STUDY FORMULA BOOKLET

Edexcel IAL Physics Unit 2 (WPH12): waves and electricity

The list printed in every Unit 2 paper covers v = f λ, refraction, the grating, E = hf, the photoelectric equation, I = P/A, resistivity and I = nqvA. Learn first: phase difference, stationary waves, the potential divider and epsilon = I(R + r).

GIVEN printed on the formula list in the paper LEARN IT not on the list: learn it

Built by CuratedPrep from 21 past question papers for Unit 2 in our question bank, June 2019 to January 2026. Given means it is in the list of data, formulae and relationships printed at the back of every unit paper. Learn it means a past question needed it and the exam did not print it.

Data and constants

Speed of light in a vacuum

Use it to turn a frequency into a wavelength for light and radio waves, and in n = c/v. Used in: Jan 2026 (A) Q11(a), wavelength of satellite radiation; Jan 2026 Q21(a)(i), photon energy from a wavelength; Oct 2025 Q15(b)(i), energy of an ultraviolet photon.

$$c = 3.00 \times 10^{8}\ \text{m s}^{-1}$$

GIVEN

Planck constant

Use it in E = hf and in the de Broglie wavelength. Used in: Jan 2026 Q21(a)(i), photon energy at 380 nm; Jan 2026 Q14(b), de Broglie wavelength of an electron; Jun 2024 Q17(a)(i), frequency of a photon.

$$h = 6.63 \times 10^{-34}\ \text{J s}$$

GIVEN

Electronvolt

Divide an energy in joules by 1.60 × 10^{-19} to get eV, and multiply an energy in eV by it to get joules before using E = hf. Used in: Oct 2025 Q15(b)(ii), kinetic energy of a photoelectron in eV; Jun 2024 Q17(b)(i), photons of energy 4.75 eV; Jun 2022 Q17(b), work function of zinc in eV.

$$1\ \text{eV} = 1.60 \times 10^{-19}\ \text{J}$$

GIVEN

Electron charge

The size 1.60 × 10^{-19} C is the q in I = nqvA and the charge of one electron in V = W/Q. Used in: Jan 2026 (A) Q12(b), drift velocity in a pencil lead; Jan 2026 Q14(a), energy gained by an electron through 4.8 kV; Jan 2026 Q11, drift velocity of conduction electrons.

$$e = -1.60 \times 10^{-19}\ \text{C}$$

GIVEN

Electron mass

Use it with E_k = 1/2 mv^2 and p = mv for electrons. Used in: Jan 2026 Q14(b), de Broglie wavelength of an accelerated electron; Jan 2026 (A) Q4, speed of an electron from its wavelength; Jun 2024 Q17(b)(i), maximum speed of photoelectrons.

$$m_{\text{e}} = 9.11 \times 10^{-31}\ \text{kg}$$

GIVEN

Gravitational field strength

Use it with W = mg when a hanging mass sets the tension in a string. Used in: Jun 2022 Q16(b), tension from a 0.300 kg mass; Jan 2022 Q15(b)(i), hanging mass from the tension; Jan 2020 Q11(b), tension from a 0.20 kg mass.

$$g = 9.81\ \text{N kg}^{-1}$$

GIVEN

Waves and stationary waves

Phase difference and the wavelengths of stationary waves are not on the list, so learn them.

Wave speed

c = f λ for light and radio waves, and the speed of sound for sound. A graph of wavelength against 1/f has gradient v. Used in: Jan 2026 (A) Q11(a), wavelength of 12.6 GHz radiation; Jan 2026 Q18(b), speed of radio waves from a standing wave; Jun 2024 Q15(c), speed of sound from a graph.

$$v = f\lambda$$

GIVEN

Frequency and period

Only T = 1/f is needed in Unit 2, for oscilloscope traces: the period is the divisions in one cycle times the time per division. It sits under Unit 5 on the list. Used in: Oct 2025 Q3, frequency of a sound from an oscilloscope trace; Jun 2024 Q15(a), frequency of a panpipe; Jan 2024 Q7, frequency from a trace.

