

## Mark schemes

1.

(a) any **two** from:

- calculate a mean
- reduces the effect of random errors  
*reduces human error is insufficient*
- identify / remove anomalies  
*allow to assess the repeatability of the data*

2

(b) random error

*allow a parallax error*  
*human error is insufficient*

1

(because) eye position would not be the same each time (relative to the liquid)

*allow systematic error only if it is clear that the student always viewed liquid level from above meniscus (or below)*

1

(c) (a temperature increase would) increase the pressure in the tube  
(even if the volume was constant)

1

(because a higher temperature would mean) higher (average) kinetic energy of molecules / particles

*allow higher (average) speed for higher (average) kinetic energy*

1

(d)  $1.6 \times 10^5 \times 9.0 (= 1.44 \times 10^6)$

1

$$1.44 \times 10^6 = 1.8 \times 10^5 \times V$$

*allow for 2 marks*

$$V = \frac{1.6 \times 10^5 \times 9.0}{1.8 \times 10^5}$$

1

**or**

$$V = \frac{1.44 \times 10^6}{1.8 \times 10^5}$$

$$V = 8.0 \text{ (cm}^3\text{)}$$

1

*an answer of 8.0 (cm<sup>3</sup>) scores 3 marks*

(e) work is done on the air (in the tyre)

1

so the temperature (of the air) increases

*allow the (average) kinetic energy of the particles increases*

1

[11]

2.

(a) 0 to 25 cm<sup>3</sup>

1

(b) control

1

(c) 2 sets of data recorded from line of best fit to show that the product is the same in both cases (1600)

*allow for 1 mark one set of calculated data for one point on the line of best fit*

2

(d) decreases

1

increases

1

increases

1

[7]

3.

(a)  $p = \frac{27}{0.009}$

1

$p = 3000$

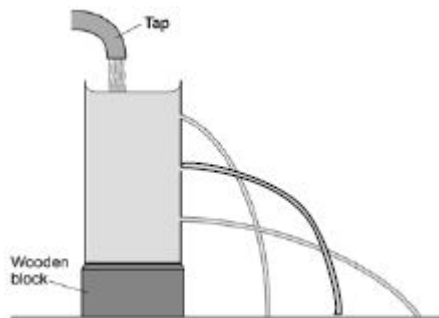
1

Pa

1

*an answer of 3000 scores 2 marks*

(b)



*the water path hits the surface somewhere between the other two paths*

1

(c) pressure increases with depth  
*allow when the pressure is higher, the water travels further*

1

(d) pressure acts in all directions  
**or**  
pressure causes a force on (all) the surfaces  
*ignore liquids cannot be compressed*

1

[6]

4.

(a) all heights drawn the same as tube 1  
*judge by eye*

1

(b) increasing depth increases the height / mass / volume (of the water column) above the swimmer  
*allow more water above (the swimmer)  
more water is insufficient*

1

increasing the weight / force (of water) acting on the swimmer

1

(c) increase in depth = 1.2 (m)

1

$(\Delta) p = 1.2 \times 1030 \times 9.8$   
*allow either 0.50 or 1.70 for 1.2*

1

$(\Delta) p = 12112.8$   
*allow a correctly rounded answer  
allow a correct calculation using either 0.50 or 1.70*

1

pascals **or** Pa  
*do not accept pa  
allow  $N/m^2$*

1

*an answer of 12 112.8 scores 3 marks*

[7]

5.

(a) air molecules colliding with a surface create pressure

1

at increasing altitude distance between molecules increases

**or**

at increasing altitude fewer molecules (above a surface)

1

so number of collisions with a surface decreases

**or**

or so always less weight of air than below (the surface)

1

- (b) atmospheric pressure = 20 kPa from graph **and** conversion of  $810 \text{ cm}^2$  to  $0.081 \text{ m}^2$   
*allow ecf for an incorrect value clearly obtained from the graph*

1

$$5 \times 10^4 = E$$

$$0.081$$

1

$$F = 5 \times 10^4 \times 0.081$$

1

4050

1

4100 (N)

1

*allow 4100 (N) with no working shown for 5 marks*

*allow 4050 with no working shown for 4 marks*

- (c) force from air pressure acting from inside to outside bigger than force acting inwards

1

so keeps the window in position

1

**[10]**

**6.**

- (a) (i) are incompressible

1

- (ii) in all directions

1

- (b) 1.6

*allow 1 mark for correct substitution, ie  $\frac{80}{50}$  provided no*

*subsequent step shown*

*an answer 0.032 gains 0 marks*

2

- (c) Pa

1

- (d) increases

1

**[6]**