GCSE Required Practical – Physics 1 – Specific Heat Capacity

Specific Heat Capacity: the amount of energy needed to raise the temp of 1kg by 1°C

What's the point of the practical?

To find out the specific heat capacity of a material.
(You'll need to heat it and work out how much energy has gone in.)

If you haven't got a joulemeter, but do have a ammeter, voltmeter or power meter you can work out the amount of energy by:

Energy = power x time
Power = current x potential difference

Results:

$$\text{specific heat capacity } c\ (\text{J/kg °C}) = \frac{\text{energy transferred } \Delta E\ (\text{J})}{\text{mass } m\ (\text{kg}) \times \text{temperature change } \Delta\theta\ (\text{°C})}$$

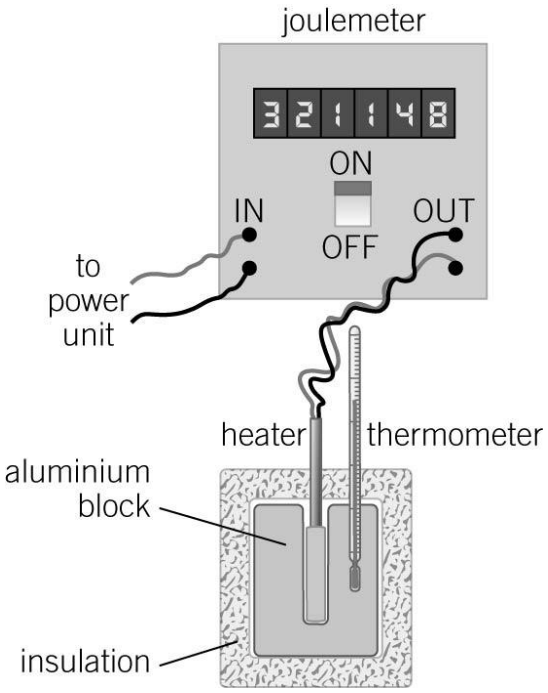
Example Apparatus

Joulemeter – measures energy going into the heater in joules

Heater – heats the block

Insulation – stops heat escaping into the atmosphere

Thermometer – measures the temperature rise



What may they ask us about?

Why do you need to insulate the block (*to stop heat loss to the atmosphere*)
Why is your answer not the true value (*because not all the heat was transferred into the block and through to the thermometer*)
Why is the temperature increase slower at first? *(because it takes some time for the block to heat up and for the heat to reach the thermometer.)*
It may not be a block of metal. You could use a kettle to heat an amount of water or any other way of heating something.
What's the **resolution** of temperature measurements? This experiment could be repeated and you'd get slightly different readings. They could ask about **repeatability** and ask you to calculate the **mean** or the **uncertainty**.

GCSE Required Practical – Physics 1 – Investigating Resistance

Resistance: how difficult it is for current to flow through part of the circuit.

What's the point of the practical?

To find out resistance of a wire.

(You could look at different lengths of wire, different thicknesses, or even different temperatures)

Results:

$$\text{resistance } (\Omega) = \frac{\text{potential difference (V)}}{\text{current (A)}}$$

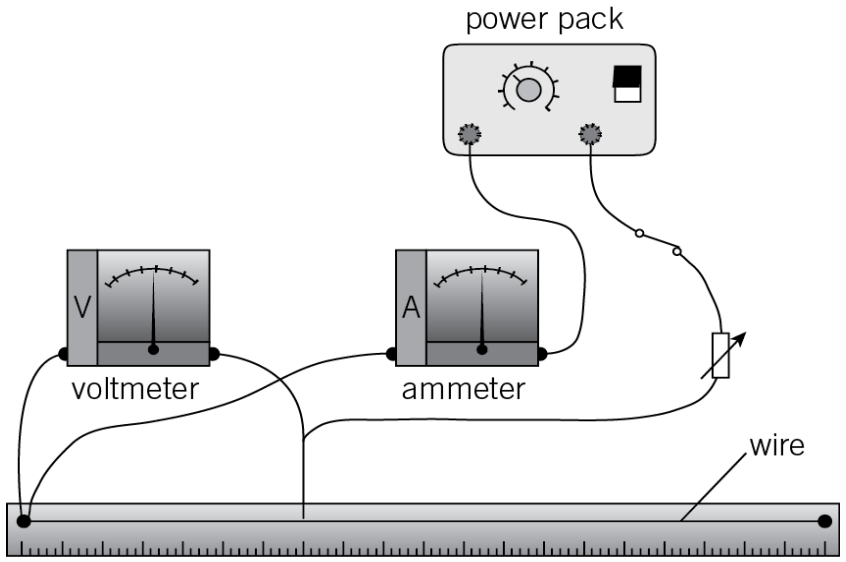
The longer the wire, the more resistance
The thicker the wire, the less resistance
The higher the temperature the more resistance

Example Apparatus

Voltmeter: measures the potential Difference

Ammeter: measures the current

Metre stick: Measures the length of wire that the current is going through



What may they ask us about?

