

Chemistry Units 3 & 4

Contents

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Series contents

This series comprises **thirteen content workbooks**, cumulative **topic tests**, and a **practice-examination booklet**, covering the complete VCAA Chemistry Units 3 & 4 course. Each content workbook follows the same structure: concise theory, scaffolded and unscaffolded worked examples, graded practice questions, a compact answer key, and fully-worked solutions. Each topic test comprises **Test A** (multiple-choice) and **Test B** (short- and extended-answer), taken under scientific-calculator conditions with the Chemistry Data Sheet, cumulative over the chapters of that Area of Study.

Unit 3: How can design and innovation help to optimise chemical processes?

Area of Study 1 — What are the current and future options for supplying energy?

Chapter 1 — Carbon-based fuels (24 pp)

1A Types of fuels · 1B Fuels, photosynthesis and cellular respiration · 1C Exothermic and endothermic reactions

Chapter 2 — Measuring energy changes (26 pp)

2A Combustion and greenhouse gases · 2B Calorimetry · 2C Energy content of food and fuels

Chapter 3 — Galvanic cells (37 pp)

3A Oxidation and reduction · 3B Writing redox half-equations · 3C Features of galvanic cells · 3D Using the electrochemical series

Chapter 4 — Fuel cells (32 pp)

4A Fuel cells · 4B Cell stoichiometry and Faraday's laws

Topic 1 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Area of Study 2 — How can the rate and yield of chemical reactions be optimised?

Chapter 5 — Rates of reaction (21 pp)

5A Collision theory and activation energy · 5B Factors affecting reaction rate

Chapter 6 — Equilibrium (31 pp)

6A Dynamic equilibrium · 6B The equilibrium constant and reaction quotient · 6C Le Châtelier's principle

Chapter 7 — Electrolytic cells (56 pp)

7A Features of electrolytic cells · 7B Predicting the products of electrolysis · 7C Commercial electrolytic cells and green hydrogen · 7D Faraday's laws of electrolysis

Topic 2 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Unit 4: How are carbon-based compounds designed for purpose?

Area of Study 1 — How are organic compounds categorised and synthesised?

Chapter 8 — Structure and properties of organic compounds (46 pp)

8A Structural diversity in organic compounds · 8B Hydrocarbons · 8C Functional groups: haloalkanes, amines and alcohols · 8D Functional groups: aldehydes, ketones, carboxylic acids, esters and amides · 8E Physical properties of organic compounds

Chapter 9 — Reactions of organic compounds (49 pp)

9A Substitution, addition and oxidation · 9B Condensation and hydrolysis · 9C Reaction pathways and sustainable production

Topic 3 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Area of Study 2 — How are organic compounds analysed and used?

Chapter 10 — Laboratory analysis of organic compounds (23 pp)

10A Analysis of functional groups · 10B Analysis of purity and concentration

Chapter 11 — Instrumental analysis of organic compounds (39 pp)

11A Mass spectrometry · 11B Infrared spectroscopy · 11C Nuclear magnetic resonance spectroscopy · 11D Chromatography

Chapter 12 — Medicinal chemistry (37 pp)

12A Organic compounds as medicines · 12B Enzymes

Topic 4 Test A (multiple-choice) and Test B (short and extended response), with fully-worked solutions, are included at the end of this workbook.

Area of Study 3 — How is scientific inquiry used to investigate the sustainable production of energy and/or materials?

Chapter 13 — Scientific investigations and data analysis (29 pp)

13A Investigation design · 13B Generating and evaluating evidence · 13C Communicating chemistry

Practice Examinations

Practice Examinations (148 pp)

Six complete practice examinations, each mirroring the VCAA Chemistry examination structure — Section A (30 multiple-choice questions) and Section B (short- and extended-answer questions, 90 marks), for a total of 120 marks — with a house Chemistry Data Sheet and fully-worked solutions. The six papers span three difficulty levels and cumulatively cover the complete Units 3 & 4 course, including the key science skills.

≈ 603 pages across the series.