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GCSE Physics

Paper 1 · Required Practicals - Cheat Sheet

AQA Physics (8463) | Paper 1 | 5 Practicals

Quick-revision reference for the Required Practicals in AQA GCSE Physics. For each practical: the **aim**, the **method**, the **variables**, the expected **result**, and the **exam tips** examiners reward. Learn the method and the why, not just the what.

RP1 Specific Heat Capacity

AIM	Determine the specific heat capacity of a solid metal block by linking energy transferred to temperature rise.
METHOD	**1.** Insulate a 1 kg metal block, place a thermometer and an electric immersion heater into the drilled holes. **2.** Record the start temperature, then switch on the heater through a joulemeter (or ammeter, voltmeter and timer). **3.** Heat for a set time and record the energy supplied and the highest temperature reached. **4.** Repeat for different materials and calculate c using $E = m \times c \times \Delta\theta$ rearranged to $c = E \div (m \times \Delta\theta)$.
VARIABLES	IV: energy transferred (J) · DV: temperature change $\Delta\theta$ (°C) · Control: mass of block, insulation, same heater
RESULT	Energy supplied is directly proportional to $\Delta\theta$; the gradient of energy against $\Delta\theta$ gives mass × c, so c follows in J/kg°C.
EXAM TIPS	› Add a drop of water or oil to the thermometer hole for good thermal contact with the block. › Lag the block well - uninsulated heat loss makes c read too high. › Temperature keeps rising briefly after switch-off, so take the peak reading.

RP2 Thermal Insulation (Rate of Cooling)

AIM	Investigate the effectiveness of different materials or thicknesses as thermal insulators around a container of hot water.
METHOD	**1.** Pour the same volume of hot water at the same start temperature into identical sealed beakers. **2.** Wrap each beaker in a different insulating material (or a different number of layers), keeping a lid on. **3.** Place a thermometer through the lid of each and record the temperature every minute for ten minutes. **4.** Plot temperature against time for each material and compare the temperature drop over the period.
VARIABLES	IV: insulating material or number of layers · DV: temperature after a fixed time (°C) · Control: volume and start temperature of water, beaker, room temperature
RESULT	The better insulator gives the smallest temperature fall; more layers reduce the rate of cooling, shown by a shallower cooling curve.
EXAM TIPS	› Start every beaker at the same temperature or the comparison is unfair. › Use a lid to cut evaporation, which would otherwise add its own cooling. › Trapped air is a poor conductor, so it is the key reason layered materials insulate well.

RP3 Resistance and Length of a Wire

AIM	Investigate how the resistance of a metal wire depends on its length.
METHOD	**1.** Connect a length of resistance wire into a circuit with a cell, an ammeter in series and a voltmeter across the wire. **2.** Tape the wire to a metre ruler and attach a flying lead crocodile clip at a chosen length. **3.** Record the current and the potential difference, then calculate resistance using $R = V \div I$. **4.** Repeat for lengths from about 10 cm to 100 cm and plot resistance against length.
VARIABLES	IV: length of wire (cm) · DV: resistance (Ω) · Control: wire material and thickness, temperature, supply voltage
RESULT	Resistance is directly proportional to length - a straight line through the origin; doubling the length doubles the resistance.
EXAM TIPS	› Switch the circuit off between readings so the wire does not heat up and change resistance. › Measure length from the clip contact point, not the loose end of the wire. › Use low voltage to keep the current and heating effect small.

RP4 I-V Characteristics

AIM	Investigate the current-potential difference relationship for a resistor, a filament lamp and a diode.
METHOD	**1.** Build a circuit with the component, an ammeter in series, a voltmeter in parallel and a variable resistor. **2.** Adjust the variable resistor to change the potential difference in steps and record current at each step. **3.** Reverse the cell connections to obtain negative values, then plot current against potential difference. **4.** Repeat the whole process for the fixed resistor, the filament lamp and the diode.
VARIABLES	IV: potential difference (V) · DV: current (A) · Control: component under test, temperature, same circuit setup
RESULT	Fixed resistor → straight line through the origin (ohmic). Filament lamp → S-shaped curve that flattens as it heats. Diode → current flows one way only.
EXAM TIPS	› The filament lamp curves because resistance rises as the filament gets hotter. › A diode has very high resistance in reverse, so almost no current flows backwards. › Protect the diode with a series resistor to limit the forward current.

RP5 Density of Solids and Liquids

AIM	Determine the density of regular solids, irregular solids and liquids using mass and volume measurements.
METHOD	**1.** Find the mass of each object or an empty measuring cylinder on a balance. **2.** For a regular solid measure its dimensions and calculate volume; for a liquid read the volume in a measuring cylinder. **3.** For an irregular solid lower it into a eureka can and measure the displaced water volume. **4.** Calculate density using $\rho = m \div V$ in kg/m^3 or g/cm^3.
VARIABLES	IV: object or substance tested · DV: density ρ (kg/m^3) · Control: balance used, temperature, measuring method
RESULT	Density is the mass per unit volume; $\rho = m \div V$. Denser objects pack more mass into the same volume, and objects denser than water sink.
EXAM TIPS	› Zero (tare) the balance with the empty cylinder before adding liquid to get the liquid mass alone. › Read the measuring cylinder at the bottom of the meniscus at eye level. › Dry irregular solids after displacement so trapped water does not skew the next mass reading.