

# Water Pitch Pipes

## Introduction

An empty bottle can be an instrument! Use bottles and water to explore sound waves, pitch, and frequency.

## Think About This

How can different sounds come from the same object?

## Materials

- 
- A sheet of paper
  - A writing utensil
  - A bottle with a narrow mouth, such as a water or soda bottle
  - Water
  - A towel for any spills
  - (Optional) A computer, tablet, or smart phone with a microphone

## Do Ahead of Time

- Practice blowing across the top of the bottle to make a sound. Rest your lower lip on the rim of the bottle, purse your lips, and blow across the opening, not into it. Be patient, this can take a few tries to get just right!
- Open this [Online Oscilloscope](#) on a computer, tablet, or smart phone.
  - You can still do the activity even if you can't use the oscilloscope. The website just lets you see the soundwaves.
  - If you don't have access to the Online Oscilloscope when recording observations, describe the sound instead of copying the soundwave.

- Fold a piece of paper into thirds to make an observation sheet.
- Clear a surface to be used as a work space for this investigation.
  - Water may be spilled, so be sure there is nothing that could be damaged nearby
  - Keep a towel around in case of any spills.

## Directions

Experiment with bottles to create a water pitch pipe that makes sound. Use an online oscilloscope to see the sound waves made by your instrument!

- 1** Find a bottle with a narrow mouth. Make sure it is empty and clean.
- 2** If using the [Online Oscilloscope](#), set it to "Live Input." Leave all other settings as they are. This will let you see the soundwaves.
- 3** Blow into the bottle. Click "Freeze Live Input" while the bottle is making noise.
- 4** In the first column of your observation sheet, copy or trace the soundwave from the online oscilloscope and label it "Empty." Then, describe the sound—did it sound high or low?
- 5** Add water to the bottle until it is about one-third full. Repeat steps 3 and 4, using the next column of your observation sheet.
- 6** Look at the first two waves you drew and think about the observations you made about the sounds – what do you notice? Make a hypothesis, or a guess, for how the sound will change when the bottle is two-thirds full. Draw what you think the wave may look like.

# Water Pitch Pipes Continued

**Hypothesis:**

**IF** I add more water to the bottle and blow on it,

**THEN** \_\_\_\_\_

**BECAUSE** \_\_\_\_\_

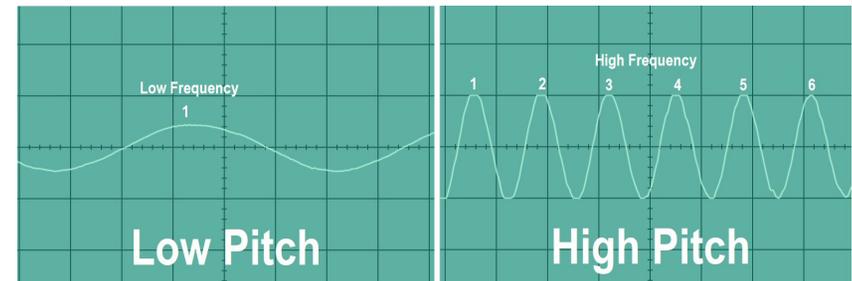
**7** Add water to the bottle until it is about two thirds full. Repeat steps 3 and 4, using the last third of your observation sheet.

**What's Happening?**

A bottle is a **closed-end air column**, which means it is a tube with one end closed (the bottom) and one end open (the part you drink out of). Many instruments like clarinets, pan flutes, and organs use this same shape to make music.

When you blow into the bottle, the air inside of the bottle vibrates. This vibrating air causes a soundwave that we can hear. An empty bottle has a long length of air that can vibrate, which makes a long soundwave. A bottle with water inside of it has less air, which makes a shorter soundwave.

Soundwaves are measured by their **frequency**, or how many waves pass through one place in a certain amount of time. Shorter waves have a higher frequency and longer waves have a lower frequency. We hear the frequency as sounds that are higher or lower, which we call **pitch**.

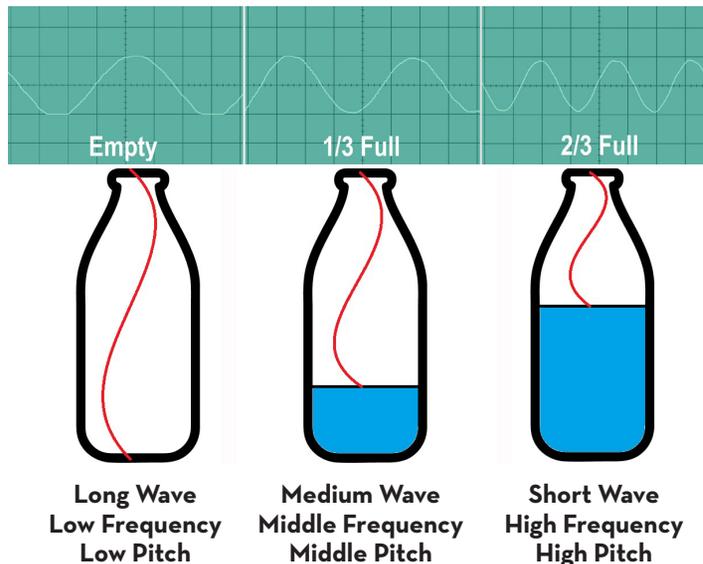


**Take it Further**

If you have several bottles, fill them all to different levels to see how many different pitches you can create.

Try this activity, but with glass cups. Fill several glass cups to different levels and tap lightly with a spoon instead of blowing across the top. Can you use the many pitches you've created to make a song?

Water Pitch Pipes



What music can you create with your water pitch pipes?  
Let us know at  
[AtHome@discoveryworld.org](http://AtHome@discoveryworld.org)