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	$2.72 \times 10^{-8}\,m^3\,s^{-1}$	±3%
r	$7.1 \times 10^{-5}\,m$	±2%
L	$2.5 \times 10^{-2}\,m$	±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.

α = (..... ± .....) × $10^7\,s^{-1}$ [3]

[Total: 5]