

1 The rate of flow Q of a liquid along a narrow pipe of length L and radius r is given by

$$Q = \frac{\alpha r^4}{L}$$

where α is a constant.

An experiment is carried out to determine the value of α . The data from the experiment are shown in Table 1.1.

Table 1.1

quantity	value	percentage uncertainty
Q	$2.72 \times 10^{-8} \text{ m}^3 \text{ s}^{-1}$	$\pm 3\%$
r	$7.1 \times 10^{-5} \text{ m}$	$\pm 2\%$
L	$2.5 \times 10^{-2} \text{ m}$	$\pm 4\%$

(a) Use information in Table 1.1 to show that the SI base unit of α is s^{-1} .

[1]

(b) Show that the percentage uncertainty in α is 15%.

[1]

(c) Calculate α with its absolute uncertainty. Give your answer to an appropriate number of significant figures.

$\alpha = (\dots\dots\dots \pm \dots\dots\dots) \times 10^7 \text{ s}^{-1}$ [3]