



Musical Glass

This bit of science is all about making music (or musical noises) using glass.

Safety considerations:

Glass vessels are used in this activity. It is recommended that teachers undertake a [Curriculum Activity Risk Assessment \(CARA\) process](#). It is recommended that students are briefed as to the risks of cuts and the use of gloves when handling materials should be considered.

Aim:

To make music using glass.

Materials:

Glass bottle (at least three), spoon, water, funnel, tuning app (optional) and wine glass.



What to do:

Start by making a glass xylophone. To do this, arrange identical glass bottles in a row and add a small amount of water to the first, and more to the next and so on. You can also leave one empty at the start of the line up.

Tap the bottles with the spoon. What do you notice about the pitch of the notes?

Try using your ear (if you are musical) or a tuning app to get each bottle to make a particular musical note. You will have to add or take away water to achieve this.

Once you have done this, try also blowing across the top of each bottle and see how the pitch of the noise changes. Is it the same pattern as when you tap the bottles?

What's going on and what did you find out?

Tapping the bottle causes the glass to vibrate and those vibrations are passed into the air and onto our eardrums. When the bottle is empty, the glass vibrates at a higher frequency (makes a higher note) which means it is literally wiggling back and forth more times per second (too small and fast for us to see). As water is added the vibrations are slightly slower and the pitch becomes lower.

Blowing across the top of the bottle makes noise in an entirely different way. When you blow, a small amount of air is forced into the bottle, which then squashes the air already in there, causing the air to rebound back up and out (until more air is forced in by the blowing). This very rapid cycle of air being forced in and rebounding out is the source of the vibrations. A larger air space (little or no water) results in slower vibrations and lower notes.

Extension ideas and real world links:



Another way to create a musical sound with glass is by using a wine glass. Add a little water to the glass, hold it firmly by the base with one hand and using a finger on the other hand, dip into the water and run it around the upper rim, gently pressing as you go.

The glass should “sing” as the friction from your finger causes it to vibrate at its resonant frequency (though you may need to test a couple of glasses to find one that responds nicely).

Don't try this at home, but if this exact pitch or note is blasted back at the wine glass at sufficient volume (like a big speaker or very loud singer) the glass can be made to vibrate so much it shatters, and there are many [great slo-mo videos](#) online showing this.

The singing wine glass can also be turned into an experiment by testing variables such as wine glass size and water depth in the glass.

More information on the **Glass Harmonica** (*image to the right*), the instrument invented by Benjamin Franklin and mentioned in Dr Rob's video, can be found [here](#).



Tuning App - The tuning app Dr Rob used to tune up his bottle was called “[Tuner - Pitched](#)”. It is free and there are several others that will work just as well.

For the glass xylophone, glasses or jars can be substituted for the bottles, and they need not be identical if you are going to tune them up, but they may start out at very different frequencies.

Curriculum links:

(ACSSU020) Light and sound are produced by a range of sources and can be sensed.