

Chemistry

Expected entry-level knowledge for TU-Delft MSc Life Science & Technology

Chemistry is the molecular basis of all processes in Life. Therefore, a basic but profound knowledge of chemical reactions and their mechanisms is crucial for successfully completing the MSc Life Science & Technology!

Amongst the many textbooks of **organic chemistry**. We recommend 'Organic Chemistry' (by Jonathan Clayden, Nick Greeves, and Stuart Warren)
Oxford University Press, ISBN: 9780199270293,

In particular, we presume that every student starting the MSc Life Science and Technology has a profound knowledge of the following topics:

- 1) **Basic definitions of Organic Chemistry** (i.e. organic molecules, their structures, functional groups, properties and analytics) (Clayden chapters 1-5, 7,8,12-14, 16, 18)
- 2) **The organic chemistry of the carbonyl group**
 - Nucleophilic addition to the carbonyl group (Chapters 6,9)
 - Nucleophilic substitution at the carbonyl group (Chapters 10, 11)
 - Formation and reactions of enols and enolates (Chapter 20)
 - Alkylation of enolates (Chapter 25)
 - Reactions of enolates with carbonyl compounds: the aldol and Claisen reactions (Chapter 26)
- 3) **Nucleophilic substitution** at saturated carbon (Chapter 15)
- 4) **Elimination reactions** (Chapter 17)
- 5) **Electrophilic additions** to alkenes (Chapter 19)
- 6) **Aromaticity and Electrophilic aromatic substitution** (Chapters 7, 21)
- 7) **Heterocycles** (Chapters 29, 30)

As textbook for **inorganic chemistry** we recommend 'Inorganic Chemistry' (by M. Weller, T. Overton, J. Rourke and F. Armstrong)
Oxford University Press, 2014. ISBN-13: 978-0-19-964182-6.

In particular, we presume that every student starting the MSc Life Science and Technology has a profound knowledge of the following topics:

- 1) **Structure** of atoms, molecules, coordination complexes and solids (chapters 1-3, 7, 20-22)
- 2) **Acid-base chemistry** (chapter 4)
- 3) **Redox chemistry** (chapter 5)
- 4) The **general chemistry** of main group elements (chapters 9-18)
- 5) General chemistry of d-elements (chapters 19-21)

A good web-based course covering some of the topics outlined above may be at the Khan Academy (<https://www.khanacademy.org/>). **Please note that this resource is meant as additional help! These online courses do not substitute for profound textbook knowledge!**

| Topic | Link |
|--|---|
| General Chemistry | |
| Chemical reactions and stoichiometry | https://www.khanacademy.org/science/chemistry/chemical-reactions-stoichiome |
| The periodic table and trends within | https://www.khanacademy.org/science/chemistry/periodic-table |
| Chemical bonds | https://www.khanacademy.org/science/chemistry/chemical-bonds |
| Gases and kinetic molecular theory | https://www.khanacademy.org/science/chemistry/gases-and-kinetic-molecular-theory |
| Chemical equilibrium | https://www.khanacademy.org/science/chemistry/chemical-equilibrium |
| Acids and bases | https://www.khanacademy.org/science/chemistry/acids-and-bases-topic |
| Buffers | https://www.khanacademy.org/science/chemistry/acid-base-equilibrium |
| Basic Thermodynamics | https://www.khanacademy.org/science/chemistry/thermodynamics-chemistry |
| Redox chemistry | https://www.khanacademy.org/science/chemistry/oxidation-reduction |
| Kinetics | https://www.khanacademy.org/science/chemistry/chem-kinetics |
| Organic Chemistry | |
| Structure and Bonding | https://www.khanacademy.org/science/chemistry/organic-chemistry/gen-chem-review |
| Resonance and acid-base chemistry | https://www.khanacademy.org/science/chemistry/organic-chemistry/organic-structures |
| Alkanes, cycloalkanes, and functional groups | https://www.khanacademy.org/science/chemistry/organic-chemistry/bond-line-structures-alkanes-cycloalkanes |
| Stereochemistry | https://www.khanacademy.org/science/chemistry/organic-chemistry/stereochemistry-topic |
| Substitution and elimination reactions | https://www.khanacademy.org/science/chemistry/organic-chemistry/substitution-elimination-reactions |
| Aromatic compounds | https://www.khanacademy.org/science/chemistry/organic-chemistry/aromatic-compounds |
| Aldehydes and ketones | https://www.khanacademy.org/science/chemistry/organic-chemistry/aldehydes-ketones |
| Carboxylic acids and derivatives | https://www.khanacademy.org/science/chemistry/organic-chemistry/carboxylic-acids-derivatives |
| α -Carbon chemistry | https://www.khanacademy.org/science/chemistry/organic-chemistry/ochem-alpha-carbon-chemistry |
| Spectroscopy | https://www.khanacademy.org/science/chemistry/organic-chemistry/spectroscopy-jay |