InkPhysics

ANSWER BOOK

SI units and prefixes

Measurements · Year 12

AQA 3.1.1 · CIE 1.1, 1.2 · OCR A 2.1.1, 2.1.2

10 questions · 29 marks

NAVY EDITION

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SECTION A · Warm-up

A1 Mass (kilogram, kg), length (metre, m), time (second, s), electric current (ampere, A), temperature (kelvin, K) and amount of substance (mole, mol). [2]

A2 (a) 5.0 km = 5000 m (5.0×10^3 m). (b) 2.5 GHz = 2.5×10^9 Hz. [2]

A3 From $F = ma$, 1 N = 1 kg m s^{-2}. [2]

SECTION B · Standard

B1 (a) J = N m = kg m^2 s^{-2}. (b) W = J s^{-1} = kg m^2 s^{-3}. [3]

B2 (a) 3.0 mA = 3.0×10^{-3} A. (b) 450 nm = 4.5×10^{-7} m. (c) 12 MΩ = 1.2×10^7 Ω. [3]

B3 LHS: $(\text{m s}^{-1})^2 = \text{m}^2\,\text{s}^{-2}$. RHS: $a \times s = (\text{m s}^{-2})(\text{m}) = \text{m}^2\,\text{s}^{-2}$. Both sides have the same units, so the equation is homogeneous. [3]

B4 Pa = N m^{-2} = kg m s^{-2} / m^2 = kg m^{-1} s^{-2}. [3]

SECTION C · Stretch

C1 Rearranging, $G = Fr^2/(Mm)$, so units = $(\text{kg m s}^{-2} \times \text{m}^2)/(\text{kg} \times \text{kg}) = \text{m}^3\,\text{kg}^{-1}\,\text{s}^{-2}$. [4]

C2 (a) 2.7 g cm^{-3} × 1000 = 2700 kg m^{-3}. (b) 90 km h^{-1} = (90 × 1000)/3600 = 25 m s^{-1}. [4]

C3 A correct physical equation must have the same units on both sides. If the units do not match, the equation must be wrong, so a units check quickly catches errors such as a missing factor or a wrongly placed quantity, before any numbers are used. [3]