

**SMART EXAM RESOURCES**  
**9702 PHYSICS TOPIC QUESTIONS**  
**TOPIC: PHYSICAL QUANTITIES AND UNITS**  
**SUB-TOPIC: SI UNITS**  
**SUB-SUB-TOPIC: CONVERT BETWEEN UNITS**  
**SET-2-QP-MS**

- 1** (i) A wire of cross-sectional area  $1.5 \text{ mm}^2$  and length  $2.5 \text{ m}$  has a resistance of  $0.030 \Omega$ .  
Calculate the resistivity of the material of the wire in  $\text{n}\Omega\text{m}$ .

resistivity = ..... $\text{n}\Omega\text{m}$  [3]

## Mark Scheme:

$\rho = (RA/l)$	C1
$= (0.03 \times 1.5 \times 10^{-6}) / 2.5 \quad (= 1.8 \times 10^{-8})$	C1
$= 18 \text{ n}\Omega \text{ m}$	A1

- 2 A beam PQ is clamped so that the beam is horizontal. A mass  $M$  of 500 g is hung from end Q and the beam bends slightly, as illustrated in Fig. 1.1.

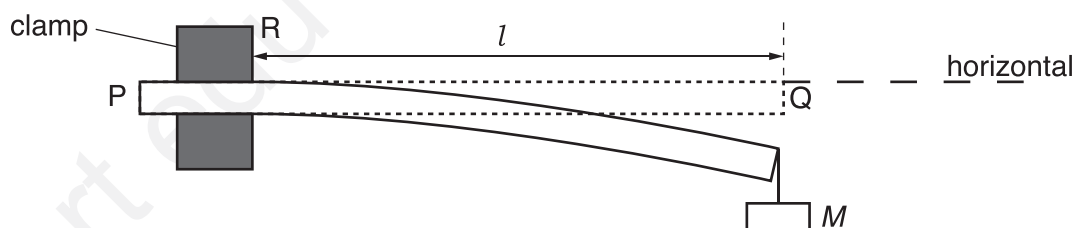


Fig. 1.1

The length  $l$  of the beam from the edge of the clamp R to end Q is 60.0 cm. The width  $b$  of the beam is 30.0 mm and the thickness  $d$  of the beam is 5.00 mm. The material of the beam has Young modulus  $E$ .

The mass  $M$  is made to oscillate vertically. The time period  $T$  of the oscillations is 0.58 s.

The period  $T$  is given by the expression

$$T = 2\pi \sqrt{\frac{4Ml^3}{Ebd^3}}.$$

- (i) Determine  $E$  in GPa.

$E = \dots\dots\dots$  GPa [3]

## Mark Scheme:

$0.58 = 2\pi \times [(4 \times 0.500 \times 0.600^3) / (E \times 0.0300 \times 0.00500^3)]^{0.5}$	<b>C1</b>
$E = [4\pi^2 \times 4 \times 0.500 \times (0.600)^3] / [(0.58)^2 \times 0.0300 \times (0.00500)^3]$ $= 1.35 \times 10^{10} \text{ (Pa)}$	<b>C1</b>
$= 14 \text{ (13.5) GPa}$	<b>A1</b>

- 3 The distance from Earth to a star is  $8.5 \times 10^{16}$  m. Calculate the time for light to travel from the star to Earth in Gs.

time = ..... Gs [2]

**Mark Scheme:**

$$t = (8.5 \times 10^{16}) / (3.0 \times 10^8)$$

C1

$$(\text{= } 2.83 \times 10^8 \text{ =}) 0.28(3) \text{ Gs}$$

A1 [2]

4

- (a) The spacing between two atoms in a crystal is  $3.8 \times 10^{-10} \text{ m}$ . State this distance in pm.

spacing = ..... pm [1]

- (b) Calculate the time of one day in Ms.

time = ..... Ms [1]

- (c) The distance from the Earth to the Sun is 0.15 Tm. Calculate the time in minutes for light to travel from the Sun to the Earth.

time = ..... min [2]

**MARKING SCHEME:**

(a) spacing = 380 or  $3.8 \times 10^2$  pm

B1 [1]

(b) time =  $24 \times 3600$

time = 0.086 (0.0864) Ms

B1 [1]

(c) time = distance / speed =  $\frac{1.5 \times 10^{11}}{3 \times 10^8}$

C1

= 500 (s) = 8.3 min

A1 [2]



5 The frequency of an X-ray wave is  $4.6 \times 10^{20}$  Hz.

Calculate the wavelength in pm.

wavelength = ..... pm [3]

**MARKING SCHEME:**

$$v = f\lambda$$

C1

$$\lambda = (3.0 \times 10^8) / (4.6 \times 10^{20})$$

C1

$$(\text{= } 6.52 \times 10^{-13} \text{ =}) 0.65(2) \text{ pm}$$

A1 [3]