Substances & particles: Learning pathway

Matter

	Activate	Acquire	Apply	Assess	Analyse
Particle model	❑ States	❑ Use particle model to suggest a hypothesis for an observation ❑ Sketch particles to show an idea about how a change in state happens	❑ Suggest a hypothesis to explain observations about changes in state ❑ Work out the state of substances from melting and boiling point information	❑ Acquire ❑ Apply	❑ Suggest hypotheses for unfamiliar physical processes, in terms of particles
Mixtures	❑ Material propert-ies	❑ Choose a suitable method to separate a mixture and use a model to explain how it works	❑ Identify features of substances and suitable separating techniques ❑ Identify evidence from a chromatogram and explain what it shows	❑ Acquire ❑ Apply	❑ Develop a combination of methods to separate a complex mixture and justify the choices
Solutions	❑ Material propert-ies	❑ Plan an investigation into how temperature affects solubility	❑ Calculate the mass of solute that will dissolve in a given volume of solvent ❑ Estimate solubility from graphical data	❑ Acquire ❑ Apply	❑ Interpret solubility data to design an experiment to identify a range of unknown substances

Analytical chemist

Act Use chromatography to solve a mystery

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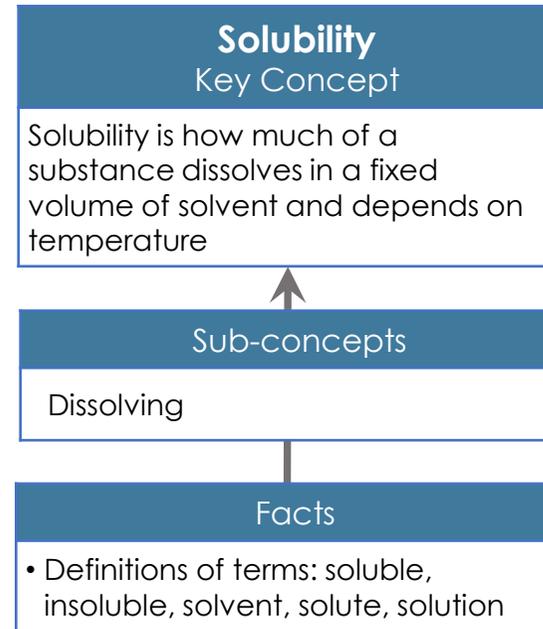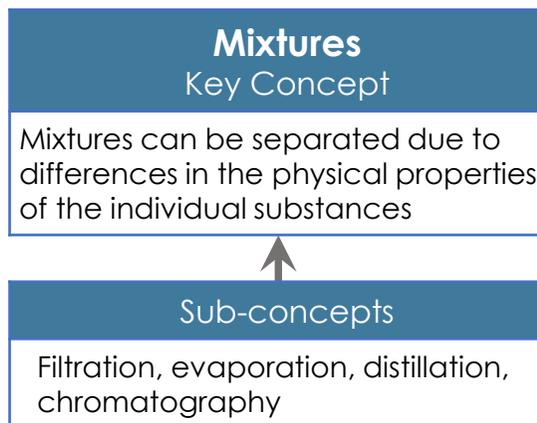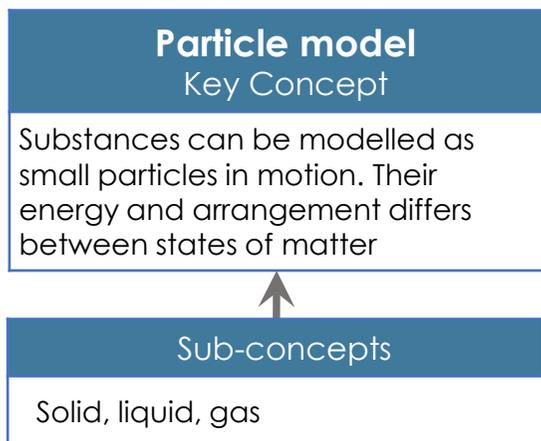
Substances & particles: Big ideas

What expert understanding do we want after 5 years?

Structure determines properties
Big idea

The properties of a substance depend upon the type of atoms it contains and the strength of the bonds holding them together. The properties determine the uses the substance is suitable for.

How does the unit develop this?

Particle model
Key Concept

Substances can be modelled as small particles in motion. Their energy and arrangement differs between states of matter

↑

Sub-concepts

Solid, liquid, gas

Mixtures
Key Concept

Mixtures can be separated due to differences in the physical properties of the individual substances

↑

Sub-concepts

Filtration, evaporation, distillation, chromatography

Solubility
Key Concept

Solubility is how much of a substance dissolves in a fixed volume of solvent and depends on temperature

↑

Sub-concepts

Dissolving

Facts

• Definitions of terms: soluble, insoluble, solvent, solute, solution

Substances & particles: Scientific thinking, maths & literacy

How are investigation skills integrated with the concepts?

Particle model
Test hypotheses
Suggest a hypothesis for the observation

Solutions
Manage variables
Choose variables to answer a scientific question

How are maths skills integrated with the concepts?

Solutions
Graphs
Reading values off graphs and interpolating and extrapolating

How are practical skills integrated with the concepts?

Mixtures

Apparatus and techniques	AT.4.C

Required practical activity 12: investigate how paper chromatography can be used to separate and tell the difference between coloured substances

Substances & particles: Curriculum links

Matter

Which parts of KS3 are covered?

AQA KS3 syllabus: 3.5.1 Particle model
3.5.2 Separating mixtures

## Which parts of GCSE are covered?

(AQA Trilogy combined science)

Particle model	✓ 5.2.2.1 The three states of matter	
Mixtures	✓ 5.1.1.2 Mixtures	✓ 5.8.1.3 Chromatography
Test hypotheses	✓ WS 2.1 Use scientific theories and explanations to develop hypotheses	✓ WS 3.6 Present reasoned explanations including relating data to hypotheses
Manage variables	✓ WS 2.2 Plan experiments or devise procedures	
Maths	✓ 4a Translate information between graphical and numeric form	

What resources are there to teach this unit?

Visit shop.masteryscience.com

KICKSTART your 5-year plan Workshop

MASTERY PRACTICE BOOK

DIAGNOSTICS Year 7 Assessment
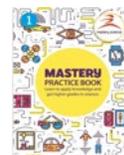
CPD   Teaching   Assessment

Analytical chemist	**Act** Students are given the R_f value of a food colouring that has been banned. They then carry out chromatography on different sweets to find out if any contains the banned colouring

blueprint
secondary science

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