineering problems. Students will develop communication skills that will align with their Academic Communication and Research Skills module.

International

All students are international, representing a wide range of cultural, linguistic, and educational backgrounds. They bring diverse experiences and perspectives, enriching discussion and supporting the development of intercultural awareness. Examples for analysis and evaluation are drawn from a variety of countries, ensuring that teaching and learning are embedded in an international context.

Subject specific skills

Students will develop skills in the application of theoretical chemical concepts and apply them to real-life contexts.
Students will develop a familiarity with the terminology of chemistry and chemical laboratory practices.

Transferable skills

Students will be able to develop their analytical and mathematical skills to solve problems, develop their
organisational time management, work independently and as in team to generate creative solutions in the context of solving problems.
Students will develop effective communication for different target audience through written, oral and visual means.
Students will learn to select and manage information drawn from books, journals, and the internet.
Students will learn to make value judgements about their own work and the work of peers.

Study

Study time

Type	Required
Seminars	25 sessions of 2 hours (17%)
Supervised practical classes	25 sessions of 2 hours (17%)
Private study	140 hours (47%)
Assessment	60 hours (20%)
Total	300 hours

Private study description

Revision, completing worksheets, reading and watching videos.

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D

	Weighting	Study time	Eligible for self-certification
Assessment component			
Chemistry Laboratory Practical Assessment and Report	30%	18 hours	Yes (extension)
To conduct a laboratory experiment and present the results in a detailed written report.			
Reassessment component is the same			
Assessment component			
Chemical data analysis	30%	18 hours	Yes (extension)
Apply mathematical tools to analyse and interpret chemical data and formulate a relevant conclusion.			
Reassessment component is the same			
Assessment component			
Foundations of Chemistry Exam	40%	24 hours	No
Written in-person examination			

- Students may use a calculator

Reassessment component is the same

Feedback on assessment

Feedback will by written feedback on Tabula and verbal feedback in individual meetings.

Past exam papers for FP085

Availability

There is currently no information about the courses for which this module is core or optional.