

Chemistry and Earth science (age 11-14)

Subject map

Big ideas and key concepts

The **Best Evidence Science Teaching** resources can be used with your existing scheme of work, if desired. However, we have used research evidence on learning pathways and effective sequencing of ideas to develop subject maps for biology, chemistry, Earth science and physics.

This subject map shows how three **big ideas** of chemistry and two of Earth science can be developed through a series of **key concepts**, organised into teaching topics.

Each key concept requires approximately 1-3 lessons' worth of teaching time.

The numbering in the subject map gives some guidance about teaching order based on our review of the research and teaching experience. In general, key concepts that appear earlier in the subject map need to be understood before progression to key concepts that appear later. However, the teaching order can be tailored for different classes as appropriate.

Notes about the chemistry and Earth science subject map

Some topics develop understanding of more than one big idea; these are presented as stretching across more than one column.

Publication of resources

Teaching and learning resources will be added on a topic-by-topic basis, with the final topics due to be added in the first few months of 2020.

The resources are being developed based on careful consideration of the best available research evidence on learning pathways, common student misunderstandings, and effective teaching approaches.

To find out when new topics have been published, please email uyseg@york.ac.uk and ask to subscribe to BEST project updates, or follow [@BestEvSciTeach](https://twitter.com/BestEvSciTeach) on Twitter.

CHEMISTRY AND EARTH SCIENCE (AGE 11-14)				
BIG IDEA: SUBSTANCES AND PROPERTIES	BIG IDEA: PARTICLES AND STRUCTURE	BIG IDEA: CHEMICAL REACTIONS	BIG IDEA: EARTH'S ATMOSPHERE	BIG IDEA: DYNAMIC EARTH
<p>Big Idea: Substances and properties</p> <p>Properties and characteristics of a range of substances are a result of substances' atomic-level structure and composition.</p> <p>Topic C01: Substances and mixtures</p> <p>Key concepts: C01.1 Substances C01.2 Mixtures C01.3 Separating mixtures</p>	<p>Big Idea: Particles and structure</p> <p>All matter is made up of atoms. The behaviour and physical properties of substances are explained by the arrangement of atoms in substances.</p> <p>Topic C02:</p> <p>Key concepts: C02.1 Atomic model for the solid, liquid and gaseous states C02.2 Particles in solution</p>	<p>Big Idea: Chemical reactions</p> <p>During a chemical reaction, atoms are rearranged forming new substances.</p> <p>Topic C03:</p> <p>Key concepts: C03.1 Atomic model for the solid, liquid and gaseous states C03.2 Particles in solution</p>	<p>Big Idea: Earth's atmosphere</p> <p>The composition of the earth's atmosphere changes over time. Research shows that the atmosphere has been gradually warming and cooling over time.</p> <p>Topic E01:</p> <p>Key concepts: E01.1 Atmosphere</p>	<p>Big Idea: Dynamic Earth</p> <p>The Earth's crust is constantly changing as new rocks are formed and older rock is worn away.</p> <p>Topic E02:</p> <p>Key concepts: E02.1 Stable and unstable Earth E02.2 Earth's crust</p>
<p>Topic C04: Solubility</p> <p>Key concepts: C04.1 Solubility C04.2 Solubility and temperature</p>	<p>Topic C05: Electrolysis and compounds</p> <p>Key concepts: C05.1 Solubility C05.2 Ionic structure and properties C05.3 Synthesis and formulas</p>	<p>Topic C06: Chemical change</p> <p>Key concepts: C06.1 Rate of reaction C06.2 Arrangement of atoms C06.3 Bond breaking C06.4 Types of reactions</p>	<p>Topic E03: Earth's resources</p> <p>Key concepts: E03.1 Oceans E03.2 Atmosphere</p>	<p>Topic E04: Plate tectonics</p> <p>Key concepts: E04.1 Stable and unstable Earth E04.2 Earth's crust</p>
<p>Topic C07: Understanding chemical reactions</p> <p>Key concepts: C07.1 Measurement of mass C07.2 Conservation of mass</p>	<p>Topic C08:</p> <p>Key concepts: C08.1 Conservation of mass C08.2 Combustion</p>	<p>Topic E05: Plate tectonics</p> <p>Key concepts: E05.1 Stable and unstable Earth E05.2 Earth's crust</p>	<p>Topic E06: Plate tectonics</p> <p>Key concepts: E06.1 Stable and unstable Earth E06.2 Earth's crust</p>	<p>Topic E07: Plate tectonics</p> <p>Key concepts: E07.1 Stable and unstable Earth E07.2 Earth's crust</p>

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BIG IDEA:

SUBSTANCES AND PROPERTIES

Materials are either made of a single chemical substance or a mixture of substances which each have distinctive properties.

