Different tones and pitches are produced by rubbing a wet finger around the rims of wine glasses filled water.

Photo courtesy of Robert Tiso. Public domain.

A Sound Education: Glass Orchestra

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Reference

Glass harp. Wikipedia CC-BY-3.0. http://en.wikipedia.org/wiki/Glass_harp

Image Reference

Photo courtesy of Robert Tiso. Public domain.
http://commons.wikimedia.org/wiki/File:Robert_tiso_glass_harp_beethoven.png

Key Words

sound, amplitude, frequency, glass harmonica, glass harp, hearing, pitch, resonance, sound wave, tuning fork, vibration

How to Make a Wooden Mallet

1. Purchase a wooden dowel with matching wooden ball (pre-drilled hole) from a craft shop.
2. Put a small dab of hot glue on one end of the wooden dowel and slide it into the hole in the wooden ball. Position the ball and wipe off any excess glue. The mallet is ready when the glue is dry.

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Make a Wooden Mallet

Mallets used as drumsticks are used to produce sound. They may be made of metal, plastic, rubber, or wood, and some are wrapped with felt, cord, or yarn. Heavier heads produce louder sounds. Harder heads produce sharper and louder sounds, and generate more overtones.

Materials*

- Hot glue gun with glue
- Wooden dowel with matching one-hole wooden balls (pre-drilled)

* Materials listed above are to make one mallet; adjust quantity as needed.

Optional

As an alternative to making the mallet, you can purchase inexpensive wooden (Glockenspiel) mallets by the pair at music stores or online at the Guitar Center for about $3.00 - $6.00 per pair. http://www.guitarcenter.com/Orff-Mallets-Orff-Instruments.gc

Image Reference

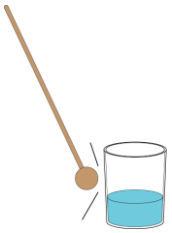
Illustration by G.L. Vogt, EdD

Key Words

sound, amplitude, dowel, Glockenspiel, mallet, sound wave

Tap

1. Fill a clear drinking glass with water until it is about one-third full.
2. Gently tap the side of the glass with a wooden mallet and listen to the sound produced.



3. Add water to the glass until it is about two-thirds full. Tap the glass with the mallet again, and listen to the sound.
4. Pour different amounts of water into a few glasses of the same shape and size. *Are the sounds different or the same? If different, how and why?*

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Tap

Materials*

•Clear drinking glass

•Water

- Wooden mallet (See slide 2 for instructions on how to make the mallet and purchasing options.)

*Materials listed are for one sound station or demonstration. Adjust quantities for students working in teams.

Optional

Provide extra glasses and have student teams create glassophones (glass xylophones), using water glasses containing water at different levels. If the glasses are clear, you may wish to add different colors of food coloring to each glass. Students may perform original compositions on their instruments.

Questions to Ask

4. Are the sounds different or the same? If different, how and why? [The sounds are different. Some have a higher pitch; some lower. The height of the water in the glass determines the pitch of the sound.]

Image Reference

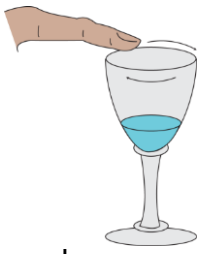
Illustration by G.L. Vogt, EdD

Key Words

sound, amplitude, frequency, hearing, pitch, resonance, sound wave, vibration

Rub

1. Fill a crystal goblet with water until it is about one-third full. Hold the base of the glass to the table top with one hand to stabilize it. Dip a finger in the water and rub it along the rim of the glass in a circular motion.



2. Watch the surface of the water as the sound occurs. *What is happening? Why?*
3. Fill a second goblet with water until it is a little over half full. Repeat step one with the second goblet of water. *Are the sounds the same? Why or why not?*

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Rub

Typical glassware is made of calcium carbonate (limestone), silica (sand) and potassium carbonate (potash). Crystal is made of lead oxide (at least 24%), silica and potassium carbonate. When the rim of a lead crystal glass is tapped, it will make a melodic ringing sound versus the flatter, “thud” sound produced by common glassware.

Materials*

•Two crystal wine glasses or crystal goblets

•Water

*Materials listed are for one sound station or demonstration. Adjust quantities for students working in teams.

Questions to Ask

2. What is happening? Why? [The friction of the moistened finger causes the glass to vibrate and produce a sound.]

3. Are the sounds the same? Why or why not? [No. The amount of water in the goblet affects the sound.]

Reference

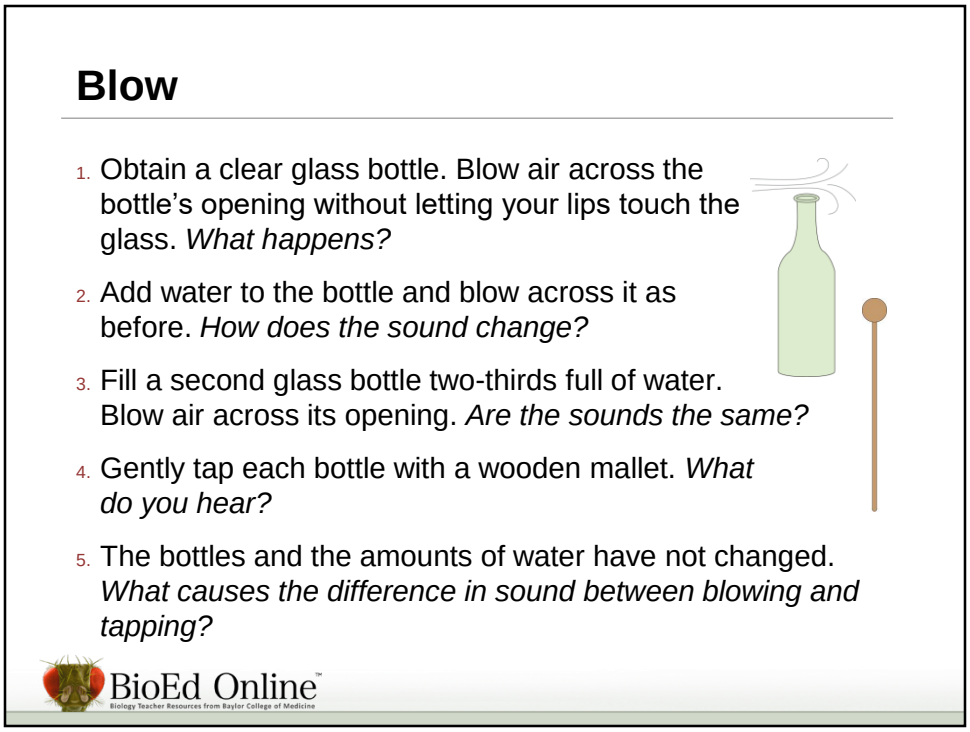
Lead Glass. Wikipedia CC-BY-3.0. http://en.wikipedia.org/wiki/Lead_crystal

