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GCSE Physics

Paper 2 · Required Practicals - Cheat Sheet

AQA Physics (8463) | Paper 2 | 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.

RP6 Force and extension of a spring (Hooke's law)

AIM	Investigate how the extension of a spring depends on the force applied to it.
METHOD	**1.** Clamp a spring vertically and record its starting length next to a fixed ruler at eye level. **2.** Hang a known weight on the spring, let it settle and read the new length to find the extension. **3.** Add weights in equal steps (e.g. 1 N each), reading the extension after every addition. **4.** Remove the masses and repeat to check the spring returns to its original length, then average results.
VARIABLES	IV: force / weight added (N) · DV: extension of the spring (m or cm) · Control: same spring, same mass increments, same temperature
RESULT	Extension is directly proportional to force up to the limit of proportionality, giving a straight line through the origin ($F = k \times e$). Beyond that limit the line curves as the spring deforms.
EXAM TIPS	› Read the ruler at eye level to avoid parallax error. › Extension is the new length − the original length, not the total length. › The line stays straight only up to the limit of proportionality; plotting too far hides this. › Wear eye protection in case the spring snaps or a mass falls.

RP7 Acceleration: force, mass and acceleration (F = ma)

AIM	Investigate the effect of varying force and varying mass on the acceleration of an object.
METHOD	**1.** Set a trolley on a runway with light gates (or ticker tape) to measure its acceleration. **2.** Pull the trolley with a constant force using hanging masses over a pulley and record the acceleration. **3.** To vary force: move masses one at a time from the trolley to the hanger so total mass stays constant. **4.** To vary mass: keep the pulling force fixed and add blocks to the trolley, recording acceleration each time.
VARIABLES	IV: pulling force (N) or total mass (kg) · DV: acceleration (m/s^2) · Control: the other of force/mass kept constant, same runway and friction compensation
RESULT	Acceleration is directly proportional to the resultant force (constant mass) and inversely proportional to mass (constant force), confirming $a = F \div m$, i.e. $F = ma$.
EXAM TIPS	› Tilt the runway slightly to compensate for friction so the trolley moves at steady speed when released gently. › Keep total mass constant when changing force by transferring masses, not adding them. › Use light gates with a card of known width for accurate, repeatable speed and acceleration values. › Plot acceleration against force (straight line) and against 1 ÷ mass to show both relationships.

RP8 Waves: wavelength, frequency and speed

AIM	Measure the frequency, wavelength and speed of waves on a string and of water waves in a ripple tank.
METHOD	**1.** For water waves, set a ripple tank with a vibrating bar and shine a lamp so wave shadows show on the screen below. **2.** Time a number of waves passing a point to find frequency, and measure the distance across several waves to find wavelength. **3.** For a stretched string, fix one end and pass it over a pulley with hanging masses, driven by a signal generator and vibrator. **4.** Adjust the frequency until a clear standing wave forms, then measure the wavelength from the nodes. **5.** Calculate wave speed using $v = f \times \lambda$ for both arrangements.
VARIABLES	IV: frequency of the vibrator (Hz) · DV: wavelength of the wave (m) · Control: same string tension and length, same depth of water in the ripple tank
RESULT	Wave speed is found from $v = f \times \lambda$. For a fixed medium the speed is roughly constant, so higher frequency gives a shorter wavelength (they are inversely proportional).
EXAM TIPS	› Measure across many whole wavelengths and divide, to reduce the percentage error in λ. › Use a stroboscope or photograph to freeze ripple-tank waves before measuring. › Count waves over a longer time when finding frequency for a more reliable value. › Keep the water shallow and level so the wave speed stays constant across the tank.

RP10 Infrared radiation and surfaces (Leslie cube)

AIM	Investigate how the amount of infrared radiation emitted depends on the nature of a surface (separate Physics).
METHOD	**1.** Fill a Leslie cube with very hot water so its four differently finished faces reach the same temperature. **2.** Hold an infrared detector a fixed distance from one face and record the reading. **3.** Move the detector the same distance from each of the other faces and record each reading. **4.** Repeat the readings and average them for matt black, shiny black, matt white and shiny silver faces.
VARIABLES	IV: type of surface (matt black, shiny silver, etc.) · DV: infrared radiation detected (detector reading) · Control: same temperature of the cube, same distance from detector to face, same detector
RESULT	A matt black surface emits the most infrared radiation and a shiny silver surface the least, showing dull dark surfaces are the best emitters (and absorbers) of radiation.
EXAM TIPS	› Keep the detector exactly the same distance from every face, as radiation falls off rapidly with distance. › Take all readings quickly before the water cools, so each face is tested at the same temperature. › Handle the cube with care and use heat-proof gloves to avoid scalds from the hot water. › Zero the detector against the background before starting to remove stray infrared.

RP11 Reflection and refraction of light (ray box)

AIM	Investigate the reflection of light by surfaces and the refraction of light by different substances (separate Physics).
METHOD	**1.** Draw round a transparent block on paper and shine a thin ray from a ray box at the surface. **2.** Mark the incoming and outgoing rays, remove the block and draw the normal where the ray met the surface. **3.** Measure the angle of incidence and the angle of reflection (or refraction) from the normal with a protractor. **4.** Repeat for several angles of incidence and for different materials such as glass and perspex.
VARIABLES	IV: angle of incidence (°) · DV: angle of reflection or angle of refraction (°) · Control: same block/material, same single ray, same light source
RESULT	For reflection the angle of incidence equals the angle of reflection. For refraction, light entering a denser medium bends towards the normal and slows down; angles are always measured from the normal.
EXAM TIPS	› Always measure angles from the normal, never from the surface itself. › Use a single thin ray and mark its centre with two dots far apart for an accurate line. › Work in a dimmed room so the ray is easy to see and trace. › Refraction bends the ray towards the normal on entering glass and away from it on leaving.