Tracing water through xylem

Teacher / technician

YEAR 10 / LESSON 39 / BIOLOGY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Tracer and structural observation; cut stems bypass roots and dye movement is not identical to total water flux.

Coverage and delivery

Shared Biology / Double Award: 2.54. Xylem transport of water and minerals.

Allow about 60 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklets	1 per learner	30
Dyed / plain stems	shared matched examples	at least 5 treatment pairs
Microscopes / slide sets	1 per pair	15 sets
Food dye / water vessels	pilot-tested dilute food dye; plain control	class demonstration supply
Staff cutting station	blade, board, forceps and waste container	1–2 stations

Immediate safety

Staff alone use the cutting blade on a stable tile. Handle coverslips and slides carefully, avoid dye and plant sap contact, and do not taste any material. Wash hands after the activity.

Preparation and delivery

Read alongside the student method

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1. Use a locally suitable leafy celery petiole or soft stem and a low-hazard food dye. Pilot visible transport and record the actual dye dilution and elapsed time; prepare matched plain-water controls.

2. Staff cut sections shortly before viewing and check a visible vascular pattern. Use permanent reference slides if the fresh section is too thick; label that evidence as a different preparation.

3. Keep all blade handling at the staff station and retain labels throughout; do not infer a precise water-flow rate from dye height alone.

Close of lesson

• Staff secure the cutting blade and collect cut stems and sections through the school’s designated plant-waste route.

• Return permanent slides to labelled boxes; collect used wet slides and coverslips in the designated tray, without handling broken glass.

• Switch off and cover microscopes as directed, clean dye spills and wash hands.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- Water and dissolved mineral ions.
- To distinguish original tissue colour from added dye.
- Light can pass through it and the tissue pattern is easier to resolve.
- The root uptake pathway.
- No. Dye binding, detection and distribution affect the visible mark.
- It uses a cut stem and tracer, not an intact plant or a direct volumetric flow measurement.

References and provenance

Pearson Biology specification

Practical Biology: water moving through plants

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.