$$T = \frac{1}{f} = \frac{2\pi}{\omega}$$

GIVEN

Phase difference from path difference

Use 360 degrees in place of 2 pi for an answer in degrees; to change degrees to radians multiply by 2 pi/360. A path difference of one wavelength is a phase difference of 2 pi. Used in: Jan 2026 Q5, phase difference at a point P; Oct 2025 Q5, 25 degrees in radians.

$$\Delta\phi = \frac{\text{path difference}}{\lambda} \times 2\pi$$

LEARN IT

Interference condition

n is a whole number. Constructive means the waves arrive in phase, destructive means in antiphase (a phase difference of pi). Used in: Jan 2026 Q17(b), why a maximum forms at X; Oct 2025 Q16(a)(ii), bright dots from a grating; Jun 2022 Q14(b)(ii), zero amplitude at a point.

$$\text{path difference} = n\lambda \text{ (constructive)}, \quad \left(n + \tfrac{1}{2}\right)\lambda \text{ (destructive)}$$

LEARN IT

Wavelength of the simplest stationary wave

Adjacent nodes are λ/2 apart, and a tube open at both ends also gives λ = 2L. Used in: Jun 2024 Q15(d), longest panpipe; Jun 2023 Q18(b), violin string.

$$\lambda = 2L \text{ (string fixed at both ends)}, \quad \lambda = 4L \text{ (tube closed at one end)}$$

LEARN IT

Speed of a transverse wave on a string

T is the tension (a hanging weight gives T = mg) and μ is the mass per unit length. Doubling T multiplies v by the square root of 2. Used in: Jan 2026 Q6, speed on a 2.5 m string; Jan 2026 (A) Q15(c), replacement harp string; Jun 2022 Q16(b), node on a vibrating string.

$$v = \sqrt{\frac{T}{\mu}}$$

GIVEN

Mass per unit length

Divide the mass of the string by its length in metres. Used in: Jan 2026 Q6, string of mass 0.005 kg and length 2.5 m; Jan 2026 (A) Q15(c), mass of a 1.5 m string; Jan 2024 Q15(c), mass of a replacement string.

$$\mu = \frac{m}{l}$$

LEARN IT

Frequency of a stretched string

Combine v = f λ, λ = 2L and v = sqrt(T/μ); it shows f is proportional to the square root of T. Used in: Oct 2025 Q7, frequency when the tension is doubled; Jun 2023 Q18(b), which violin string; Oct 2022 Q15(b), change in tension of a wire.

$$f = \frac{1}{2L}\sqrt{\frac{T}{\mu}}$$

LEARN IT

Pulse-echo and intensity

Distance to a reflector in a pulse-echo method

The pulse travels to the object and back, so halve the total time or the total distance. The list does not print speed = distance/time. Used in: Jan 2026 (A) Q13(b), which crack returned a pulse after 1.4 × 10^{-5} s; Jun 2024 Q13(a), depth of a fish; Oct 2025 Q6, distance from a bat to an object.

$$v = \frac{s}{t}, \quad d = \frac{vt}{2}$$

LEARN IT

Intensity of radiation

A is the area at right angles to the beam. Used in: Jan 2026 (A) Q11(b), power received by a dish; Jan 2026 Q21(a)(ii), power on a pixel; Oct 2025 Q15(b)(iii), power on a detection surface.

$$I = \frac{P}{A}$$

GIVEN

Intensity from a point source

L is the power of the source and d the distance from it, so intensity falls as 1/d^2. It sits under Unit 5 on the list. Used in: Jan 2024 Q8, intensity at twice the distance; Jun 2023 Q9, intensity of sunlight at the Earth; Jan 2022 Q18(b), power of Sirius A.

$$I = \frac{L}{4\pi d^2}$$

GIVEN

Refraction and total internal reflection

Refraction at an interface

For light going from air into a material this is n = sin i / sin r, and for a critical angle between two materials put the second angle at 90 degrees. Used in: Jan 2026 (A) Q16(a), refractive index of rinse aid; Jan 2026 Q20(a)(ii), refractive index of a glycerol sample; Oct 2023 Q18(b), critical angle between glass and water.

