

Rotating Lab 3

Resonant Flame Tube

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1 Introduction

1.1 Free-Form Lab Investigation

The last five labs of the semester are “free-form” rather than “cook-book” style. I provide you the equipment to investigate different phenomena, and you decide how you are going to explore the questions. Many of these labs are new, so I am looking for you to be creative and come up with interesting methods.

Since the equipment for these five labs is specialized and expensive. *Please take good care of the equipment.* I only have one set-up for each lab. This means that for week #1, five teams will be working on five different labs, and then we will rotate. There will be a sign-up sheet to determine the rotation.

1.2 *Equipment Warnings*

As mentioned above, some of this equipment is hi-tech, and very expensive. Please be very careful; pay attention to all equipment warnings. *If you have a question, please ask.* Anyone who is electrocuted or explodes will receive a failing grade for that lab segment.

- **When the gas is turned on, be sure the flame is lit so that we don't have unburned gas escaping into the room—this can cause a serious hazard. As a precaution, open the door of the lab room to vent gas and fumes. Also watch for gas leaks at the ends of the tube.**

1.3 Required Reading

The following passages from your textbook explain the material for this lab and prelab.

- Vibrating Air Columns p.63-68

2 Experiment

Find at least four resonances for the flame tube. For each resonance, sketch both the pressure and displacement waves in this tube, and find the frequency f , and the wavelength λ , and thus the velocity of sound in the gas using the relation $v = f\lambda$.

- Do you expect the velocity v to be the speed of sound in air? Explain.
- Are the ends of the tube **pressure** nodes or anti-nodes?
- What other observations or comments can you make?