

1 (a) (i) Define pressure.

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..... [1]

(ii) Use the answer to (a)(i) to show that the SI base units of pressure are $\text{kg m}^{-1} \text{s}^{-2}$.

[1]

(b) A horizontal pipe has length L and a circular cross-section of radius R . A liquid of density ρ flows through the pipe. The mass m of liquid flowing through the pipe in time t is given by

$$m = \frac{\pi(p_2 - p_1)R^4 \rho t}{8kL}$$

where p_1 and p_2 are the pressures at the ends of the pipe and k is a constant.

Determine the SI base units of k .

SI base units [3]

(c) An experiment is performed to determine the value of k by measuring the values of the other quantities in the equation in (b).

The values of L and R each have a percentage uncertainty of 2%.

State and explain, quantitatively, which of these two quantities contributes more to the percentage uncertainty in the calculated value of k .

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..... [1]