

Past-paper walk-through

Physical quantities ■ 1.1

eXercise

Questions in this set

- 9702/11 N25 Q15 ■ 1 mark
- 9702/12 N25 Q1 ■ 1 mark
- 9702/14 N25 Q1 ■ 1 mark
- 9702/12 J25 Q1 ■ 1 mark
- 9702/14 J25 Q3 ■ 1 mark

Question 15

9702/11 N25 ■ Q15 ■ 1 mark

A man of weight 600 N stands with both feet flat on the ground.

What is a reasonable estimate of the pressure exerted on the ground by the weight of the man? [1]

A $1 \times 10^0 \text{ Pa}$

B $1 \times 10^2 \text{ Pa}$

C $1 \times 10^4 \text{ Pa}$

D $1 \times 10^6 \text{ Pa}$

Solution 15

A $1 \times 10^0 \text{ Pa}$

B $1 \times 10^2 \text{ Pa}$

C $1 \times 10^4 \text{ Pa}$ 

D $1 \times 10^6 \text{ Pa}$

Why

- Two adult feet cover roughly 0.05 m^2 – about 25 cm by 10 cm each.
- $p = F/A = 600/0.05 \approx 1 \times 10^4 \text{ Pa}$.
- B would need feet of about 6 m^2 ; D would need them the size of a stamp.

Question 1

9702/12 N25 ■ Q1 ■ 1 mark

What is a reasonable estimate of the weight of an adult human?

[1]

A $7 \times 10^0 \text{ N}$

B $7 \times 10^2 \text{ N}$

C $7 \times 10^4 \text{ N}$

D $7 \times 10^6 \text{ N}$

Solution 1

A $7 \times 10^0 \text{ N}$

B $7 \times 10^2 \text{ N}$ ✓

C $7 \times 10^4 \text{ N}$

D $7 \times 10^6 \text{ N}$

Why

- A typical adult has a mass of about 70 kg.
- $W = mg = 70 \times 9.81 \approx 700 \text{ N}$, which is $7 \times 10^2 \text{ N}$.
- A is the weight of a 0.7 kg object; C is the weight of about 7000 kg.

Question 1

9702/14 N25 ■ Q1 ■ 1 mark

What is essential to accurately represent all physical quantities?

[1]

- A** a base unit and a number
- B** a unit and a number expressed in standard form (scientific notation)
- C** a unit and a numerical magnitude
- D** an SI unit and a numerical magnitude

Solution 1

A a base unit and a number

B a unit and a number expressed in standard form (scientific notation)

C a unit and a numerical magnitude



D an SI unit and a numerical magnitude

Why

- Every physical quantity is a numerical magnitude together with a unit.
- The unit need not be an SI one: 5 miles is still a length, so D is too strict.
- It need not be a base unit either (A), and standard form is only a way of writing it (B).

Question 1

9702/12 J25 ■ Q1 ■ 1 mark

What must all physical quantities have?

[1]

A a direction and a magnitude

B a direction and a unit

C a magnitude and a prefix

D a magnitude and a unit

Solution 1

A a direction and a magnitude

B a direction and a unit

C a magnitude and a prefix

D a magnitude and a unit



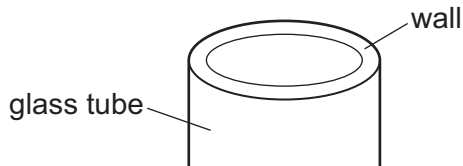
Why

- A physical quantity is always a number together with a unit, such as $m = 2.5 \text{ kg}$.
- Only vectors carry a direction, so A and B would exclude scalars like mass.
- A prefix is optional – the k in kg – so C is not essential.

Question 3

9702/14 J25 ■ Q3 ■ 1 mark

- 3** Calipers are used to determine the thickness of the wall of a glass tube.



The following measurements are made.

internal diameter of the tube = (10.0 ± 0.1) mm

Question 3

external diameter of the tube = (12.0 ± 0.1) mm

What is the thickness of the wall of the tube?

- A** (1.0 ± 0.1) mm
- B** (1.0 ± 0.2) mm
- C** (2.0 ± 0.1) mm
- D** (2.0 ± 0.2) mm

Solution 3

Answer: **A**

Why

- A diameter crosses the wall twice, so the thickness is $(12.0 - 10.0)/2 = 1.0$ mm.
- For a subtraction the absolute uncertainties add: $0.1 + 0.1 = 0.2$ mm.
- Halving the difference halves that too, giving ± 0.1 mm; B forgets to halve it.