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

GIVEN

Refractive index

Use c = 3.00 × 10^8 m s^{-1}; the ratio of the speeds in two materials gives their relative index. Used in: Jan 2026 Q20(a)(i), speed of light in glass; Jan 2026 (A) Q16(b), index of plastic in rinse aid from two speeds; Oct 2024 Q17(a), speed of light in water.

$$n = \frac{c}{v}$$

GIVEN

Critical angle

n is the index of the material the light is in when it goes into air; for a boundary between two materials use n = n1/n2 or n1 sin C = n2. Used in: Oct 2025 Q14(c), ray at the critical angle in a semicircular block; Jun 2024 Q18(b), prism surface in a camera; Jun 2022 Q11(b), glass with light speed 1.96 × 10^8 m s^{-1}.

$$\sin C = \frac{1}{n}$$

GIVEN

Diffraction grating

Diffraction grating

n is the order of the maximum, and the highest order comes from sin(θ) = 1. Used in: Jan 2026 Q17(a), lines per mm of a grating; Oct 2025 Q16(b), angle of the first order and why there is no third order; Jun 2024 Q12(b), wavelength of violet light.

$$n\lambda = d\sin\theta$$

GIVEN

Grating spacing

N is the number of lines per metre, so 450 lines per mm is 4.50 × 10^5 per metre, and d comes out in metres. Used in: Jan 2026 (A) Q19(a), wavelength with 450 lines per mm; Oct 2024 Q16(c)(i), grating of 250 lines per mm; Oct 2022 Q18(c), checking a grating labelled 300 lines per mm.

$$d = \frac{1}{N}$$

LEARN IT

Angle of a maximum from the screen

x is the distance from the central maximum to the maximum and D the distance from the grating to the screen. Used in: Jan 2026 Q17(a), first order 0.78 m from the centre on a screen 4 m away; Jan 2026 (A) Q19(a), maximum 0.500 m from the centre on a screen 1.690 m away; Oct 2022 Q18(c), maximum 0.397 m from the centre.

$$\tan\theta = \frac{x}{D}$$

LEARN IT

Photons and electrons

Photon energy

Combine it with v = f λ to get E = hc/λ. Used in: Jan 2026 Q21(a)(i), photon energy at 380 nm; Oct 2025 Q15(b)(i), energy of an ultraviolet photon; Jun 2024 Q17(a)(i), frequency of a 3.44 × 10^{-19} J photon.

$$E = hf$$

GIVEN

Einstein's photoelectric equation

Change the work function from eV to J first. A graph of maximum kinetic energy against f has gradient h and intercept -φ. Used in: Oct 2025 Q15(b)(ii), maximum kinetic energy in eV; Jun 2024 Q17(b)(i), maximum speed of photoelectrons; Jun 2022 Q17(c), checking a graph for zinc.

$$hf = \phi + \frac{1}{2}mv_{\max}^2$$

GIVEN

Work function and threshold frequency

At the threshold frequency f_0 the photon energy equals the work function, so a photoelectron has no kinetic energy. Used in: Oct 2024 Q19(c), whether a photocathode detects 380 nm to 700 nm; Jan 2024 Q19(a), minimum frequency for a semiconductor layer; Jun 2022 Q17(c), threshold frequency from a graph.

$$\phi = hf_0$$

LEARN IT

Photon energy from energy levels

E_1 and E_2 are the upper and lower levels. A photon is absorbed only if its energy matches the gap exactly, and the smallest gap gives the lowest frequency. Used in: Jan 2026 Q3, which energy a ground-state electron cannot absorb; Oct 2025 Q9, which photon the atom cannot emit; Jan 2022 Q18(a), colour for a transition.

