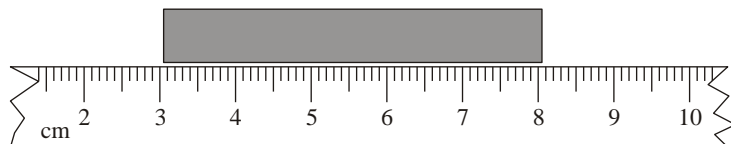


Sample Uncertainties and Graphs questions

14. The length of a rod is measured using part of a metre rule that is graduated in millimetres, as shown below.



- Which **one** of the following is the measurement, with its uncertainty, of the length of the rod?
- A. 5 ± 0.1 cm
B. 5 ± 0.2 cm
C. 5.0 ± 0.1 cm
D. 5.0 ± 0.2 cm
20. The electrical resistance R of a component varies with temperature T according to the expression

$$R = R_0 e^{k/T}$$

where R_0 and k are constants.

A graph of the variation with $\frac{1}{T}$ of $\ln R$ is drawn and a straight line is obtained. The intercept on the $\frac{1}{T}$ axis is equal to

- A. $-\ln R_0$
B. $-\frac{\ln R_0}{k}$
C. $\ln R_0$
D. $\frac{\ln R_0}{k}$
- (1)
21. The speed of sound v in a gas is related to the pressure P of the gas by the expression

$$v = \sqrt{kP}$$

where k is a constant.

Which variables should be plotted in order to produce a straight-line graph with the slope equal to k ?

- A. v^2 against P^2
- B. v^2 against P
- C. v against P
- D. v against \sqrt{P}

(1)

22. The frequency f of waves of wavelength λ travelling on the surface of deep water is given by

$$f = \sqrt{\frac{g}{2\pi\lambda}}$$

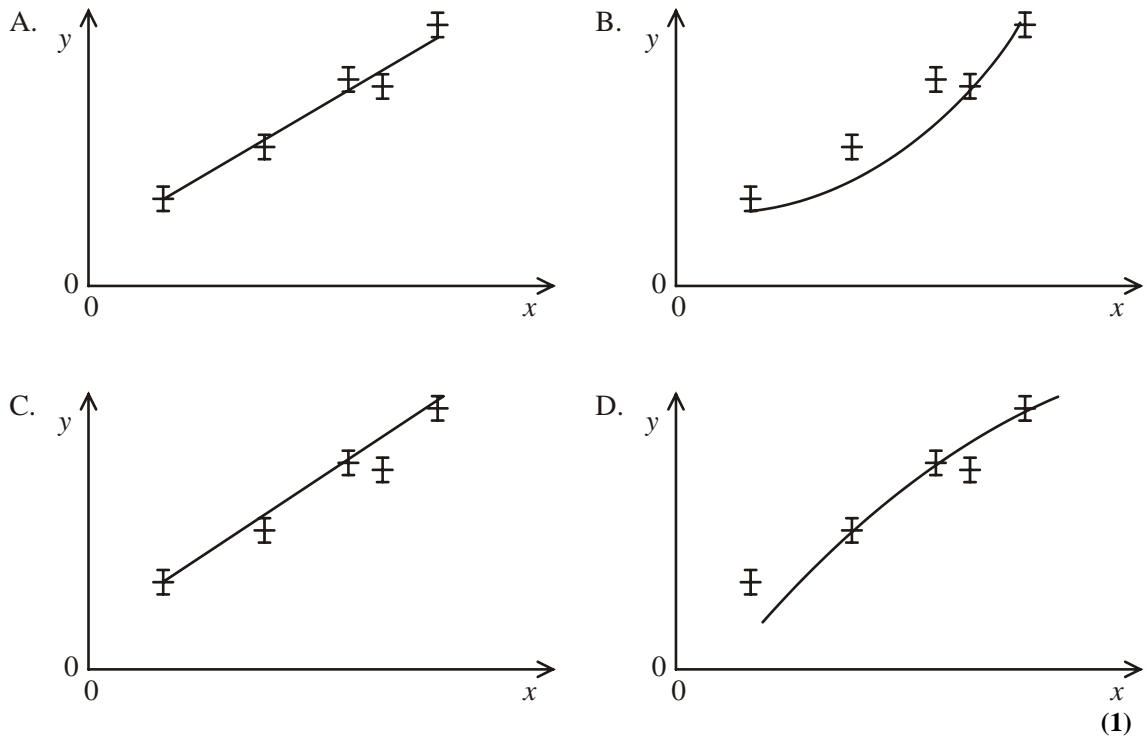
where g is the acceleration of free fall.

Which of the following will yield a straight-line graph?

	y-axis	x-axis
A.	f^2	$\frac{1}{\lambda}$
B.	f^2	λ
C.	f	λ
D.	f	$\frac{1}{\lambda}$

(1)

23. Which of the following graphs shows the best-fit line for the plotted points?



24. The volume V of a cylinder of height h and radius r is given by the expression

$$V = \pi r^2 h.$$

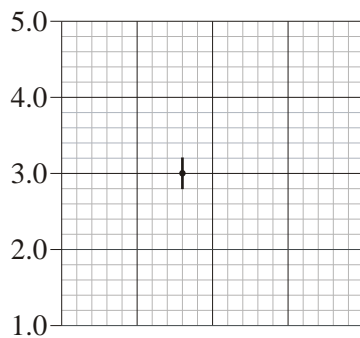
In a particular experiment, r is to be determined from measurements of V and h . The uncertainties in V and in h are as shown below.

V	$\pm 7\%$
h	$\pm 3\%$

The approximate uncertainty in r is

- A. 10%.
 B. 5%.
 C. 4%.
 D. 2%.
- (1)
25. The grid below shows one data point and its associated error bar on a graph. The x -axis is

not shown.



Which of the following is the correct statement of the y-value of the data point, with its uncertainty?

- A. 3 ± 0.2
- B. 3.0 ± 0.2
- C. 3.0 ± 0.20
- D. 3.00 ± 0.20

(1)

26. The period T of oscillation of a mass m attached to the end of a spring is given by $T = 2\pi\sqrt{\frac{m}{k}}$, where k is an accurately known constant. The mass is measured as 0.500 ± 0.045 kg.

What is the percentage uncertainty in the calculated value of the period?

- A. 3.0%
- B. 4.5%
- C. 9.0%
- D. 18%

(1)

27. The mass of a body is measured with an uncertainty of 2.0% and its volume with an uncertainty of 10%. What is the uncertainty in the density of the body?

- A. 0.2%
- B. 5.0%
- C. 12%
- D. 20%

(1)

28. The density of a metal cube is given by the expression $\rho = \frac{M}{V}$ where M is the mass and V is the volume of the cube. The percentage uncertainties in M and V are as shown below.

M	12%
V	4.0%

The percentage uncertainty in the calculated value of the density is

- A. 3.0%.
B. 8.0%.
C. 16%.
D. 48%. (1)
29. The radius of a loop is measured to be (10.0 ± 0.5) cm. Which of the following is the best estimate of the uncertainty in the calculated area of the loop?
A. 0.25%
B. 5%
C. 10%
D. 25% (1)
30. The period T of oscillation of a mass m on a spring, having spring constant k is $T = 2\pi\sqrt{\frac{m}{k}}$.
The uncertainty in k is 11% and the uncertainty in m is 5%. The approximate uncertainty in T is
A. 4%.
B. 6%.
C. 8%.
D. 16%. (1)

- 14. C
- 20. B
- 21. B
- 22. A
- 23. A
- 24. B
- 25. B
- 26. B
- 27. C
- 28. C
- 29. C
- 30. C