

Sample teaching plan Unit 1:

How can the diversity of materials be explained?

This teaching plan is adapted from the *Heinemann Chemistry 1* teacher resources and was supplied by Melissa MacEoin. Royalties from this book fund the Chemistry Education Association.

**Suggested time: 15 teaching weeks**

* 9 weeks: [Unit 1 Area of Study 1](#AOS1): How do the chemical structures of materials explain their properties and reactions?
* 5 weeks: [Unit 1 Area of Study 2](#AOS2): How are materials quantified and classified?
* 1 week: [Unit 1 Area of Study 3](#AOS3): How can chemical principles be applied to create a more sustainable future?

Area of Study 1: How do the chemical structures of materials explain their properties and reactions?

**Outcome 1:** On completion of this unit the student should be able to explain how elements form carbon compounds, metallic lattices and ionic compounds, experimentally investigate and model the properties of different materials, and use chromatography to separate the components of mixtures.

| Week | Student book section | Key ideas  | *Heinemann Chemistry 1* 6E student book questions | *Heinemann Chemistry 1 Skills and Assessment* | Suggested assessment (can be adapted and used as assessment tasks to meet the requirements of the study design) |
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| Preparation |  | Prior knowledge review  |  | WORKSHEET 1 Knowledge review—structure of the atom |  |
| 1 | 2.12.22.3 | The atomic worldEmission spectra and the Bohr modelThe Schrödinger model of the atom | 2.1 Key Questions 1–8Chapter Review 2, 6, 11, 122.2 Key Questions 1–6Chapter Review 1, 7, 132.3 Key Questions 1–5Chapter Review 3, 8, 14, 15 | WORKSHEET 2 Writing electronic configuration—shells and subshellsPRACTICAL 1 Using flame colours to identify elements | WORKSHEET 2 Writing electronic configuration—shells and subshellsPRACTICAL 1 Using flame colours to identify elements |
| 2 | 2.42.5 | The periodic tableTrends in the periodic table | Case Study 1–3, 2.4 Key Questions 1-8Chapter Review 4, 9, 17, 2.5 Key Questions 1–8Chapter Review 5, 10, 16, 18-24 | WORKSHEET 3 Trends in properties in the periodic table | Case Study 1–3, WORKSHEET 3 Trends in properties in the periodic table |
| 3 | 3.13.2 | Covalent bonding modelShapes of molecules | 3.1 Key Questions 1–6Chapter Review 2, 6, 23, 243.2 Key Questions 1–5Chapter Review 3, 7, 8, 19 | WORKSHEET 4 Representations of moleculesPRACTICAL 2 Making molecular models | WORKSHEET 4 Representations of moleculesPRACTICAL 2 Making molecular models |
| 4 | 3.33.4 | Polarity in moleculesIntermolecular forces | 3.3 Key Questions 1–7Chapter Review 9, 10, 11, 203.4 Key Questions 1-7 Chapter Review 1, 4, 5, 12-14, 21, 22, 25-28 | WORKSHEET 5 Electronegativity and polarity of molecules | WORKSHEET 4 Representations of moleculesPRACTICAL 2 Making molecular models |
| 5 | 3.5CH 3review | Covalent latticesReview of covalent substances | Case Study 1–3, 3.5 Key Questions 1–5Chapter Review 15-18, 29, 30Chapter Review all | PRACTICAL 3 Comparing the physical properties of three covalent lattices | WORKSHEET 5 Electronegativity and polarity of moleculesPRACTICAL 2 Making molecular modelsCase Study 1–3, PRACTICAL 3 Comparing the physical properties of three covalent lattices |
| 6 | 4.1 | Metallic properties and bonding | Case Study 1–3, 4.1 Key Questions 1–8Chapter Review 1-7, 10-13 | WORKSHEET 6 The metallic bonding modelPRACTICAL 4 Growing metal crystals | Case Study 1–3, WORKSHEET 6 The metallic bonding modelPRACTICAL 4 Growing metal crystals |
| 7 |  | 4.2 Reactivity of metals4.3 Producing and recycling metals | 4.2 Key Questions 1–6Chapter Review 8, 9, 14-17Case Study 1–3, 4.3 Key Questions 1–5Chapter Review 18-20 | PRACTICAL 5 Reactivity of metals—student-designed practical activity | PRACTICAL 5 Reactivity of metals—student-designed practical activity Case Study 1–3,  |
| 8 | 5.15.25.3 | Properties of ionic compoundsFormation of ionic compoundsPrecipitation reactions | Case Study 1–3, 5.1 Key Questions 1–6Chapter Review 1, 4, 5, 18-20, 285.2 Key Questions 1-8Chapter Review 2, 6, 7, 9-14, 16, 17, 21, 22, 25-27Case Study 1–3, 5.3 Key Questions 1–6Chapter Review 3, 8, 15, 23, 24 | WORKSHEET 7 The ionic bonding model WORKSHEET 8 Writing ionic formulas WORKSHEET 9 Solubility tables and predicting precipitation reactionsWORKSHEET 10 Writing full and ionic chemical equationsPRACTICAL 6 Precipitation reactions | Case Study 1–3, WORKSHEET 7 The ionic bonding model WORKSHEET 8 Writing ionic formulasWORKSHEET 9 Solubility tables and predicting precipitation reactionsWORKSHEET 10 Writing full and ionic chemical equationsPRACTICAL 6 Precipitation reactions |
| 9 | 6.16.2 | How substances dissolve Principles of chromatography | 6.1 Key Questions 1–8Chapter Review 1-9, 12-156.2 Key Questions 1–4Chapter Review 10, 11, 16-20 | PRACTICAL 7 Chromatography of a vegetable extract | PRACTICAL 7 Chromatography of a vegetable extract |
|  |  | Review | Unit 1 AoS 1 review | WORKSHEET 11 Literacy review—comparing similar termsWORKSHEET 12 Reflection—How do the chemical structures of materials explain their properties and reactions?Unit 1 AoS 1 EQ | WORKSHEET 11 Literacy review— comparing similar terms |

Area of Study 2: How are materials quantified and classified?

