

## Listen Up Lab

### Teacher's Guide

**Topic:**

Sound and Music

**The following information is provided to the student:**

**Question:**

How would the intensity and the pitch of a sound observed by an observer change when the source of sound moves towards and away from an observer?

**Purpose:**

To compare the observed pitch and the intensity of a sound produced by an approaching source to the sound produced by a receding source.

A complete lab write-up includes a Title, a Purpose, a Data section, and a Conclusion/Discussion. The Data section should include organized observations of pitch and intensity for both the approaching sound source and the receding sound source. The Conclusion/Discussion section should thoroughly and clearly compare the pitch and the intensity of the sound for the two situations involving the moving source.

**Materials Required:**

A video segment (with sound) of an approaching and receding sound source; video or DVD player; television or LCD projection capability.

**Description of Procedure:**

The class watches a video segment of a sound source (car horn, train with whistle, race car, etc.) approaching and receding from a video recorder. Observations are made and recorded. The video segment is replayed many times to insure focused and accurate observations. Students take some time to write a conclusion/discussion in which they answer the questions posed in the Purpose of the lab.

**Alternative Materials and Procedure:**

If a video segment is not available on a DVD, laser disc, or internet source, then consider making your own using your car horn, a video recorder and a helper.

**Safety Concern:**

There is always a higher than usual level of risk associated with working in a science lab. Teachers should be aware of this and take the necessary precautions to insure that the working environment is as safe as possible. Student *horseplay* and off-task behaviors should not be tolerated.

**Suggestions, Precautions, Notes:**

1. Spend some time discussing the distinction between the difference in pitch heard as the source of sound approaches or recedes from the video recorder and the difference in loudness or intensity level as the source of sound changes its proximity from the video recorder. One has to do with the Doppler shift and the other has to do with inverse square relationship between sound intensity and distance.

## The Laboratory

2. This activity can be done as a class using a classroom television or a LCD projector. The video segment can be repeated over and over again. Give students an opportunity to focus on the alteration in pitch observed the instant the sound source passes the video recorder. Then give students an opportunity to focus on the changes in the intensity level of the sound as the distance between the sound source and the video recorder changes.

### Auxiliary Materials:

None

### Scoring Rubric:

<b>S1. Listen Up Lab</b>	<b>Score</b>
___ Included, labeled and organized all parts of the lab report.	
___ Data section includes well-organized and labeled observations regarding the pitch and intensity of the sound as the train (or the car) was approaching compared to how it sounded when receding. Observations are accurate.	___/___
___ Conclusion/Discussion correctly describes the pitch and the intensity for an approaching source and a receding source.	

### Connections to The Physics Classroom Tutorial:

The following readings are a suitable accompaniment to this lab:

<http://www.physicsclassroom.com/Class/sound/u1112b.cfm>

<http://www.physicsclassroom.com/Class/sound/u1113b.cfm>

### Connections to Minds on Physics Internet Modules:

Sublevels 3 and 4 of the Sound and Music module are suitable accompaniments to this lab:

<http://www.physicsclassroom.com/mop/module.cfm>