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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 | 2.1  2.2  2.3 | The atomic world  Emission spectra and the Bohr model  The Schrödinger model of the atom | 2.1 Key Questions 1–8  Chapter Review 2, 6, 11, 12  2.2 Key Questions 1–6  Chapter Review 1, 7, 13  2.3 Key Questions 1–5  Chapter Review 3, 8, 14, 15 | WORKSHEET 2 Writing electronic configuration—shells and subshells  PRACTICAL 1 Using flame colours to identify elements | WORKSHEET 2 Writing electronic configuration—shells and subshells  PRACTICAL 1 Using flame colours to identify elements |
| 2 | 2.4  2.5 | The periodic table  Trends in the periodic table | Case Study 1–3,  2.4 Key Questions 1-8  Chapter Review 4, 9, 17,  2.5 Key Questions 1–8  Chapter 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 | 3.1  3.2 | Covalent bonding model  Shapes of molecules | 3.1 Key Questions 1–6  Chapter Review 2, 6, 23, 24  3.2 Key Questions 1–5  Chapter Review 3, 7, 8, 19 | WORKSHEET 4 Representations of molecules  PRACTICAL 2 Making molecular models | WORKSHEET 4 Representations of molecules  PRACTICAL 2 Making molecular models |
| 4 | 3.3  3.4 | Polarity in molecules  Intermolecular forces | 3.3 Key Questions 1–7  Chapter Review 9, 10, 11, 20  3.4 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 molecules  PRACTICAL 2 Making molecular models |
| 5 | 3.5  CH 3  review | Covalent lattices  Review of covalent substances | Case Study 1–3,  3.5 Key Questions 1–5  Chapter Review 15-18, 29, 30  Chapter Review all | PRACTICAL 3 Comparing the physical properties of three covalent lattices | WORKSHEET 5 Electronegativity and polarity of molecules  PRACTICAL 2 Making molecular models  Case 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 1–8  Chapter Review 1-7, 10-13 | WORKSHEET 6 The metallic bonding model  PRACTICAL 4 Growing metal crystals | Case Study 1–3,  WORKSHEET 6 The metallic bonding model  PRACTICAL 4 Growing metal crystals |
| 7 |  | 4.2 Reactivity of metals  4.3 Producing and recycling metals | 4.2 Key Questions 1–6  Chapter Review 8, 9, 14-17  Case Study 1–3,  4.3 Key Questions 1–5  Chapter 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 | 5.1  5.2  5.3 | Properties of ionic compounds  Formation of ionic compounds  Precipitation reactions | Case Study 1–3,  5.1 Key Questions 1–6  Chapter Review 1, 4, 5, 18-20, 28  5.2 Key Questions 1-8  Chapter Review 2, 6, 7, 9-14, 16, 17, 21, 22, 25-27  Case Study 1–3,  5.3 Key Questions 1–6  Chapter Review 3, 8, 15, 23, 24 | WORKSHEET 7 The ionic bonding model  WORKSHEET 8 Writing ionic formulas  WORKSHEET 9 Solubility tables and predicting precipitation reactions  WORKSHEET 10 Writing full and ionic chemical equations  PRACTICAL 6 Precipitation reactions | Case Study 1–3,  WORKSHEET 7 The ionic bonding model  WORKSHEET 8 Writing ionic formulas  WORKSHEET 9 Solubility tables and predicting precipitation reactions  WORKSHEET 10 Writing full and ionic chemical equations  PRACTICAL 6 Precipitation reactions |
| 9 | 6.1  6.2 | How substances dissolve  Principles of chromatography | 6.1 Key Questions 1–8  Chapter Review 1-9, 12-15  6.2 Key Questions 1–4  Chapter 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 terms  WORKSHEET 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 | 7.1  7.2 | Relative mass  Avogadro’s constant | 7.1 Key Questions 1-6  Chapter Review 1, 2, 19, 26  7.2 Key Questions 1–7  Chapter Review 9, 10, 11 | WORKSHEET 14 Exploring relative mass | WORKSHEET 14 Exploring relative mass |
| 11 | 7.3  7.4 | Molar mass  Percentage composition, empirical and molecular formulas | Case Study 1–3,  7.3 Key Questions 1–8  Chapter Review 3, 4, 12-14, 20-25  Case Study 1–3,  7.4 Key Questions 1–7  Chapter Review 5-8, 15-18, 27, 28 | WORKSHEET 15 Moles—the chemist’s unit of measurement  PRACTICAL 8 Mole simulations and applications  WORKSHEET 16 Empirical and molecular formulas  PRACTICAL 9 Determining molar mass of an element and a compound  PRACTICAL 10 Chemical composition of a compound | Case Study 1–3,  WORKSHEET 15 Moles—the chemist’s unit of measurement  WORKSHEET 16 Empirical and molecular formulas  PRACTICAL 8 Mole simulations and applications  PRACTICAL 9 Determining molar mass of an element and a compound  PRACTICAL 10 Chemical composition of a compound |
| 12 | 8.1  8.2  8.3 | Organic materials  Hydrocarbons  Haloalkanes | 8.1 Key Questions 1-6  Chapter Review 1, 12, 15  8.2 Key Questions 1-10  Chapter Review 2, 5, 6-8, 11, 14, 17  Case Study 1–4,  8.3 Key Questions 1-7  Chapter Review 3, 9, 10, 22 | WORKSHEET 17 Alkanes, alkenes and haloalkanes  PRACTICAL 11 Investigating hydrocarbons  PRACTICAL 12 Modelling functional groups | Case Study 1–4,  WORKSHEET 17 Alkanes, alkenes and haloalkanes  WORKSHEET 18 Families of organic molecules—haloalkanes, alcohols and carboxylic acids  PRACTICAL 11 Investigating hydrocarbons  PRACTICAL 12 Modelling functional groups |
| 13 | 8.4  9.1 | Alcohols and carboxylic acids  Polymer formation | 8.4 Key Questions 1-8  Chapter Review 4, 13, 16, 18-21  9.1 Key Questions 1-9  Chapter Review 3, 4, 5, 8, 9, 18, 20, 21, 25 | WORKSHEET 18 Families of organic molecules—haloalkanes, alcohols and carboxylic acids  WORKSHEET 19 Polyethene—a case study of a polymer | WORKSHEET 18 Families of organic molecules—haloalkanes, alcohols and carboxylic acids  WORKSHEET 19 Polyethene—a case study of a polymer |
| 14 | 9.2  9.3  9.4  9.5 | Thermoplastic and thermosetting polymers  Designing polymers for a purpose  Recycling plastics  Innovations in polymer manufacture | 9.2 Key Questions 1–5  Chapter Review 6, 7, 10-13  9.3 Key Questions 1–8  Chapter Review 1, 2, 15, 19, 22, 23  Case Study 1–4,  9.4 Key Questions 1–6  Chapter Review 14, 16, 18, 25, 27  9.5 Key Questions 1–8  Chapter 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 compounds  WORKSHEET 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 notes  Unit 1 AoS 3 assessment rubric  Unit 1 AoS 3 student checklist  Unit 1 AoS 3 sample marking scheme |