$$hf = E_1 - E_2$$

LEARN IT

Photons per second

Power divided by the energy of one photon; if you are given the intensity find P = IA first. Used in: Jan 2026 Q21(a)(ii), photons reaching a pixel; Oct 2025 Q15(b)(iii), photons on a detector; Oct 2022 Q17(a)(ii), photons from an LED in one minute.

$$\frac{N}{t} = \frac{P}{E_{\text{photon}}} = \frac{P\lambda}{hc}$$

LEARN IT

de Broglie wavelength

p is the momentum of the particle, so a faster or heavier particle has a shorter wavelength. Used in: Jan 2026 Q14(b), electron accelerated through 4.8 kV; Jun 2024 Q17(b)(ii), electrons at 5.3 × 10^5 m s^{-1}.

$$\lambda = \frac{h}{p}$$

GIVEN

Momentum

Use p = mv to turn a speed into a momentum before using λ = h/p. It sits under Unit 1 on the list. Used in: Jan 2026 (A) Q4, speed of an electron from its wavelength; Jun 2024 Q17(b)(ii), wavelength of photoelectrons; Jan 2026 Q14(b), wavelength after acceleration.

$$p = mv$$

GIVEN

Kinetic energy

It gives the speed of an accelerated electron or of a photoelectron; the list also prints E_k = p^2/2m under Unit 4, which one scheme accepted. Used in: Jan 2026 Q14(b), speed of an electron accelerated through 4.8 kV; Oct 2024 Q19(d), kinetic energy of an electron at 1.35 × 10^6 m s^{-1}; Jun 2023 Q17(c)(i), maximum speed of photoelectrons.

$$E_{\text{k}} = \frac{1}{2}mv^2$$

GIVEN

Charge, current, potential difference and energy

Current

Change minutes to seconds first. Used in: Jan 2026 Q2, charge from 5 mA in 8 minutes; Jan 2026 Q16(c), charge through a motor in 1.5 minutes; Jun 2022 Q6, charge in 2 minutes.

$$I = \frac{\Delta Q}{\Delta t}$$

GIVEN

Charge and number of electrons

e is 1.60 × 10^{-19} C, so the electrons passing each second are I/e. Used in: Jun 2023 Q11(a), current from 4.80 × 10^{20} electrons in 60 s; Oct 2022 Q7, electrons passing in 45 s; Jan 2022 Q17(a), electrons passing a point each second.

$$Q = Ne$$

LEARN IT

Potential difference

W = QV gives the energy gained by a charge through a pd; an electron through V gains eV of kinetic energy. Used in: Jan 2026 Q14(a), energy of an electron through 4.8 kV; Oct 2023 Q15(b)(i), work done on an electron through 2400 V.

$$V = \frac{W}{Q}$$

GIVEN

Resistance

Use it for any component or for a whole circuit, and read V and I from a graph if given one. Used in: Jan 2026 (A) Q14(b)(ii), resistance of a headlight from a graph; Jun 2024 Q16(b), resistance in a light-sensing circuit; Oct 2025 Q17(b), current in a thermistor circuit.

$$R = \frac{V}{I}$$

GIVEN

Electrical power (current and pd) Used in: Jan 2026 (A) Q14(a), pd at which a headlight reaches 35 W; Oct 2024 Q14(b), power of an LED from a graph; Jun 2023 Q16(a), pd for a headlight to emit light.	$P = VI$	GIVEN
Electrical power (current and resistance) Use it when you know the current, and it shows why the power in an internal resistance falls when the current falls. Used in: Oct 2025 (A) Q18(a), power in four 2.0 ohm resistors; Oct 2025 (A) Q16(c), power in an internal resistance; Jan 2023 Q17(c), power in an internal resistance as R increases.	$P = I^2R$	GIVEN
Electrical power (pd and resistance) Use it when you know the pd across a resistor. Used in: Jan 2026 Q16(b), power in a potential divider circuit; Oct 2025 Q12(a), energy from a coffee machine heater; Jun 2024 Q14(d), power of a heating system.	$P = \frac{V^2}{R}$	GIVEN
Electrical energy Used in: Oct 2025 Q12(a), energy from a heating element in 38 s; Jan 2024 Q16(b), work done by a lightning strike; Jun 2023 Q11(b), pd across a resistor from the energy it transferred.	$W = VIt$	GIVEN
Power from energy transferred It sits under Unit 1 on the list. Used in: Oct 2023 Q16(c), output of a solar array in 1 hour; Jan 2021 Q20(c), energy used by a kettle in 125 s.	$P = \frac{E}{t}$	GIVEN
Power from work done It sits under Unit 1 on the list. Used in: Oct 2025 Q12(a), energy from a heating element in 38 s; Jun 2023 Q11(b), power of a resistor that transfers 24 J in 60 s; Jun 2020 Q14(c)(i), time for an atom to absorb enough energy.	$P = \frac{W}{t}$	GIVEN
Efficiency from power It sits under Unit 1 on the list. Used in: Oct 2025 (A) Q5, efficiency of a solar panel; Jan 2023 Q16(a)(i), efficiency of solar cells; Jun 2021 Q3, a light bulb of efficiency 12%.	$\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$	GIVEN