- Why must the power pack be kept on a low potential difference / What are the hazards *(The wire will get very hot, could burn you)*
- Explain how the temperature affects the resistance (*as the wire gets hot, the ions inside the wire vibrate faster so there are more collisions with the electrons cannot flow as easily)*
- Why is it important to switch the electricity off in between each reading (*to let the wire cool down, as temperature affects resistance)*
- What sort of error could cause all the ammeter/voltmeter readings to be too high (*a zero error – the meters need to be set at zero to start with)*
- Resolution of measurements, repeatability, reproducibility, control variables etc etc

GCSE Required Practical – Physics 1 – Investigating Electrical Components (lamp, diode, resistor)

Component: part of a circuit Current: the flow of charge diode: only allows current to flow one way

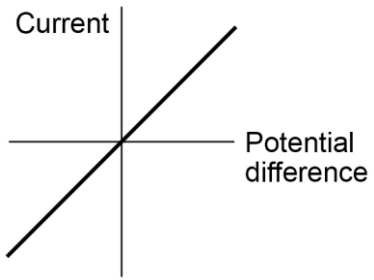
Potential Difference (V): the energy transferred to part of a circuit by each coulomb of charge

Resistor: limits the current in a circuit

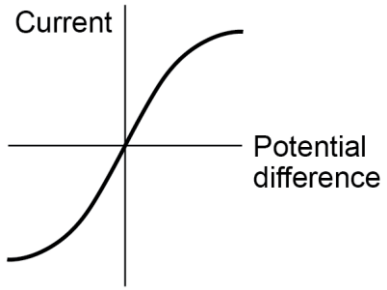
What's the point of the practical?

To find out how current and potential difference change in different components

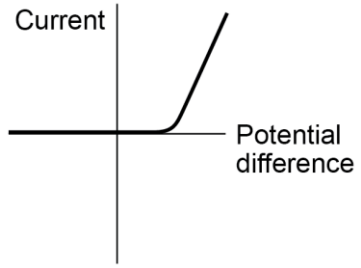
Results:



Resistor



lamp

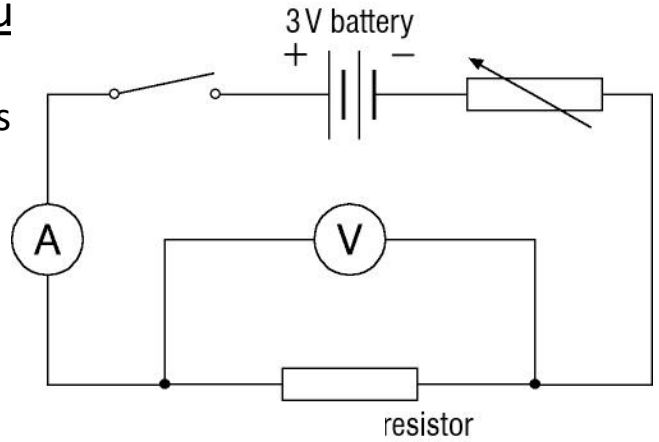


Diode

Example Apparatu

Voltmeter: measures the potential Difference

Ammeter: measures the current



Resistor: what we're testing. (can be replaced with a lamp, then a diode

What may they ask us about?

