Distillation

Teacher / technician

YEAR 10 / LESSON 6 / CHEMISTRY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. This is an observed water-distillation demonstration plus a fractional-distillation explanation. No fabricated temperature series is supplied, and no ethanol handling or flammability test is authorised by this booklet.

Coverage and delivery

1.10: simple and fractional distillation.

Allow about 50 minutes. Teacher-operated demonstration; no pupil heating.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Dilute aqueous food colouring	40 cm^3	1 teacher demonstration
100 cm^3 flask and distillation set	1 matched set	1 set
Electric heater and clamps	1 stable set	1 set
Anti-bumping granules	few, added before heating	1 small supply
Booklet and eye protection	1 per student	30 sets

Immediate safety

Teacher demonstration only. Wear eye protection and remain behind the teacher’s marked viewing line. Do not touch the heater, glassware, cooling hoses or distillate. The apparatus must stay open to the atmosphere; never seal the receiver. Steam and hot glass can burn. No tasting, smelling or ignition tests. Report leaks immediately and let the teacher stop heating.

Preparation and delivery

Read alongside the student method

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1. Use 40 cm^3 water with a small amount of water-soluble, non-volatile food colouring; no alcohol-based ink or ethanol. Check the product composition. Use compatible undamaged glassware and an electric heater designed for the flask; follow the apparatus instructions.

2. Add a few anti-bumping granules to the cool liquid before assembling. Never add them to a hot or boiling liquid. Support the flask and condenser without stressing joints. Keep the collection end and receiver open to air.

3. Position the thermometer sensing region at the vapour take-off level. Feed cooling water gently into the lower condenser connection and out through the upper connection. Secure hoses and drain the outlet to the sink; check for leaks before heating.

4. Heat gently to collect approximately 5–10 cm^3 distillate, then stop with ample liquid remaining. Do not distil to dryness. Stop for bumping, leaks or loss of cooling; keep clear of hot glass and allow cooling before dismantling.

5. Use an unheated column or diagram for fractional distillation. The earlier ethanol flame test and smell test are removed. No live fractional distillation is included; a separate approved protocol would be needed to add one.

Close of lesson

• Students return worksheets and eye protection as directed. Only the teacher dismantles the apparatus after cooling and manages the retained solution and distillate under school disposal arrangements.

Verification before use

Check quantities and available apparatus against this requisition. For heated work, complete the school risk assessment and trial the actual setup. This editorial review is not a record of a physical laboratory trial. All supplied calculation datasets are labelled teaching examples.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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• Water evaporates in the heated flask and condenses in the cooled inner condenser tube; coolant flows separately in the outer jacket.

• An open collection path prevents pressure building in heated apparatus. Never fit a sealed receiver.

• Lower inlet fills the jacket and reduces air pockets; upper outlet lets water leave. The coolant does not mix with the distillate.

• The dye is expected to remain mainly in the flask. Colourless distillate is consistent with dye removal, but colourless contaminants could still be present.

• A fractionating column provides repeated vapour–liquid contact. Vapour becomes richer in the more volatile component; the liquid returning downward is richer in the less volatile component.

• Both components can be present in the vapour. The first fraction is usually ethanol-rich, not assured pure; ordinary fractional distillation also has mixture-dependent limits. Reference boiling points depend on pressure.

References and provenance

RSC: simple distillation teaching resources

Pearson Chemistry specification

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.