- **1** What is equal to 0.000005 J?
  - **A** 5 mJ
- **B** 5 MJ
- **C** 5 μJ
- **D** 5nJ
- 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
Α	length of wire before force applied	L	$2.043 \pm 0.002\text{m}$
В	diameter of wire	d	$0.54\pm0.02\text{mm}$
С	force applied	F	$19.62 \pm 0.01\text{N}$
D	extension of wire with force applied	X	5.2 ± 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**  $(mass) \times (acceleration of the mass)$
- $\mathbf{C}$  (pressure)  $\times$  (area on which the pressure acts)
- **D** (velocity)  $\times$  (time for which an object has that velocity)