

## Make Up Lab – Sound

NAME: \_\_\_\_\_

Lab being made up:

In this lab, you will learn about the properties of waves using sound. These properties include speed frequency, as well as interference and reflection. Make sure that you use a computer with speakers! Go to <http://phet.colorado.edu/>. Click on “Play with sims...”, then click “Physics”, then “Sound & Waves” on the left. Find the “Sound” simulation. Either download it or choose “Run Now”.

### Choose the Listen to a Single Source Tab.

1. On the right make sure you have the Audio Enabled and the Speaker boxes selected. Using the sliders on the top right vary the frequency and the amplitude of the sound. (a) How does the frequency affect the pitch of the sound? (b) How are the waves themselves different for low and high frequencies? (c) What effect does the amplitude have on the sound?

(a) \_\_\_\_\_

(b) \_\_\_\_\_

(c) \_\_\_\_\_

### Choose the Measure Tab.

2. Make the frequency 200 Hz. Move the provided meterstick so the 0 mark is near the middle of the speaker. Use the provided stopwatch (Simulation Time) to measure how long it takes a single pulse to travel 5 meters. Do this a few times until you get a consistent time. Find the speed of the sound wave, showing formula, substitution and units.

3. Using the provided Meterstick, measure the wavelength of the sound wave. Calculate the speed by using the formula  $v = f\lambda$ . Show formula, substitution and units.

4. Find the percent difference between the two values you got for speed.

$$\% \text{ Error} = \frac{\text{Speed from \# 3} - \text{Speed from \# 2}}{\text{Speed from \# 2}} \times 100$$

5. Change the frequency to 400 Hz, and repeat the procedure and calculation of step 2.

6. Frequency should not affect the speed of the sound. Did it in your case? Explain why it should not, and what can cause the speed of the sound to change.

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**Choose the Two Source Interference Tab.**

7. Make sure audio is enabled, make the frequency about 300 Hz, and wait a few seconds for the pattern to emerge and stabilize. Then move the listener vertically up and down SLOWLY. What is happening to the sound?

8. Explain in terms of the types of interference occurring in different locations why this is happening.

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9. Increase the frequency to about 500 Hz. Wait a few seconds until the pattern stabilizes. What is happening to the number of nodal lines as the frequency is increased.

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**Choose the Interference by Reflection Tab.**

10. On the right, change the wall angle so it is vertical, the wall position so the wall is not too close to the speaker and on the bottom under Sound Mode choose Pulse. Fire a pulse at the wall. Draw a sketch showing the shape of the fired pulse, and that of the reflected pulse.