

# Edexcel IGCSE Physics

## Chapter 4 - Energy Resources and Energy Transfers

### Practical Flashcards

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# Investigate thermal energy transfer by conduction, convection and radiation



# 1. Conduction



# Outline the basic steps of the practical



## Outline the basic steps of the practical

1. Line up brass, iron, copper and aluminium rods along a bare tripod stand
2. Attach a drawing pin to the same end of each rod with a small blob of vaseline
3. Bring the other ends of the rods together and bring the bunsen burner under them so they all experience the same heat
4. Use a stopwatch to record how long it takes for each rod to lose its pin



What is the expected order in which the rods lose their pins?



What is the expected order in which the rods lose their pins?

1. Copper (Best conductor)
2. Aluminium
3. Brass
4. Iron (Worst conductor)



What is the main safety risk involved with the rods?





What is the main safety risk involved with the rods?

They get very hot so should not be touched with bare hands after heating.



# How can this risk be dealt with?



How can this risk be dealt with?

If they drop off the stand, a thick cloth or oven gloves should be used to pick them up.



# Explain how conduction in a metal occurs



## Explain how conduction in a metal occurs

- As one end is heated, the particles gain kinetic energy
  - Free electrons in the metal also gain KE
- The free electrons travel through the metal, transferring KE through collisions and increasing the temperature



## 2. Convection



# Outline the basic steps of the practical



## Outline the basic steps of the practical

1. Fill a beaker with water until it is  $\frac{3}{4}$  full
2. Drop one crystal of potassium manganate into the beaker
3. Place the beaker over the bunsen burner on the lowest flame possible
4. Record your observations





What tool do you use to pick up the crystal of potassium manganate? Why?



What tool do you use to pick up the crystal of potassium manganate? Why?

Forceps, as it can cause harm/irritation if it comes into contact with skin.



What do you stand the beaker on when being heated?



What do you stand the beaker on when being heated?

A tripod with a secure gauze. A heatproof mat should be under the tripod.



What safety precautions should be taken when using a bunsen burner?



What safety precautions should be taken when using a bunsen burner?

- Tie hair and loose clothing back
- Use the safety flame when not heating
- Don't touch metal areas during or after use
- Heatproof mat



Why should the bunsen burner be used on the lowest flame possible?



Why should the bunsen burner be used on the lowest flame possible?

Strong heating of the solution can cause it to become coloured very quickly, and prevent clear observations from being made.





What observation do you expect to make?



What observation do you expect to make?

- Convection currents should be visible
- You should see the colouring rise, move across and sink back down again



# What causes convection currents?



## What causes convection currents?

- The fluid near the bunsen burner heats up, causing the particles to spread out more and become less dense
  - This less dense region rises
- The cooler, more dense region takes its place and is in turn heated



# 3. Radiation



# Outline the basic steps of the practical



## Outline the basic steps of the practical

1. Tape a 2cm strip of black paper onto a thermometer's bulb
2. Tape a 2cm strip of silver foil onto another thermometer
3. Clamp both the same distance from a filament bulb and record the temperatures shown
4. Switch on the bulb and wait 10 minutes and then record the new temperature



Which temperature increase should be the highest and why?





Which temperature increase should be the highest and why?

The thermometer wrapped with black paper since black surfaces are better absorbers of radiation and reflect less radiation than the foil.



What safety precautions should be taken  
in this experiment?



What safety precautions should be taken in this experiment?

- Be careful when clamping thermometers to ensure they don't break
  - Don't touch the lamp during or immediately after use