- Explain the pattern for each component (***resistor****: fixed resistance – more PD =more current.* ***Lamp:*** *more PD = more current but at high PD, the filament gets hot, ions vibrate so resistance increases and current levels off.* ***Diode****: current can only flow in one direction)*
- Resolution of measurements, repeatability, reproducibility, control variables etc etc

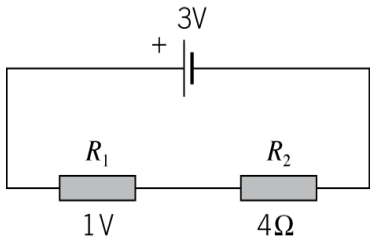
GCSE Required Practical – Physics 1 – Resistors in Series and Parallel

Resistor: limits the current in a circuit

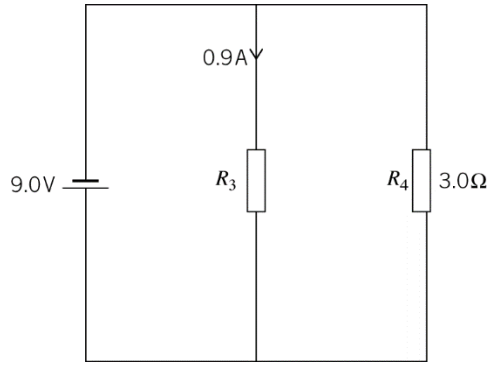
What's the point of the practical?

To find out what happens to the total resistance when resistors are put in series and in parallel

Example Apparatus



Series circuit



Parallel circuit

Results for series circuits

the total resistance is the same as both resistors added up. Each time you add a resistor, you get more resistance and less current

Results for parallel circuits

The total resistance is less than the smallest resistor. Each time you add more resistors, the current increases and the total resistance decreases. (the are more 'routes' overall for the current)

What may they ask us about?

- Why aren't your results completely accurate? (*because the meters aren't completely accurate, the power pack potential difference fluctuates slightly, the temperature of the wires changes which affects resistance)*
- What is the resolution of measurements? (*e.g. 0.41A, 0.32A, 0.39A are all to 0.01 resolution)*
- They may ask you to calculate resistance, current or PD. Or ask what happens if you add/take away resistors.

GCSE Required Practical – Physics 1 – Resistors in Series and Parallel

Resistor: limits the current in a circuit

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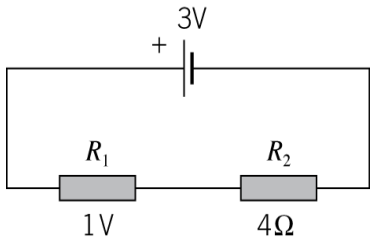
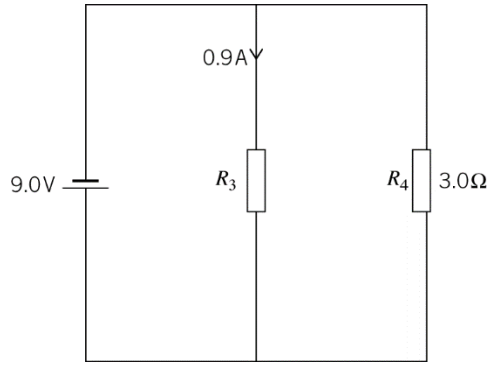
Example Apparatus



Series circuit



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GCSE Required Practical – Physics 1 – Calculating Density

Density = a substance's mass per unit volume.

$$density = \frac{mass}{volume} = \frac{m}{v}$$

What's the point of the practical?

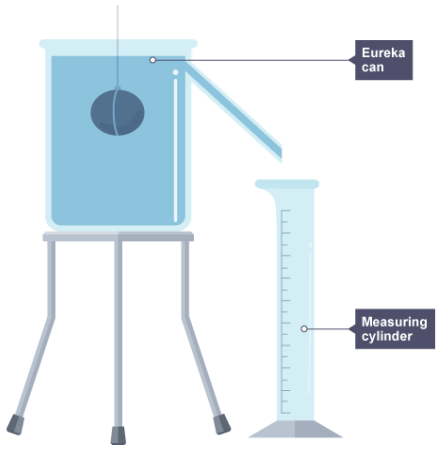
To find out the density of different materials.

Cubes of material are easy for volume (length x width x height). For irregular shapes, you need a eureka can to work out the volume

Results

Material	Mass (g)	Volume (cm^3)	Density (g/cm^3)
Aluminium	22.3	8.0	2.79
Steel	50.2	6.4	7.84

Example Apparatus



Finding Volume

Finding Mass

What may they ask us about?

- What is the resolution of the balance? (*0.1g in this case*)
- How could you get errors when using the eureka can? (*water may spill out of the sides if you drop the object in too quickly / there may already be some water in the measuring cylinder / the water might not be at exactly the level of the spout)*
- How could you get errors when weighing the object (*the balance may not be at exactly zero to start with (not calibrated))*
- What is the uncertainty of the measurements? (the balance has a ±0.05 uncertainty here as it only goes up in 0.1's)