

Extension Worksheet – Topic 1, Worksheet 1

- 1** Assume that after getting out of a swimming pool a layer of water of depth 1 mm covers the skin of the body. The surface area of an average adult person is about 1.5 m^2 . The density of water is 10^3 kg m^{-3} . The fraction $\frac{\text{mass of water}}{\text{mass of person}}$ is of order
- A** 10^{-1}
B 10^{-2}
C 10^{-3}
D 10^{-4} [1]
- 2** The volume of a cylinder of radius R and height h is given by $V = \pi R^2 h$. The percentage uncertainty in the measured value of the radius is 3% and that in the height is 2%. What is the percentage uncertainty in the value of the volume?
- A** 5
B 8
C 11
D 18 [1]
- 3** The side of a square is measured as $12.5 \pm 0.1 \text{ mm}$. The best estimate of the perimeter of the square is
- A** $50 \pm 0.4 \text{ mm}$
B $50.0 \pm 0.4 \text{ mm}$
C $50 \pm 0.1 \text{ mm}$
D $50.0 \pm 0.1 \text{ mm}$ [1]
- 4** The period of oscillations T of a loaded cantilever is given by $T = cL^{3/2}$ where c is a constant and L is the length of the cantilever. Which sets of variables must be plotted in order to give a straight line **with** the indicated slope?

	Variables	Slope
A	T vs L	c
B	T vs $L^{3/2}$	c
C	$T^{3/2}$ vs $L^{3/2}$	$1/c$
D	$T^{2/3}$ vs L	$1/c$

[1]

- 5 Two forces of magnitude 3.0 N and 4.0 N act on a body. The magnitude of the resultant (net) force on the body **cannot** be

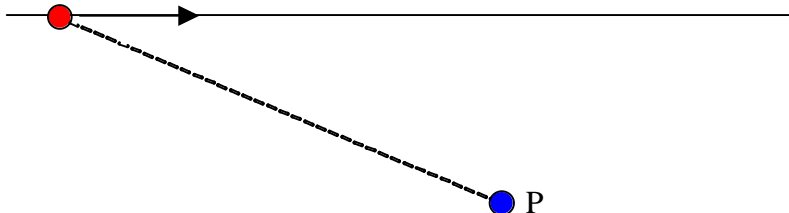
A 2.0 N
B 5.0 N
C 7.0 N
D 8.0 N

[1]

- 6 The flow rate Q of a liquid in a thin pipe of radius r and length L is given by $Q = kr^4 \frac{\Delta P}{L}$ where ΔP is the difference in pressure at the ends of the tube and k is a constant. State and explain which quantity from r , L and ΔP needs to be measured with special care in order to determine Q accurately.

[2]

- 7 A particle moves along a straight line with constant speed as shown in the diagram.



The magnitude of the component of the particle's velocity along the line joining the particle and a fixed observer at P

- A always increases
B always decreases
C first increases then decreases
D first decreases then increases
- 8 The capacitance C of a circular parallel plate capacitor is given by $C = \epsilon \frac{A}{d}$ where ϵ is a constant. The area of each plate is A and the plates are separated by a distance d . In an experiment the following measurements were taken:

Capacitance: $C = 161 \pm 5$ pF

Radius of circular plate: $r = 8.50 \pm 0.01$ cm

Distance between plates: $d = 1.25 \pm 0.02$ mm

Calculate the value of the constant ϵ including its unit and uncertainty.

[1]

[3]