Resistivity and charge carriers

Resistivity A is the cross-section, so find it first; a graph of R against l has gradient ρ/A. Used in: Jan 2026 Q15(a)(i), resistance of a heater strip; Jan 2026 (A) Q12(a), area of a pencil lead; Oct 2025 Q13, which metal a wire is made from.	$R = \frac{\rho l}{A}$	GIVEN

Cross-sectional area

Halve a diameter to get r, and write widths in metres. The circle formula also gives the area of a pixel for intensity. Used in: Jan 2026 Q21(a)(ii), area of a pixel; Jan 2026 Q15(a)(i), strip of width 1.64 mm and height 0.20 mm; Oct 2025 Q13, wire of diameter 0.24 mm.

$$A = \pi r^2 = \frac{\pi d^2}{4} \text{ (wire)}, \quad A = \text{width} \times \text{thickness (strip)}$$

LEARN IT

Current and charge carriers

q is the charge of each carrier, and the drift velocity is very small. Used in: Jan 2026 (A) Q12(b), drift velocity in a pencil lead; Jan 2026 Q11, drift velocity of conduction electrons; Oct 2025 Q11, drift velocity in a wire.

$$I = nqvA$$

GIVEN

Resistors and potential dividers

Resistors in series

Use it for any resistors in a single path. Used in: Oct 2025 Q17(b), thermistor and fixed resistor; Jun 2022 Q15(b)(i), parallel pair in series with a resistor; Jan 2022 Q17(a), resistor in series with a parallel pair.

$$R = R_1 + R_2 + R_3$$

GIVEN

Resistors in parallel

The total is always less than the smallest resistance, and N identical resistors in parallel give R/N. Used in: Jan 2026 Q15(a)(ii), 11 identical strips in parallel; Jun 2024 Q7, total resistance of a network; Jun 2022 Q12(a), thermistor in parallel with a resistor.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

GIVEN

Potential divider

R_2 is the resistor across which V_out is taken. Some schemes also accepted finding the current with R = V/I. Used in: Jan 2026 Q16(a), voltmeter reading across 6.8 kohm; Oct 2025 Q17(b), pd across a thermistor; Oct 2023 Q14(a), pd across a thermistor at 10 °C.

$$V_{\text{out}} = \frac{R_2}{R_1 + R_2} V_{\text{in}}$$

LEARN IT

Potential along a uniform wire

The pd across a length x of a uniform wire is proportional to x. Used in: Jan 2026 Q8, pd across length x of a wire; Jan 2026 (A) Q9, output pd across XZ; Jun 2022 Q8, reading on a voltmeter between two wires.

$$V_x = \frac{x}{l} V$$

LEARN IT

E.m.f. and internal resistance

E.m.f. and internal resistance

R is the external resistance, V the terminal pd and Ir the lost volts. On a graph of V against I the intercept is epsilon and the gradient is -r. Two questions asked you to show R = epsilon/I - r from it. Used in: Jan 2026 Q13, e.m.f. and r from a graph; Jun 2023 Q12(a), e.m.f. and r from a graph.