**Outcome 2:** On completion of this unit the student should be able to calculate mole quantities, use systematic nomenclature to name organic compounds, explain how polymers can be designed for a purpose, and evaluate the consequences for human health and the environment of the production of organic materials and polymers.

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| Week | Student book section | Key ideas | *Heinemann Chemistry 1* 6E student book chapter/section  | *Heinemann Chemistry 1 Skills and Assessment* | Suggested assessment (can be adapted and used as assessment tasks to meet the requirements of the study design) |
|  |  | Prior knowledge review  |  | WORKSHEET 13 Knowledge review— comparing metallic, ionic and covalent bonding models |  |
| 10 | 7.17.2 | Relative massAvogadro’s constant | 7.1 Key Questions 1-6Chapter Review 1, 2, 19, 267.2 Key Questions 1–7Chapter Review 9, 10, 11 | WORKSHEET 14 Exploring relative mass | WORKSHEET 14 Exploring relative mass |
| 11 | 7.37.4 | Molar massPercentage composition, empirical and molecular formulas | Case Study 1–3, 7.3 Key Questions 1–8Chapter Review 3, 4, 12-14, 20-25Case Study 1–3, 7.4 Key Questions 1–7Chapter Review 5-8, 15-18, 27, 28 | WORKSHEET 15 Moles—the chemist’s unit of measurementPRACTICAL 8 Mole simulations and applicationsWORKSHEET 16 Empirical and molecular formulasPRACTICAL 9 Determining molar mass of an element and a compoundPRACTICAL 10 Chemical composition of a compound | Case Study 1–3, WORKSHEET 15 Moles—the chemist’s unit of measurementWORKSHEET 16 Empirical and molecular formulasPRACTICAL 8 Mole simulations and applicationsPRACTICAL 9 Determining molar mass of an element and a compoundPRACTICAL 10 Chemical composition of a compound |
| 12 | 8.18.28.3  | Organic materials HydrocarbonsHaloalkanes | 8.1 Key Questions 1-6Chapter Review 1, 12, 158.2 Key Questions 1-10Chapter Review 2, 5, 6-8, 11, 14, 17Case Study 1–4, 8.3 Key Questions 1-7Chapter Review 3, 9, 10, 22 | WORKSHEET 17 Alkanes, alkenes and haloalkanesPRACTICAL 11 Investigating hydrocarbonsPRACTICAL 12 Modelling functional groups | Case Study 1–4, WORKSHEET 17 Alkanes, alkenes and haloalkanesWORKSHEET 18 Families of organic molecules—haloalkanes, alcohols and carboxylic acidsPRACTICAL 11 Investigating hydrocarbonsPRACTICAL 12 Modelling functional groups  |
| 13 | 8.49.1 | Alcohols and carboxylic acidsPolymer formation | 8.4 Key Questions 1-8Chapter Review 4, 13, 16, 18-219.1 Key Questions 1-9Chapter Review 3, 4, 5, 8, 9, 18, 20, 21, 25 | WORKSHEET 18 Families of organic molecules—haloalkanes, alcohols and carboxylic acidsWORKSHEET 19 Polyethene—a case study of a polymer | WORKSHEET 18 Families of organic molecules—haloalkanes, alcohols and carboxylic acidsWORKSHEET 19 Polyethene—a case study of a polymer |
| 14 | 9.29.39.49.5 | Thermoplastic and thermosetting polymersDesigning polymers for a purposeRecycling plasticsInnovations in polymer manufacture | 9.2 Key Questions 1–5Chapter Review 6, 7, 10-139.3 Key Questions 1–8Chapter Review 1, 2, 15, 19, 22, 23Case Study 1–4, 9.4 Key Questions 1–6Chapter Review 14, 16, 18, 25, 279.5 Key Questions 1–8Chapter Review 17, 24, 26 | PRACTICAL 13 Investigating properties of slime, an addition polymer WORKSHEET 20—Designing a polymer for a particular purpose PRACTICAL 14 Making a bioplastic | WORKSHEET 19 Polyethene—a case study of a polymer PRACTICAL 13 Investigating properties of slime, an addition polymer WORKSHEET 20—Designing a polymer for a Case Study 1–4, PRACTICAL 14 Making a bioplastic particular purpose |
|  |  | Review | Unit 1 AoS 2 review | WORKSHEET 21 Literacy review—naming compoundsWORKSHEET 22 Reflection—How are materials quantified and classified?Unit 1 AoS 2 EQ | WORKSHEET 21 Literacy review—naming compounds |

Area of Study 3: How can chemical principles be applied to create a more sustainable future?

**Outcome 3:** On completion of this unit the student should be able to investigate and explain how chemical knowledge is used to create a more sustainable future in relation to the production or use of a selected material.

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| Week | Key ideas | *Heinemann Chemistry 1* 6E student book chapter/section  | *Heinemann Chemistry 1 Skills and Assessment* | Suggested assessment (can be adapted and used as assessment tasks to meet the requirements of the study design) |
| 15 | Research task | n/a | AoS 3: Producing and using ‘greener’ polymers | Unit 1 AoS 3 sample editorial article Unit 1 AoS 3 editorial article guidelines Unit 1 AoS 3 sample logbook Unit 1 AoS 3 logbook template Unit 1 AoS 3 teacher notesUnit 1 AoS 3 assessment rubricUnit 1 AoS 3 student checklistUnit 1 AoS 3 sample marking scheme |