

- 3 What are the SI base units of the watt?
- A Js^{-1} B $\text{kg m}^2 \text{s}^{-3}$ C $\text{kg m}^2 \text{s}^{-1}$ D Nm s^{-1}
- 22 What are the SI base units of stress?
- A kg ms^{-2} B $\text{kg m}^{-1} \text{s}^{-2}$ C $\text{kg m}^{-2} \text{s}^{-2}$ D $\text{kg m}^{-3} \text{s}^{-2}$

- 3 Which physical quantity could have units of $\text{N s}^2 \text{m}^{-1}$?
- A acceleration
- B force
- C mass
- D momentum

- 1 Scientists are investigating the variation in air pressure at different locations on a mountain.
- (a) The scientists take measurements of several physical quantities at each location.
- Complete Table 1.1 by stating the SI base unit for each quantity and identifying with a tick (✓) whether each quantity is a scalar or a vector. Use the space for any working.

Table 1.1

quantity measured	SI base unit	scalar	vector
air temperature			
air pressure			

[2]

- (b) (i) At one location, the density of the air is 1.1 kg m^{-3} . A spherical weather balloon is filled with a gas and released from rest. The balloon has radius 0.90 m.
- Calculate the upthrust acting on the balloon when it is released.

upthrust = N [2]

- (ii) Explain why an upthrust acts on the balloon.

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..... [2]

(iii) The balloon has weight 19 N.

Calculate the magnitude of the initial acceleration of the balloon.

acceleration = ms^{-2} [3]

(c) A quantity c relating to the motion of the balloon is calculated from three measured quantities k , F and v using the formula

$$c = \frac{2kF}{v^2}.$$

The percentage uncertainties in the measured quantities are given in Table 1.2.

Table 1.2

measured quantity	percentage uncertainty
k	5%
F	3%
v	4%

The calculated value of c is 1.8.

Determine the absolute uncertainty in c .

absolute uncertainty = [2]

[Total: 11]

2 What is 0.25 kNmm^{-2} expressed in Nm^{-2} ?

A 0.00025 Nm^{-2}

B 0.25 Nm^{-2}

C $250\,000 \text{ Nm}^{-2}$

D $250\,000\,000 \text{ Nm}^{-2}$

4 The time period T of a pendulum is given by

$$T = 2\pi \left(\frac{L}{g} \right)^n$$

where L is the length of the pendulum and g is the acceleration of free fall.

The equation is homogeneous.

What is the value of n ?

A -2

B $-\frac{1}{2}$

C $\frac{1}{2}$

D 2