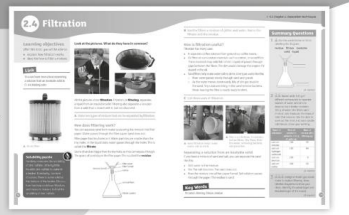
2.4 Filtration



Chemistry NC link:
- simple techniques for separating mixtures: filtration, evaporation.

Working Scientifically NC link:
- use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety.

Band	Outcome	Checkpoint	
		Question	Activity
Developing	Name the filtrate and residue in given situations (Level 3).	B, 1	Maths, Main 2
	State some situations in which filtering is used (Level 4).	A, C	Maths, Main 1, Main 2, Homework
	Draw a labelled diagram of the apparatus needed to filter a solution (Level 4).		Main 2, Plenary 2
Secure	Explain how filtration works (Level 5).	3	Starter 2, Main 2, Plenary 1, Plenary 2, Homework
	Describe how to filter a mixture (Level 5).		Maths, Main 2, Plenary 2
	Label a diagram of apparatus used for filtration to show where the filtrate and residue are found (Level 5).	1	Main 2, Plenary 2
Extending	Use particle diagrams to illustrate how filtering works (Level 7).	3	Main 2, Homework
	Explain whether or not filtering can be used in given situations (Level 7).		Main 2
	Explain in detail how filtration apparatus can be used to separate salt from a mixture of salt and sand (Level 7).		Main 2, Plenary 2, Homework

Maths
Students carry out simple calculations and apply the concept of ratios when working through the student-book activity and summary questions.

Literacy
Students use scientific terminology to explain their experiment and in answering questions.

APP
Students use models to explain what happens to particles during filtration (AF1).

Students also plan and carry out an investigation to separate salt from a mixture of rock and salt (AF4).

Key Words
filtration, filtering, filtrate, residue

Answers from the student book

In-text questions	**A** A liquid or solution from an insoluble solid. **B** glitter = residue, water = filtrate **C** Removing coffee from ground-up coffee beans, removing solid impurities from oil, making water safe to drink.
Activity	**Solubility puzzle** Remove solid solute by filtering the solution into a pre-weighed beaker. Find the mass of the filtrate by: final mass of beaker – initial mass of beaker Pour the filtrate into a measuring cylinder to measure volume volume of solution = volume of solvent Covert volume of solvent to mass by using 1 cm^3 of water = 1 g Solubility of zinc sulfate in the volume of solvent used can be found by: mass of solution – mass of solvent Scale up or down to give solubility in g/100 g of water

Summary Questions	**1** residue and insoluble solid (top), filtrate and liquid (bottom) (4 marks) **2** Amount of solute dissolved in 100 g of water: calcium chloride = 100 – 25 = 75 g calcium hydrogencarbonate = 100 – 84 = 16 g calcium bromide = 100 g calcium iodide = 100 – 33 = 67 g (4 marks) **3** Students design a suitable model and identify at least one advantage and one disadvantage of their model. They have also included relevant diagrams that help describe their model. (6 marks)

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Starter	Support/Extension	Resources
Filtration demonstration (10 min) Demonstrate the filtration of a mixture of sand and water. Explain that filter paper contains tiny holes, large enough for water molecules to pass through but not sand. Identify the apparatus names and introduce the terms filtrate and residue.	**Extension**: Ask students whether the residue is always discarded after filtration. Discuss that sometimes the residue is important (production of aspirin) and sometimes it can be discarded (ground coffee beans).	
Filter paper model (10 min) Introduce filtration apparatus and the terms filtrate and residue. Stretch a badminton net across the classroom, or arrange chairs with tiny gaps between them. Line up students on one side of the room and give them coloured balls. Ask students to approach the net (or chairs) and to pass the balls through the gaps. Ask students to explain this model of filtration (students = residue, coloured balls = filtrate).	**Extension**: Students should offer strengths and weaknesses of this model.	
Main	**Support/Extension**	**Resources**
Uses of filtration (15 min) Students work in pairs or small groups to gather as many ideas as possible on what filtration may be used for. Students then share these ideas as a class, before noting down two important uses of filtration in society (oil filters in cars and sand filters for drinking water).	**Extension**: Students should attempt the maths activity on the corresponding student-book spread to test their understanding and application of the concepts from this lesson and the last.	
Investigating filtration (25 min) Students solve a problem of separating salt from a mixture of rock and salt by filtration. Students start by planning the investigation, explaining why their plan works, and drawing a diagram of the filtration apparatus. They then answer the questions that follow about filtration.	**Support**: The accompanying support sheet includes diagrams of apparatus that can be used during filtration to help students draw their own labelled diagrams.	**Practical**: Investigating filtration **Skill sheet**: Planning investigations **Skill sheet**: Scientific apparatus
Plenary	**Support/Extension**	**Resources**
How does filtering work? (5 min) Students summarise key concepts and terminology from this lesson using a gap-fill exercise on the interactive resource.		**Interactive**: How does filtering work?
Filtering apparatus (5 min) Students draw a labelled diagram showing the apparatus for filtering on mini-whiteboards and define what the residue and filtrate are. Students should also give a brief description how filter paper works in separating the filtrate from the residue.	**Extension**: Students should offer detailed explanations that involve a discussion of relative particle sizes and solubility.	
Homework	**Support/Extension**	
Students research six uses of filtration. They should include three examples where the residue is useful, and three examples where the filtrate is useful. An explanation of how filtration works is required.	**Extension**: Students may use particle diagrams to explain this process.	