Insulation: comparing cooling over time

Teacher / technician

YEAR 10 / LESSON 29 / PHYSICS + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. This tests a particular sleeve and cup arrangement, not a universal ranking of all insulating materials.

Coverage and delivery

Shared Physics / Double Award: 4.6, 4.7, 4.10. Reducing unwanted thermal transfers.

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

Requisition • class of 30, five groups of six

Item	Per pair / setup	Class total
Matching cups and prepared lids	2 per group	10 each
Temperature probes	2 per group	10
Felt sleeves	1 per group	5
Trays, cylinders and timers	1 of each per group	5 of each
Water, maximum 50 °C	200 mL per group	1 L plus filling allowance
Booklets	1 per learner	30

Immediate safety

Staff dispense warm water at 50 °C or below. Keep cups stable in trays and probe leads clear. Do not use glass-fibre insulation or cut lid holes during the lesson. Wipe spills and leave wet sleeves to dry.

Preparation and delivery

Read alongside the student method

YEAR 10 / LESSON 29 / PHYSICS + SCIENCE (DOUBLE AWARD)

1. Provide five groups of six with matched cups and pre-cut felt sleeves. Check probes together in the same water and note any offset.

2. Pilot the temperature drop over ten minutes. Pre-make safe probe holes, prepare warm water centrally and keep initial conditions close between cups.

Close of lesson

- Allow water to cool, empty cups at the sink and dry equipment and sleeves.

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 29 / PHYSICS + SCIENCE (DOUBLE AWARD)

- Presence of the felt sleeve.
- Cup, volume, lid, initial temperature, probe position and surroundings.
- Initial temperature minus final temperature.
- Air conducts poorly, and small trapped spaces restrict bulk convection.
- Otherwise evaporation and convection change along with the sleeve.
- A vacuum removes matter for conduction and convection, but radiation remains.

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.