$= \pm \omega \sqrt{(x_0^2 - x^2)}$

electric current	$I = Anvq$
resistors in series	$R = R_1 + R_2 + \ldots$
resistors in parallel	$1/R = 1/R_1 + 1/R_2 + \ldots$
electric potential	$V = \dfrac{Q}{4\pi\varepsilon_0 r}$
alternating current / voltage	$x = x_0 \sin \omega t$
magnetic flux density due to a long straight wire	$B = \dfrac{\mu_0 I}{2\pi d}$
magnetic flux density due to a flat circular coil	$B = \dfrac{\mu_0 N I}{2r}$
magnetic flux density due to a long solenoid	$B = \mu_0 n I$
radioactive decay	$x = x_0 \exp(-\lambda t)$
decay constant	$\lambda = \dfrac{\ln 2}{t_{\frac{1}{2}}}$

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[redacted]

Section A

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

1 A light wooden metre rule of thickness t and width w is placed horizontally on two supports a distance L apart.

An object of mass M is suspended from the midpoint of the rule and the rule bends by a distance x, as shown in Fig. 1.1.

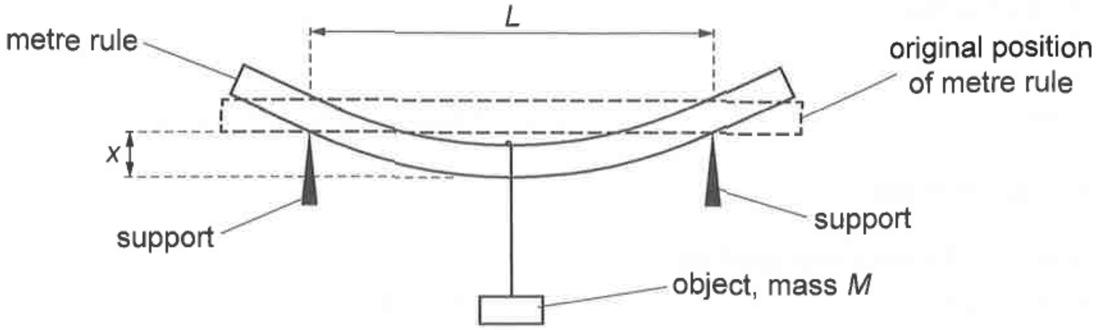

Fig. 1.1

The amount of bending x of the metre rule is related to the mass M of the object by the equation:

$$x = \frac{L^3 gM}{4wt^3 E}$$

where E is a constant measured in Pa and g is the gravitational field strength.

(a) Use SI base units to show that this equation is homogenous.

[3]

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(b) Data for Fig. 1.1 is given in Table 1.1.

Table 1.1

w / cm	2.10 ± 0.02
t / mm	4.56 ± 0.01
L / m	0.800 ± 0.005
M / g	300 ± 2
x / cm	1.00 ± 0.01

Use this data to calculate E and the percentage uncertainty in its value.

E = ... Pa ± .... % [4]

[Total: 7]

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