

1 What is equal to 0.000005 J?

- A 5 mJ                      B 5 MJ                      C 5  $\mu$ J                      D 5 nJ

2 The measurement of a physical quantity may be subject to random errors and to systematic errors.

Which statement is correct?

- A A systematic error **cannot** be reduced by adjusting the apparatus.  
B A systematic error results in a different reading each time the measurement is taken.  
C Random errors are always caused by the person taking the measurement.  
D Random errors can be reduced by taking the average of several measurements.

3 The Young modulus of the material of a wire is to be found. The Young modulus  $E$  is given by the equation shown.

$$E = \frac{4FL}{\pi d^2 x}$$

The wire is extended by a known force and the following measurements are made.

Which measurement has the largest effect on the uncertainty in the value of the calculated Young modulus?

	measurement	symbol	value
A	length of wire before force applied	$L$	$2.043 \pm 0.002$ m
B	diameter of wire	$d$	$0.54 \pm 0.02$ mm
C	force applied	$F$	$19.62 \pm 0.01$ N
D	extension of wire with force applied	$x$	$5.2 \pm 0.2$ mm

4 Two physical quantities combined together as a product can produce a scalar quantity or a vector quantity.

Which product of two quantities produces a scalar quantity?

- A (force)  $\times$  (displacement of an object in the direction of the force)  
B (mass)  $\times$  (acceleration of the mass)  
C (pressure)  $\times$  (area on which the pressure acts)  
D (velocity)  $\times$  (time for which an object has that velocity)