$$\varepsilon = V + Ir = I(R + r)$$

LEARN IT

Identical cells

For n identical cells the e.m.f. adds in series and the internal resistance adds too; in parallel the e.m.f. is unchanged and the internal resistance is r/n. Used in: Oct 2025 Q8, five cells in parallel; Oct 2025 (A) Q16(d), a second cell in series; Jun 2023 Q12(b), new graph for two cells.

$$\text{series: } n\varepsilon,\ nr; \quad \text{parallel: } \varepsilon,\ \frac{r}{n}$$

LEARN IT

Practical graphs

Straight-line graph

Rearrange the formula into this form and read the gradient and intercept: R against l has gradient ρ/A, wavelength against 1/f has gradient v. Used in: Oct 2025 Q13, resistivity from a graph; Jun 2024 Q15(c), speed of sound from a graph; Oct 2025 (A) Q16(b), e.m.f. and r from a graph of R against 1/I.

$$y = mx + c$$

LEARN IT

Also learn these

Longitudinal and transverse waves

A transverse wave has oscillations at right angles to the direction of energy transfer. In a longitudinal wave the pressure is a maximum or minimum where the displacement is zero. Used in: Jan 2026 Q10, Jan 2026 (A) Q15(a), Oct 2025 Q2.

Coherence

Coherent waves have the same frequency and a constant phase difference, and only coherent waves give a stable interference pattern. Used in: Oct 2025 Q16(a)(i), Jun 2022 Q14(b)(i), Jan 2024 Q11(a).

Stationary waves

A wave and its reflection superpose, with zero amplitude at nodes and maximum amplitude at antinodes; points in one loop are in phase and points in neighbouring loops are in antiphase. Used in: Jan 2026 Q18(a), Jun 2022 Q16(c), Oct 2024 Q18(a).

Pulse-echo technique

Pulses are used so each echo returns before the next pulse is sent, and a higher frequency means a shorter wavelength and so more detail and less diffraction. Used in: Jan 2026 (A) Q13(c), Jun 2024 Q13(b), Jan 2026 Q19.

Polarisation

Plane polarised light has oscillations in one plane, only transverse waves can be polarised, and rotating a single filter does not change the transmitted intensity of unpolarised light. Used in: Oct 2025 Q18, Jun 2024 Q11, Jan 2026 Q18(c).

Diffraction grating pattern

Bright dots form where the path difference between adjacent slits is a whole number of wavelengths; white light gives a white central maximum with spectra on each side, violet nearest the centre. Used in: Jan 2026 (A) Q19(b), Oct 2025 Q16(c), Jun 2024 Q12(a).

Refraction and total internal reflection

Light refracts because its speed changes. Total internal reflection needs light going towards a lower refractive index at an angle of incidence above the critical angle. Used in: Jun 2022 Q1, Jan 2026 Q20(b), Jun 2024 Q18(a).

Wave and particle behaviour

Electron diffraction shows the wave nature of electrons, and the photoelectric effect shows the particle nature of light. Used in: Jun 2024 Q4, Jun 2022 Q10, Oct 2024 Q11.

The photoelectric effect

One photon releases one electron, there is no emission below the threshold frequency, emission is immediate, and more intensity releases more electrons per second without raising their kinetic energy. Used in: Jan 2026 (A) Q17, Oct 2025 Q15(a), Jun 2020 Q14(c)(ii).

Work function and threshold frequency

The work function is the minimum energy needed to release an electron from the surface, and the threshold frequency is the lowest frequency that can release one. Used in: Jun 2024 Q6, Jun 2022 Q17(a), Jan 2020 Q14(a).

Line spectra

Electrons in atoms have discrete energy levels, so only certain photon frequencies are absorbed or emitted. A colliding electron can excite an atom with any energy above the gap, but a photon must match the gap exactly. Used in: Jun 2024 Q17(a)(ii), Jan 2021 Q14, Jun 2022 Q7.

