

# Routes through Chemistry\*

The Natural Sciences Tripos (NST) is the framework within which most of the science subjects are taught in Cambridge and which allows you to study a range of both biological and physical sciences. It is taught primarily by sixteen departments. You can choose from a range of courses depending upon your interest. For specialisation in Chemistry, you will usually be considering specific courses during the course of four years.

## 1st Year (IA)

In your first year (Part IA), you can opt for Chemistry, a Mathematics option and 2 other experimental science subjects. Physics, Materials Science, Earth Science or Biology of Cells are commonly taken with Chemistry

### Choose 3 + Maths option

Biology of Cells

#### Chemistry

Shapes & structures of molecules  
Reactions & mechanisms in organic chemistry  
Kinetics of chemical reactions  
Energetics & equilibria  
Inorganic & materials chemistry

Earth Sciences

Evolution & Behaviour

Materials Science

Mathematics

Physics

Physiology of Organisms

Mathematical Biology

## 2nd Year (IB)

In your second year (Part IB), taking both Chemistry A and Chemistry B gives the best preparation for Part II Chemistry in the third year. The Chemistry A course complements Physics AB, Materials Science and Mathematics. Chemistry B is a good fit for Biological options with a molecular emphasis.

### Choose 3

Biochemistry

Cell & Developmental Biology

#### Chemistry A

Introduction to Quantum Mechanics  
Molecular Spectroscopy  
Symmetry & Bonding  
Molecular Energy Levels & Thermodynamics  
Electronic Structure & Properties of Solids

#### Chemistry B

Aromatic & Enolate chemistry  
Conjugate addition & chirality  
Introduction to Stereochemistry  
Shape & Organic reactivity  
Structure, bonding & reactivity of Transition metal complexes  
Structure, bonding & the p-block elements  
Introduction to Chemical Biology

Earth Sciences A/B

History & Philosophy of Science

Mathematics

Materials Science

Physics A/B

Quantitative Environmental Sciences

Many other Biological options

## 3rd Year (II)

The aim of the third year Part II Chemistry course is to complete your study of Core chemistry topics and to offer the opportunity to both broaden and deepen your knowledge of Chemistry

### Core courses (A)

A1: The heavier transition metals and the lanthanoids and actinoids (12)  
A2: The foundations of organic synthesis (12)  
A3: High resolution molecular spectroscopy (12)  
A4: Theoretical techniques (12)  
A6: Concepts in physical chemistry (24)

Part IB Chemistry AB take courses A1-4

Part IB Chemistry B only take A1-2 & A6

### Option courses (B)

B0 Electron deficient compounds (6)

B1 Organometallic catalysis (6)

B2 Organic spectroscopy (6)

B3 Biological catalysis (12)

B4 Chemistry in the atmosphere (12)

B5 Structure and reactivity (6)

B6 Biomaterials (6)

B7 Statistical mechanics (12)

B8 Symmetry (6)

B9 Polymers: synthesis, characterisation and application (6)

B10 Electronic structure (6)

Minimum requirement is for 24 Option B lectures. Majority of students will take 30 or more.

### Option courses (C)

C1 Electrochemistry (6)

C2 The chemistry of future energy (6)

C3 NMR (6)

C4 Proteins: structure, stability & folding (12)

C5 Control in organic chemistry (12)

C6 Diffraction methods in chemistry (12)

C7 Further quantum mechanics (12)

C8 Computer simulation methods (6)

C9 Nucleic acids (12)

C10 Surfaces and interfaces (12)

C11 Investigating organic mechanisms (12)

Minimum requirement is for 24 Option C lectures. Majority of students will take 30 or more.

### Further Work (Core)

Techniques in Synthetic Chemistry lab course

Physical & Theoretical Chemistry lab course

Chemical Informatics

### Further Work (Options)

Extended Experiments (4 units)

Language option (4 units)

Programming course (1 or 2 units)

Mathematical Methods (3 units)

Students must offer 4 units from options

## 4th Year (III)

The fourth-year course, Part III Chemistry, is designed to provide the necessary foundation for a professional career in academic or industrial research. There are two components to the Part III year:

Firstly, a series of advanced lecture courses. A wide range of topics are offered, reflecting the enormous breadth of research work undertaken in the Department, and each course aims to take you to the ‘research frontier’ so that you can begin to obtain a feel of just where modern chemistry is going.

The second component of the course is a 16-week research project covering the Michaelmas and Lent Terms.

### Michaelmas term courses (M)

M0: Advanced polymer chemistry

M1: Inorganic materials

M2: Bio-inorganic chemistry

M3: Soft matter-from molecules to materials

M4: Energy landscapes and soft matter

M5: Stereocontrolled organic synthesis

M8: Main group organometallics

M9: Aromatic heterocycles & medicinal chemistry

Minimum requirement is for 3 Michaelmas term courses  
Most students will take 4 courses

### Lent term courses (L) & (IDP)

L1: Catalysis in synthesis

L3: Electronic structure of solid surfaces

L4: Synthetic biology

L5: Solid electrolytes

L6: Supramolecular chemistry

L7: Chemical dynamics & Computer simulation

L8: Total synthesis

L9: Biosynthesis

L10: Frontiers of atomistic simulation techniques

### Interdisciplinary courses (IDP)

IDP1:Atmospheric chemistry & Global change

IDP2:The Earth system & Climate change

IDP3: Materials, Electronics & Renewable Energy

Minimum requirement is for 3 Lent term courses  
Most students will take 4 courses

### Research Project

The independent research project represents about 35% of the final year and will be undertaken within one of the department’s Research Interest Groups (Biological, Materials, Theory, Physical and Synthetic)



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\*Example course list, subject to change