Music Makers

What is Sound?

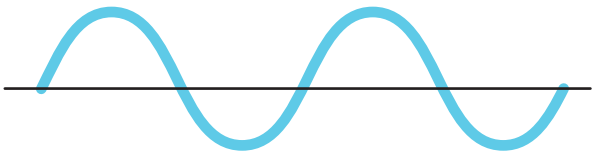
Sounds occur when energy travels as **waves** through a substance or medium such as air, water or even solid materials. Almost anything that **vibrates** can produce sound. Have you ever put your hand on your throat when you talk? Try it! You can feel your vocal cords vibrating and producing sound.

Another aspect of sound is **pitch**. Pitch results from the rate, or **frequency**, of the vibrations. We experience this as higher and lower tones, like the "do – re – mi" of a musical scale. The faster something vibrates, the higher the pitch.

What about **volume**, or how loud the sound is? Volume is increased or decreased depending on the amplitude (or height) and intensity of the sound waves. Higher waves are louder, and smaller waves are quieter.

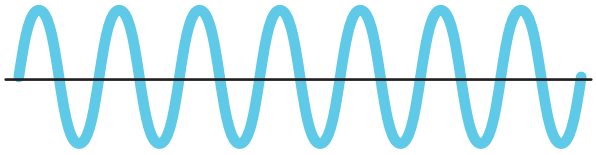
We can show what we just described as a graph:

Lower Pitch



Low Frequency

Higher Pitch

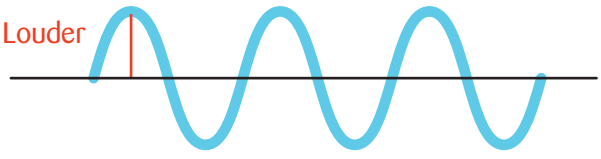


High Frequency

Quieter

Low Amplitude

Louder



High Amplitude

Museum of Virginia Science

www.smv.org

Screaming Balloon

In this activity, you will explore pitch and frequency by making a "screaming balloon!"

What You'll Need

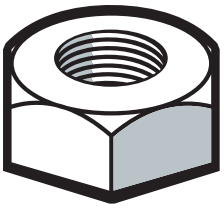
- Balloons
- Penny
- Hex nut
- Pencil

What You'll Do

- Place the penny inside one balloon. Inflate it and tie off the end.
- Place the hex nut inside another balloon. Inflate it and tie off the end.
- Now, make a prediction. Which object will have the higher pitch, the penny or the hex nut?
- Make a prediction about the volume. Will the object make a loud sound or a quiet sound? Record that on the chart provided.
- With your palm down and holding the penny balloon from the stem side, rotate it in a circular motion.
- Stop spinning the balloon and watch the penny continue to rotate.
- Repeat using the nut balloon and listen to the noise it makes.
- What happened? Record the results in the table provided.
- Experiment with different sized hex nuts and objects (marbles, rocks, etc.) to see if they are as effective in creating sounds, and how those sounds differ.

Item tested	Prediction for pitch: high or low?	Prediction for volume: loud or quiet?	Results
Penny			
Hex Nut			
Other objects			

Screaming Balloon



What's Happening:

The noise from the hex nut is very much louder than the noise from the penny. The sound comes from the fact the hex nut has sides. Those sides attribute to more friction which causes vibrations on the balloon. Those vibrations are turned into sound waves, which is the noise you hear.

Things to Ponder:

- Which item ended up making the most noise? Why do you think this happened?
- Try the experiment again, but change the amount of air in the balloon. What happens?
- Try creating different pitches and volume with the hex nut using varying amounts of force to increase friction.
- What happens when you spin the balloon faster or slower? Does it change the pitch and/or volume?

Have fun learning about sound!

Scientist Spotlight

Wanda Díaz-Merced is an astrophysicist best known for developing methods to turn large data sets into audible sound. Díaz-Merced began to go blind as an undergraduate student at the University of Puerto Rico. Determined not to let this stop her from studying the stars she loved, she began to develop a method that translates satellite information from the stars she studies into sound waves instead of visual graphs.

While working at the Harvard-Smithsonian Center for Astrophysics, Díaz-Merced's work inspired musician and researcher Gerhard Sonnert to create X-Ray Hydra, an album of jazz music based on her audio representations!

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