Current-potential difference graphs

An ohmic conductor gives a straight line through the origin, a filament lamp flattens as it heats, a diode conducts in one direction only and a negative temperature coefficient thermistor gives a curve that steepens. Used in: Jan 2026 Q1, Oct 2025 Q1, Jan 2026 (A) Q3.

Resistance and temperature

In a metal more lattice vibrations mean more collisions, so resistance rises. In a thermistor or an LDR more conduction electrons are released, so resistance falls. Used in: Jan 2026 Q12, Oct 2025 Q12(b), Jan 2026 (A) Q5.

Charge and energy in circuits

Current is the same at every point in series and splits at a junction, and the pd is shared in series and equal across parallel branches. Used in: Jun 2022 Q15(a), Jan 2026 Q15(b), Jan 2026 (A) Q14(b)(i).

E.m.f. and terminal pd

An e.m.f. of 6 V means 6 J is transferred to each coulomb of charge, and the terminal pd is smaller than the e.m.f. when there is a current because of the internal resistance. Used in: Jan 2025 Q16(a), Jun 2021 Q12(a), Oct 2021 Q17(b) (our bank files this paper under two dates).

Resistivity and drift velocity

Resistivity is the resistance of a sample of unit length and unit cross-section. For the same current, a metal with more conduction electrons per unit volume has a smaller drift velocity, as does a wire with a larger cross-section. Used in: Jun 2024 Q14(a)(i), Oct 2024 Q12, Jan 2025 Q10.

Core practical: speed of sound

Move a microphone along a metre rule between successive positions where the two traces on a 2-beam oscilloscope are in antiphase; the distance moved is one wavelength, and $v = f\lambda$ uses the signal generator's frequency. Used in: Jun 2021 Q17, Oct 2019 Q19(b).

Core practical: internal resistance and resistivity

Vary a variable resistor and plot V against I, whose intercept is the e.m.f. and whose gradient is -r. For resistivity measure the diameter with a micrometer and the length with a metre rule, then use the gradient of a graph against length. Used in: Oct 2022 Q12, Jan 2021 Q19, Oct 2019 Q15.

Units

The volt is a joule per coulomb, and 1 eV is the energy gained by an electron through 1 V. Used in: Jan 2026 (A) Q1, Jan 2024 Q4.

Using the booklet in the exam

- The list of data, formulae and relationships is printed in every Unit 2 paper, but several rows you need sit under other units: T = 1/f and I = L/4 pi d^2 under Unit 5, p = mv, E_k = 1/2 mv^2, W = mg and efficiency under Unit 1, and E_k = p^2/2m under Unit 4.
- Phase difference, the wavelength of a stationary wave, d = 1/N, tan(θ) = x/D, the potential divider and epsilon = I(R + r) are not on the list. Learn them, because the papers use them without printing them.
- Photoelectric questions mix eV and joules. Convert with 1 eV = 1.60 × 10^{-19} J before using E = hf or hf = φ + 1/2 mv^2, as in Oct 2025 Q15(b)(ii) and Jun 2024 Q17(b)(i).
- In a pulse-echo question the pulse goes there and back, so halve the time or the distance: Jan 2026 (A) Q13(b) and Jun 2024 Q13(a).
- For a grating, write d in metres from the lines per metre, find θ with tan(θ) = x/D, and use sin(θ) = 1 for the highest order you can see: Oct 2025 Q16(b)(ii) and Oct 2024 Q16(c)(ii).
- In I = nqvA use q = 1.60 × 10^{-19} C and expect a tiny drift velocity (about 10^{-4} m s^{-1} in Jan 2026 Q11), and halve a diameter before using pi r^2.

Built by CuratedPrep from the Edexcel International A Level Physics Unit 2 (WPH12) papers June 2019 to January 2026 in our question bank (21 question papers). Given rows are copied from our checked copy of the Edexcel IAL Physics list of data, formulae and relationships. Updated 17 November 2026. Always practise with the version of the official booklet your exam uses. More free sheets and topic worksheets at curatedprep.com.