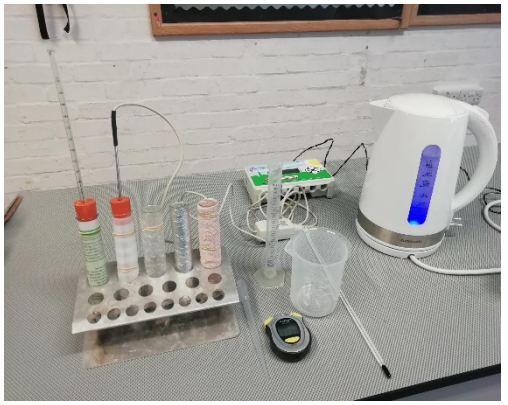
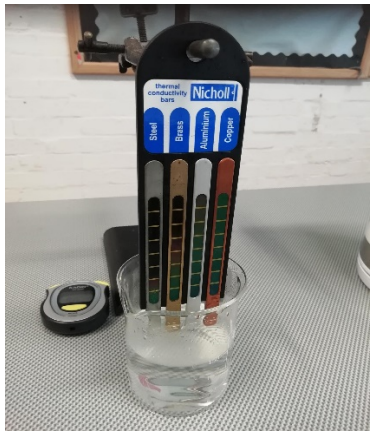
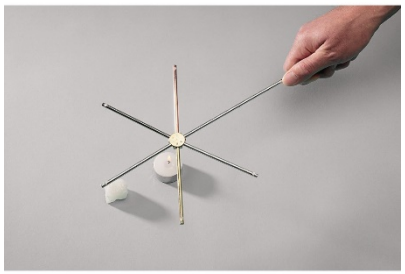
Year 7 Physics
Insulators Practical Guide

Science Mastery

Aim: Testing Thermal insulators and Conductors

Equipment Per Group	Method	Notes and guidance
Test tube rack Boiling Tubes Thermometers -10 to 110°c No 21 bung with hole Stopwatch Elastic Bands 100ml Measuring cylinder Pipette Plastic beaker Access to hot water from a boiled kettle. Samples of various materials, for instance: Aluminium Foil Newspaper Cloth Bubble wrap Dataloggers can be used with temperature sensors if available	Assign insulating materials for each group and pour hot water from the kettle into each table's beaker. Students should draw a table to record their results. 1. Wrap each boiling tube with a different material and secure with elastic bands. Ensure there is one layer of insulating material around each tube. 2. Place the boiling tubes into the rack. 3. Measure the temperature of the hot water in the beaker with a thermometer. 4. Use the measuring cylinder to measure 50ml of water into each of the tubes – TAKE CARE. 5. Place the bung with thermometers into the boiling tube. 6. Record the initial temperature of the water in the tubes and start the stopwatch. 7. Record the temperature of each boiling tube's water every minute. 8. At the end of the experiment (six minutes, or longer for more clear results) calculate which material insulated best.	 Care must be taken to decide the temperature of the water the students have access to. You may wish to give each group just one material and then share results at the end. This is recommended if students may struggle to fill multiple boiling tubes safely or if you have too few thermometers/bungs etc. available.

	Time (Minute)					
Sample	1min	2min	3min	4min	5min	6min
Foil	74°c	71°c	69°c	66°c	64°c	62°c
Paper	74°c	72°c	70°c	67°c	66°c	64°c
Cloth	74°c	72°c	70°c	68°c	66°c	65°c
Bubble wrap	76°c	73°c	71°c	68°c	66°c	65°c

Demo (optional) Equipment needed	Method	Notes and guidance
Thermal Conductivity bars/conductivity star/metal rods 250ml Beaker and kettle/candle/Bunsen burner Retort stand, boss and clamp Stopwatch Vaseline Paperclips	Thermal conductivity bars: Pour hot water into a 250ml beaker and lower the unit on a retort stand so that the ends of the metal strips just touch the water. Students can time how quickly the thermal indicator colour travels up each bar. Conductivity star or rods: Attach metal rods or star to a retort stand. Dip paperclips into Vaseline and suspend one on the end of each metal rod. Heat the centre of the star/end of each rod and observe in which order the paperclips fall. Can also be a class practical if enough equipment is available.	 

General Teacher Notes
A risk assessment needs to be completed for this practical. The risk assessment must be specific to the class involved and written only by the teaching member of staff. For more guidance refer to CLEAPSS Demo- Broken glass should always be cleared immediately and disposed of in the broken glass bin. Take care with hot water – ensure your lab has a burns first aid kit before the lesson
Clearing up
It is important that equipment is returned to the prep room in good order. Return everything back to the tray it came in neatly. If the trays arrived on a trolley, students must return all trays and equipment to that trolley.

Technician Notes	Hazcards	Clearing away
The material sample size in the trial was 135mm x 90mm for a boiling tube. If using a 250ml beaker, it was 220mm x 90mm. Insert thermometers into bungs before giving out to students as this can be tricky.	N/A	Place back into tray as supplied. Wipe up water spills to prevent slips.