Image Reference

Illustration by G.L. Vogt, EdD

Key Words

sound, amplitude, frequency, friction, glass harmonica, glass harp, hearing, pitch, resonance, sound wave, vibration



Blow

Materials*

•2 identical clear glass bottles

•Water

- Wooden mallet (See slide 2 for instructions on how to make the mallet and purchasing options.)

*Materials listed are for one sound station or demonstration. Adjust quantities for students working in teams.

Questions to Ask

1. What happens? [The air inside the bottle vibrates, producing a sound.]

2. How does the sound change? [The pitch increases with water level.]

3. Are the sounds the same? [No. The bottle with the higher water level has a

higher pitch than the bottle with the lower amount of water.]

4. What do you hear? [The bottle with the higher level of water now has a lower pitch than the bottle with less water.]

5. What causes the difference in sound between blowing and tapping? [When blowing air across the bottle, it makes the air inside of the bottle vibrate. But when striking the bottle, the water dampens the sound, lowering the pitch.]

Image Reference

Illustration by G.L. Vogt, EdD

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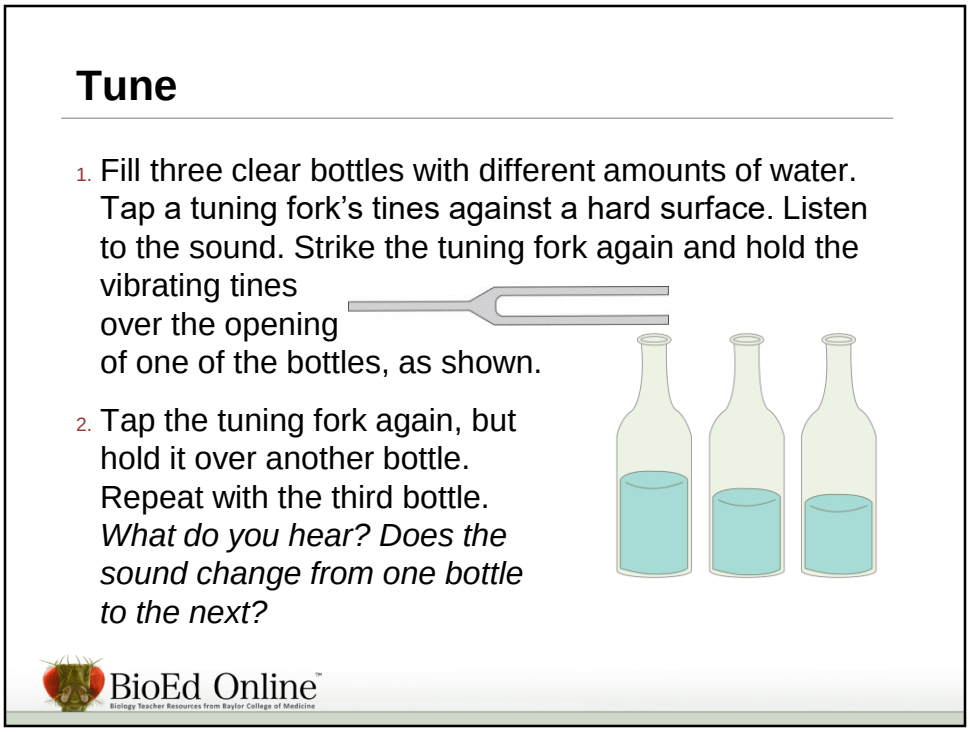

Tune

A tuning fork is an acoustic resonator, that resonates at a specific constant pitch, producing a pure tone.

Materials*

•3 identical clear glass bottles

•Tuning fork

•Water

*Materials listed are for one sound station or demonstration. Adjust quantities for students working in teams.

Note: Tuning forks are available for purchase from school science supply companies.

Setup

Prior to class, fill the bottles with different levels of water. Strike the tuning fork and listen for a hum from the bottle (resonance). The frequency of a particular bottle matches the frequency of the fork. If no bottle hum is heard, the water level should be raised or lowered a little bit. Eventually, the right level will be found. Find the “hum” for the other two bottles of water.

Questions to Ask

2. What do you hear? Does the sound change from one bottle to the next? [If the water level is exactly correct, the vibration of the tuning fork will cause the air inside the bottle to resonate and produce an additional faint “humming” sound along with the sound of the tuning fork.]

Reference

Tuning Fork. Wikipedia CC-BY-3.0. http://en.wikipedia.org/wiki/Tuning_fork

Image Reference

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