States of matter, purity and separation

AQA GCSE Chemistry (8462) · Foundation and Higher

Answer on your own paper. Show your working where needed.

1. Two particle models

Sketch how the particles of a crystalline solid are arranged. Describe how the arrangement and movement of those particles change if the solid melts.

2. Use the temperature data

At normal atmospheric pressure, substance X melts at −9 °C and boils at 48 °C. Substance Y melts at 23 °C and boils at 110 °C.

State the physical state of X and of Y at 15 °C and at 62 °C. Use the data to justify one of your choices.

3. Limits of a particle picture (Higher)

A pupil draws touching circles in fixed rows for a crystalline solid. Give one useful feature of the drawing. Identify two features of real particles or their behaviour that this picture leaves out.

4. A fogged window

The air next to a cold window contains water vapour. Explain how droplets appear without liquid water being poured on the window. Use ideas about the energy and spacing of particles.

5. Recover both solids

A beaker contains insoluble chalk powder suspended in a solution of sodium chloride. Plan a separation that recovers chalk and sodium chloride crystals. Explain what happens to each substance at the first separation step.

6. Separate two liquids

Two liquids mix completely. P boils at 65 °C and Q boils at 78 °C. A pupil chooses filtration to obtain a sample rich in P. Explain why that will not work, choose a better method and predict which liquid the first fraction is richer in.

7. Check the sample label

A reference sample of a pure compound melts sharply at 81 °C. Sample A melts sharply at 75 °C. Sample B starts to melt at 75 °C and finishes melting at 80 °C.

Which result is more consistent with a mixture? Explain why neither result supports the label ‘pure reference compound’.

8. Keep the solvent

A teacher needs to recover water from a solution containing a non-volatile dissolved solid. One pupil suggests heating the open solution and collecting the solid left behind. Describe an arrangement that collects the water instead, and explain how it works.

9. Extra challenge · Recover two useful samples

A class has a mixture of insoluble sand, water and dissolved salt. It needs dry sand and the greatest possible amount of water. Someone proposes evaporating the whole mixture in an open dish.

Describe a sequence that recovers the two samples. Explain how one stage depends on particle size and how the other depends on a change of state.

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