Topic CSU1

Substances and mixtures

Key concepts:

- CSU1.1 Substance
- CSU1.2 Solutions
- CSU1.3 Separating solutions

BIG IDEA:

PARTICLES AND STRUCTURE

All matter is made up of atoms. The behaviour and structural arrangement of atoms explains the properties of different materials.

Topic CPS1

Key concepts:

- CPS1.1 Particle model for the solid, liquid and gas states
- CPS1.2 Particles in solutions

BIG IDEA:

CHEMICAL REACTIONS

During a chemical reaction, atoms are rearranged forming new substances.

BIG IDEA:

EARTH CHEMISTRY

Substances can move within and between the atmosphere, hydrosphere, geosphere and biosphere as part of large-scale Earth systems.

BIG IDEA:

DYNAMIC EARTH

The Earth's crust is constantly changing as new rocks are formed and older rock is worn away.

	<p>Topic CPS2 Elements and compounds</p> <p>Key concepts:</p> <p>CPS2.1 Atoms and molecules</p> <p>CPS2.2 Symbols and formulae</p> <p>CPS2.3 Polymers</p>			
<p>Topic CSU2 Solubility</p> <p>Key concepts:</p> <p>CSU2.1 Comparing solubility</p>	<p>Topic CPS3 Chemical change</p> <p>Key concepts:</p> <p>CPS3.1 Rearrangement of atoms</p>	<p>Topic CCR1</p> <p>Key concepts:</p> <p>CCR1.1 Formation of new substance</p>		<p>Topic EDE1 Earth's resources</p> <p>Key concepts:</p> <p>EDE1.1 What's in a rock?</p> <p>EDE1.2 Inside the Earth</p> <p>EDE1.3 Making rocks by heating</p>
	<p>Topic CPS4 Understanding chemical reactions</p> <p>Key concepts:</p> <p>CPS4.1 Representing reactions</p> <p>CPS4.2 Conservation of mass</p>	<p>Topic CCR2</p> <p>Key concepts:</p> <p>CCR2.1 Reactions in solution</p> <p>CCR2.2 Combustion</p>	<p>Topic EEC1 Air pollution</p> <p>Key concepts:</p> <p>EEC1.1 Air quality</p>	

	<p>Topic CPS5 Water cycle</p> <p>Key concepts: CPS5.1 Explaining evaporation</p>	<p>Topic CCR3 Energy and reactions</p> <p>Key concepts: CCR3.1 Exothermic and endothermic reactions</p>	<p>Topic EEC2 Water cycle</p> <p>Key concepts: EEC2.1 Hydrological processes</p>	
<p>Topic CSU3 Acids and alkalis</p> <p>Key concepts: CSU3.1 pH scale</p>		<p>Topic CCR4</p> <p>Key concepts: CCR4.1 Neutralisation</p>	<p>Topic EEC3</p> <p>Key concepts: EEC3.1 Acid rain</p>	
			<p>Topic EEC4 Weathering and erosion</p> <p>Key concepts: EEC4.1 Chemical weathering</p>	<p>Topic EDE2</p> <p>Key concepts: EDE2.1 Physical weathering and erosion</p>
<p>Topic CSU4 Periodic table</p> <p>Key concepts: CSU4.1 Trends in physical properties</p>	<p>Topic CPS6</p> <p>Key concepts: CPS6.1 Atomic model</p>	<p>Topic CCR5</p> <p>Key concepts: CCR5.1 Periodic patterns</p>		<p>Topic EDE3 Rock changes</p> <p>Key concepts: EDE3.1 Making rocks by pressure and cementing EDE3.2 Making fossil fuels</p>