1 A student proposes that the speed v of a sound wave through a gas of pressure P and density ρ is given by the equation

$$v = \sqrt{\frac{kP}{3\rho}}$$

where k is a constant with no unit.

An experiment is performed to determine the value of k. The data from the experiment are shown in Table 1.1.

Table 1.1

quantity	value	
v	3.3×10^2 m s^{-1}	percentage uncertainty = $\pm$ 8%
P	9.9×10^4 Pa	fractional uncertainty = $\pm$ 0.07
ρ	1.29 kg m^{-3}	absolute uncertainty = 0.09 kg m^{-3}

(a) Use data from Table 1.1 to calculate k.

k = ... [1]

(b) Use your answer in **(a)** and data from Table 1.1 to determine the value of k, with its absolute uncertainty, to an appropriate number of significant figures.

k = ... ± ..... [3]

(c) It is proposed in that in the presence of wind, the actual speed u of the sound wave of frequency f is

$$u = v + fA$$

Derive the unit for A.

unit = …… [2]

[Total: 6]