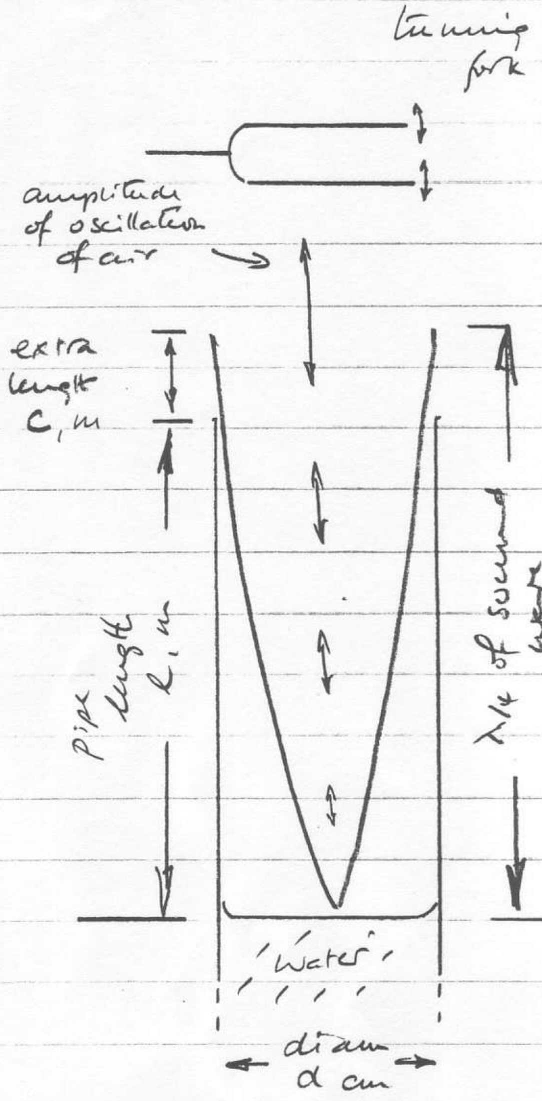
Waves – standing waves in a closed pipe

A Physics



1. Theory (Simple)

For a column of air vibrating in its fundamental mode,

column length, $l = \frac{\lambda}{4} = \frac{V_{sound}}{4f}$

2 Procedure

For 5 well spaced frequencies measure the length of air column at which the sound resonates in the tube (sounds loud + "booming")
(Use the fact that $l = \lambda/4$ to help you find the approx. length)
For each frequency, get 2 values of length. Calculate average, and V_{sound} for each.
Tabulate all your measurements and results.
What is your average value for velocity of sound in air?

3. Theory (harder)

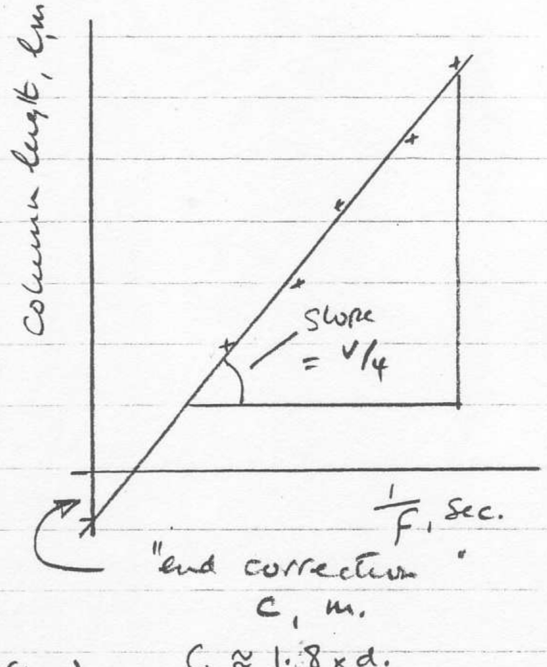
The standing wave "sticks out" of the end of the tube, a little way,

so $l + c = \frac{\lambda}{4} = \frac{V}{4f} = \frac{V}{4} \times \frac{1}{f}$

so $l = \frac{V}{4} \times \frac{1}{f} - c$

$y = m \times x + c$

So a plot of l vs. $1/f$ should give you a better value of V_{sound}.



4. Thinking further... How might you study the speed of sound in different gases, and with changes of pressure?

TLN 1.99 (just)