



QUESTION WORKBOOK

SI units and prefixes

Measurements · Year 12

AQA 3.1.1 · CIE 1.1.1, 1.2.1, 1.2.2, 1.2.3, 1.2.4, 15.1.1

OCR A 2.1.1(a), 2.1.2(a), 2.1.2(b), 2.1.2(c), 2.1.2(d), 2.1.2(e), 2.1.2(f), 3.2.1(b), 4.2.5(c)

19 questions · 53 marks

PRINT EDITION

SECTION A · Warm-up

A1 Name the six SI base quantities used at A-level and the SI base unit of each.

[3]

A2 Convert (a) 5.0 km into metres and (b) 2.5 GHz into hertz.

[2]

A3 Express the newton (N) in terms of SI base units.

[2]

A4 A capacitor is labelled 85 pF and a nuclear radius is quoted as 2.4 fm. Write (a) 85 pF in farads and (b) 2.4 fm in metres, each in standard form.

[2]

A5 A photon of red light has an energy of 3.2×10^{-19} J. $1 \text{ eV} = 1.60 \times 10^{-19}$ J. Calculate the photon energy in electronvolts.

[2]

SECTION B · Standard

B1 Express (a) the joule and (b) the watt in SI base units. [3]

B2 Convert (a) 3.0 mA into amperes, (b) 450 nm into metres and (c) 12 M Ω into ohms. [3]

B3 Use base units to check whether the equation $v^2 = 2as$ is homogeneous (dimensionally consistent). [3]

B4 Express the pascal (Pa) in SI base units. [2]

- B5** A domestic oven transfers energy at a rate of 2.4 kW. It runs for 90 minutes. Calculate the energy transferred (a) in kilowatt hours and (b) in joules. (1 kW h = 3.6×10^6 J.) [3]

- B6** The cross-sectional area of a copper track on a circuit board is 0.020 mm^2 . Express this area in m^2 , in standard form. [2]

- B7** Four lasers emit light of wavelength 580 nm, $0.65 \mu\text{m}$, $6.2 \times 10^{-7} \text{ m}$ and 0.00071 mm . By converting each wavelength to metres in standard form, place the four in order of increasing wavelength. [3]

- B8** The period of a simple pendulum is given by $T = 2\pi\sqrt{l/g}$, where l is a length and g is the gravitational field strength in m s^{-2} . Show that the unit of $\sqrt{l/g}$ is the second. [3]

SECTION C · Stretch

- C1** The gravitational constant G appears in $F = GMm/r^2$. Determine the SI base units of G . [3]

- C2** Convert (a) a density of 2.7 g cm^{-3} into kg m^{-3} and (b) a speed of 90 km h^{-1} into m s^{-1} . [4]

- C3** Explain why checking that an equation is homogeneous (has matching units on both sides) is a useful way to spot mistakes. [3]

- C4** A pulsed laser delivers pulses of energy 2.5 mJ, each lasting 6.0 ns. Calculate the average power of one pulse in watts, and express your answer using an appropriate SI prefix. [3]

- C5** A student cannot remember whether the speed of a wave on a stretched string is $v = \sqrt{T/\mu}$ or $v = \sqrt{\mu/T}$, where T is the tension in newtons and μ is the mass per unit length in kg m^{-1} . Deduce, using base units, which of the two equations could be correct. [3]

- C6** An electricity supplier charges 28p per kilowatt hour. A 3.0 kW immersion heater runs for 2.0 hours each day. Determine the cost of running the heater for a 30-day month. [4]