

# CHEM 1003 ESSENTIAL CHEMISTRY 1

**Credit Points** 10

**Legacy Code** 300800

**Coordinator** Janice Aldrich-Wright ([https://directory.westernsydney.edu.au/search/name/Janice Aldrich-Wright/](https://directory.westernsydney.edu.au/search/name/Janice%20Aldrich-Wright/))

**Description** This unit provides an introduction to some of the essential knowledge, concepts and skills of chemistry, to serve the needs of students majoring in chemistry and those requiring a working knowledge of chemistry. Observable chemical facts and phenomena including structure, dynamics, and energetics, are explained in terms of current mathematical and visual models and further developed in Essential Chemistry 2. Evidence for chemical understanding is provided using IR spectroscopy, mass spectrometry, and computer molecular modelling. Laboratory skills relate theory to practice through the development of practical skills required to determine the concentration of an analyte using volumetric and spectrophotometric analysis.

**School** Science

**Discipline** Organic Chemistry

**Student Contribution Band** HECS Band 2 10cp

Check your HECS Band contribution amount via the Fees ([https://www.westernsydney.edu.au/currentstudents/current\\_students/fees/](https://www.westernsydney.edu.au/currentstudents/current_students/fees/)) page.

**Level** Undergraduate Level 1 subject

**Equivalent Subjects** CHEM 1001 - Chemistry 1 CHEM 1011 - Principles of Chemistry CHEM 1004 Essential Chemistry 1

## Assumed Knowledge

HSC Chemistry (2 unit) or HSC Multi-strand Science (3 or 4 unit) or equivalent. General Mathematics bands 5 and 6 or Mathematics band 4 or equivalent.

## Learning Outcomes

On successful completion of this subject, students should be able to:

1. Explain chemistry concepts accurately, clearly, and concisely, using an appropriate combination of everyday language with correct spelling and grammar; specialist chemical terms and notation; mathematics (equations, graphs); molecular-level representations; and labelled diagrams
2. Demonstrate competence in the manipulative laboratory skills and deductive skills involved in volumetric, spectrophotometric, and qualitative analysis
3. Calculate quantities using mathematical formulas, and expressing them with the appropriate number of significant figures, and in some cases, uncertainty
4. Describe an atom's chemical personality by relating its position in the Periodic Table to its electron configuration, and ratio of effective nuclear charge  $Z_{\text{eff}}$ , to average distance  $r$  of the valence electrons from the nucleus
5. Predict the physical properties of a substance based on its classification as a metal, ionic compound, molecular substance, or network substance and the types of intra- and intermolecular bonding involved.

6. Explain how IR spectra and data from mass spectrometry provide experimental evidence for the composition, connectivity (which atoms are bonded together), and formula for a compound.
7. Identify a reaction as an example of a Lewis acid-base reaction (complexation or proton exchange) or a redox reaction (electron exchange), identify the donors and acceptors, express the extent of reaction quantitatively in terms of the reaction quotient,  $Q$ , and predict the direction of reaction from the difference between  $Q$  and  $t$

## Subject Content

Atomic structure and periodicity

Pure substances - physical properties, structure and bonding

Lewis acid-base reactions (dissolving, precipitation, complexation, proton exchange) and redox reactions in aqueous systems

Introduction to chemical thermodynamics

Structure, shape and bonding within and between molecules

Colligative properties of solutions

Chemical systems at equilibrium, and open living systems

Chemical speciation and buffering in aqueous solution as a result of competitive equilibria

Stoichiometric concepts in volumetric and spectrophotometric analysis

Prescribed Texts

- Mahaffy, P, Tasker, R, Bucat, B, Kotz, J, Weaver, GC, & Treichel, P, et al. 2011, Chemistry: human activity, chemical reactivity, Nelson Education, Toronto.
- Recommended: Odyssey Molecular Modelling Software v4.x. Wavefunction Inc

Teaching Periods