

Edexcel Physics IGCSE

Chapter 4: Energy Resources and Energy Transfers Practical Notes



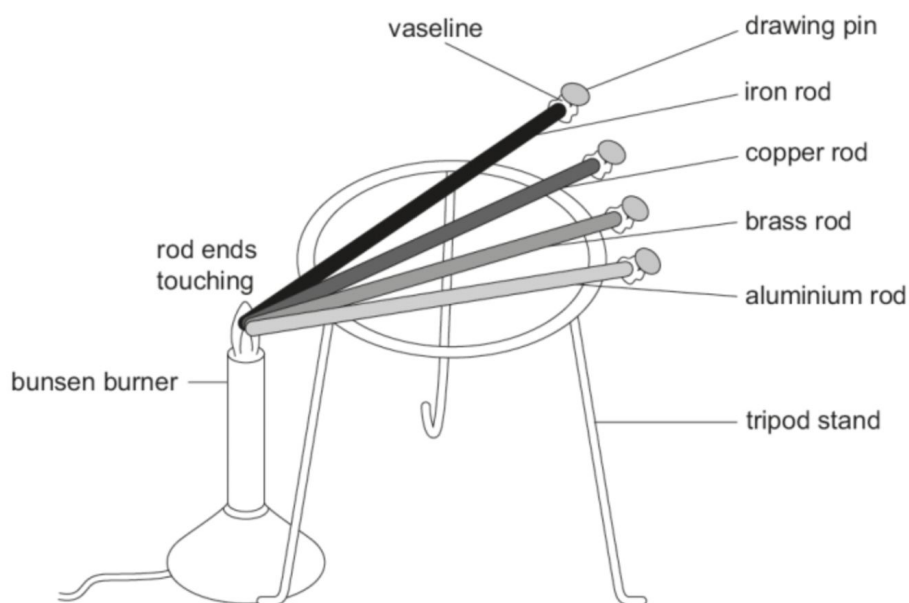
Investigate Thermal Energy Transfer by Conduction, Convection and Radiation

Conduction: Metal Rods Method

Equipment

- 4x metal rods of different types of metal
 - Aluminium, brass, copper and iron
- 4x drawing pins
- Petroleum jelly
- Tripod
- Bunsen burner
- Heatproof mat
- Stopwatch

Diagram



[Image: WJEC](#)



Method

1. Set up the equipment as shown in the diagram.
2. Using a small amount of petroleum jelly, attach a drawing pin to the end of each of the rods.
 - Try to make this the same amount of petroleum jelly for each rod.
3. Bring together the other ends of the rods (without the pins) so that they can each be heated the same amount.
4. Using the Bunsen burner, begin heating the ends of the rods without the pins and start the stopwatch.
5. Record the time taken for the pins to fall off the end of each rod and use this to determine the order of conductivity of the metals.
 - The first pin to fall will be from the rod that is the best conductor

Tips

- Try to avoid handling the rods and the jelly too much before heating.
- Allow the rods to cool to room temperature before heating so that they all begin at the same temperature and the results are more accurate.

Safety Precautions

- Ensure hair is tied back and no loose clothing is hanging near the flame when working with the Bunsen burner.
 - Blazers, lanyards and ties should be removed
 - Sleeves should be rolled up to the elbow
- Ensure the safety (orange) flame is on when you are not heating anything with the Bunsen burner, and do not leave the flame lit for longer than necessary so as to reduce the risk of causing a fire.
- Gas taps must be off when not connected to a lit Bunsen burner.



Convection:

Equipment

- 2x 250cm³ beaker
- 1 crystal of potassium manganate
- 10cm³ glass tube
- Tripod and gauze
- Heatproof mat
- Bunsen burner
- Forceps

Diagram

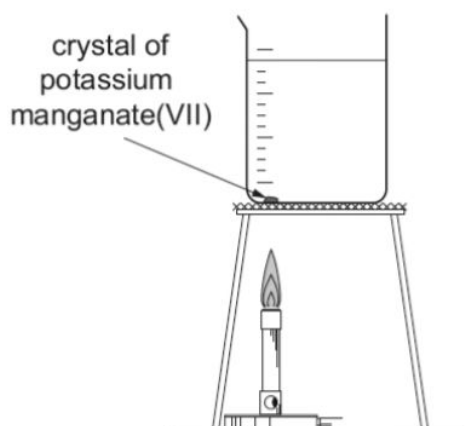


Image: WJEC

Method

1. Fill the beaker with water until it is three-quarters full and place it on top of the tripod and gauze.
2. Using the forceps, pick up the crystal and drop it through the glass tube to one side of the bottom of the beaker.
3. Cover the top of the tube with your finger and remove the tube carefully.
4. Heat the beaker using the Bunsen burner and record observations.

Safety Precautions

- Ensure hair is tied back and no loose clothing is hanging near the flame when dealing with the Bunsen burner.
 - Blazers, lanyards and ties should be removed
 - Sleeves should be rolled up to the elbow
- Ensure the safety (orange) flame is on when you are not heating anything with the Bunsen burner, and do not leave the flame lit for longer than necessary so as to reduce the risk of causing a fire.
- Gas taps must be off when not connected to a lit Bunsen burner.



Radiation: Leslie Cube Experiment

Equipment

- Leslie cube (a cube with different surfaces on each side)
- Kettle
- 30cm ruler
- Stopwatch
- Infrared detector
- Heatproof mat

Method

1. Pour boiling water into the Leslie cube.
2. Align the infrared detector with one side of the Leslie cube, 20cm away from the side, and take the initial temperature of the surface.
3. Measure and record the temperature of the surface every 30s for five minutes.
4. Rotate the cube and repeat the experiment for a different surface.
5. Plot temperature (plot on y-axis, measured in °C) against time (plot on x-axis, measured in seconds) for each different surface.

Notes

- The rate at which each side radiates heat will vary depending on the material of the side.
- Matt and dark surfaces will radiate heat faster than shiny and white surfaces.

Safety Precautions

- Take care when pouring the boiling water since it can cause burns if it comes in contact with skin.
- Don't touch the Leslie cube during or immediately after the experiment since it will be very hot.

