Convection: following a coloured water plume

Teacher / technician

YEAR 10 / LESSON 27 / PHYSICS + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. The activity provides evidence of buoyant fluid motion. It does not measure heat flow or guarantee that a complete circulation loop will be visible.

Coverage and delivery

Shared Physics / Double Award: 4.6, 4.7, 4.9. Convection in fluids.

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

Requisition • class of 30, one staff demonstration

Item	Per pair / setup	Class total
Tank with water and tray	Staff demonstration	1
Matching vials with safe lowering/retrieval handle	Staff demonstration	2
Food colouring and dropper	A few drops per vial	1 small bottle
Thermometer and timer	Staff demonstration	1 each
Booklets	1 per learner	30

Immediate safety

Staff lower and retrieve the vials. Keep water at 50 °C or below, handle glass carefully and wipe spills promptly. Do not taste the dye. This activity uses no flame, smoke, sparkler or potassium manganate(VII).

Preparation and delivery

Read alongside the student method

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1. Pilot both trials using equal dye concentrations and minimal disturbance. Fit a secure retrieval handle and a cover that can be removed without tipping the vial.

2. Set up one visible demonstration for 30. Choose a tank size and vial volume that give a clear plume while remaining easy to handle; record these for repeats.

Close of lesson

• Let the water cool, empty it at the sink and rinse the tank and vials.

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

YEAR 10 / LESSON 27 / PHYSICS + SCIENCE (DOUBLE AWARD)

- It reveals dye diffusion and disturbances caused by placing the vial.
- It is usually less dense than the surrounding cooler water and experiences a net upward buoyant force.
- Bulk movement of the fluid transfers internal energy.
- Not by bulk movement of the solid.
- Mechanical stirring could imitate the motion being investigated.
- No; radiation and conduction also occur.

References and provenance

Pearson Physics specification

IOP: thermal transfers

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.