

Frequency of Sounds Lab

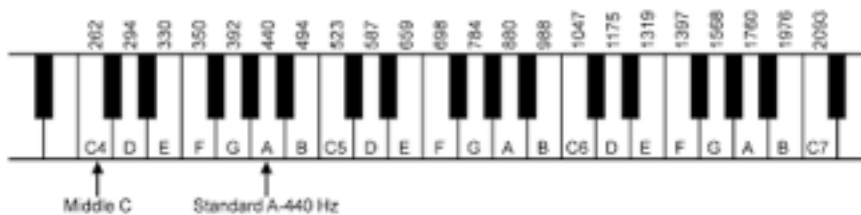
Please read over the lab and write your hypothesis in the space provided on this worksheet before starting the lab video.

Overview

This lab is an investigative lab in which you will verify how frequency is related to pitch and how different drum sizes and materials produce different sounds. You will also look at rattles and how their materials effect the sound that is produced.

Every sound has its source in a vibrating object. What vibrates depends on the object that is making the noise. Vibrating objects send energy through waves into the surrounding air. The human eardrum passes those vibrations through to the middle and inner ear where tiny hair cells change the vibrations into electrical signals that are sent to the brain. The brain tells you that you are hearing sound and what that sound is.

The human ear can detect sounds ranging from approximately 20 Hz to 200000 Hz. Below is a portion of a piano keyboard and the frequencies those keys produce.



What does it mean to say that one note is higher than another? What happens to a sound's frequency when you increase its pitch?

Objectives

- To experimentally determine how different sizes of drums and different materials of drums affect the frequency of sound produced by that drum.
- To experimentally determine how a rattle produces different frequency of sound and how the amplitude vs time graph for a rattle is different from that of a drum.

Materials

- Cell phone with Lab4Physics app using Sonometer
- 2 handmade drums with drumsticks
- 3 different handmade rattles.

Write your Hypothesis:

For this lab, write a hypothesis below. You may use the "If ... then ... because ..." format.

Predict which drum material and size you think will have the highest and lowest pitches. Explain why you think so.

Procedure

1. Turn on Lab4Physics app on your cell phone. Go to tools and choose Sonometer.
2. Click "New measurement"
3. Press "Go" button
4. Beat one drum once with the drumstick
5. When recording stops three result options are presented. "Amplitude vs. Time", Frequency, and "Intensity vs Frequency". Click on Save Data.
6. Precisely name the data so as not to confuse it later.
7. Measure the diameter and thickness of the drum and record it in Table 1.
8. Record the type of material used to make the drum in Table 1.
9. Record the frequency of the drum in Table 1.
10. Repeat steps 2 – 9 for the other drum. Record your data in Table 1.
11. Repeat steps 2 - 7 and steps 8 - 9 for three different rattles. Record your data in Table 2.

Discussion Questions

1. What is producing the sound?
2. What diameter of drum tends to produce a higher pitch sound?
3. What diameter of drum tends to produce a lower pitch sound?
4. How are pitch and frequency related?
5. Why does the Sonometer app produce such a different amplitude vs time graph for the rattles than it did for the drums?
6. Evaluate your hypothesis. Make sure you use your results to refute or verify your hypothesis.

Conclusion

In one or two sentences, summarize the key findings of the lab.

Blackline Master 10-2 Page 3

Data Recording

Table 1: Drum size and composition compared to frequency of sound produced.

Drum Description			Peak Frequency:(Hz)
Diameter (cm)	Thickness (cm)	Material	

Table 2: Rattle composition compared to frequency of sound produced.

Rattle Description		Peak Frequency (Hz)
Outside Material:	Inside Material:	