

Answer **all** the questions in the spaces provided.

- 1 (a) State two SI base quantities other than mass, length and time.

1.

2.

[2]

- (b) A beam is clamped at one end and an object X is attached to the other end of the beam, as shown in Fig. 1.1.

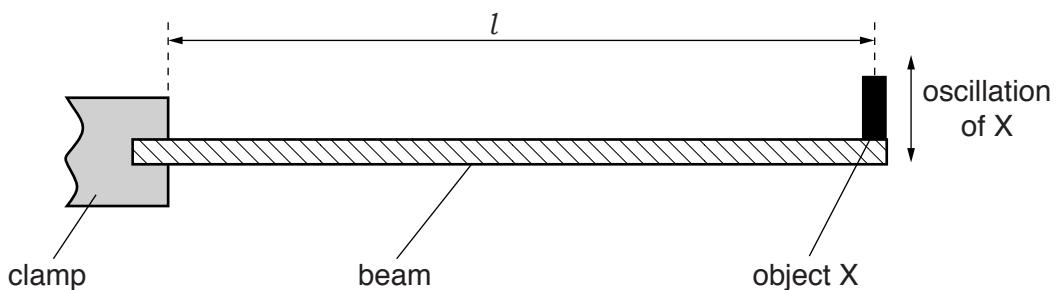


Fig. 1.1

The object X is made to oscillate vertically.

The time period T of the oscillations is given by

$$T = K \sqrt{\frac{Ml^3}{E}}$$

where M is the mass of X,

l is the length between the clamp and X,

E is the Young modulus of the material of the beam

and K is a constant.

- (i) 1. Show that the SI base units of the Young modulus are $\text{kg m}^{-1} \text{s}^{-2}$.

[1]

2. Determine the SI base units of K .

SI base units of K [2]

(ii) Data in SI units for the oscillations of X are shown in Fig. 1.2.

quantity	value	uncertainty
T	0.45	$\pm 2.0\%$
l	0.892	$\pm 0.2\%$
M	0.2068	$\pm 0.1\%$
K	1.48×10^5	$\pm 1.5\%$

Fig. 1.2

Calculate E and its actual uncertainty.

$E = \dots \pm \dots$ $\text{kg m}^{-1} \text{s}^{-2}$ [4]

