



## Curiosity Guide #702

### Sound Frequency

Accompanies Curious Crew, Season 7, Episode 2 (#702)

#### Wiggling Rulers

Investigation #3

#### Description

Rule the air waves with this exciting investigation!

#### Materials

- 3 rulers
- 3 meter sticks
- 2 long wooden sticks
- 8 C clamps
- Stopwatch

#### Procedure

- 1) Clamp the rulers flat on the table with varying amounts hanging off the table: 7 cm, 14 cm, and 21 cm.
- 2) Repeat with the meter sticks so that the ends of the meter sticks hang 30 cm, 60 cm, and 90 cm off the table.
- 3) Clamp the long sticks so that the sticks have a lot of their length hanging off the edge of the table.
- 4) Predict what will happen when the hanging end of each ruler or stick is flicked or struck. The motion is to push the stick down and then let up, like the key on a piano.
- 5) Strike each ruler or stick. What do you notice?
- 6) Start the stopwatch when the ruler or stick is struck, and time how long the ruler or stick vibrates up and down.
- 7) What patterns do you notice? How long did each stick vibrate?

## Results

### Explanation

The longer the length of stick that is suspended off the table, the slower that the end moves up and down and the lower the pitch. One measurement of sound is its frequency, which is the up-and-down movement, or oscillation, of the sound wave. As the sticks move up and down in the air, the sticks collide with the air particles and cause the air particles to bunch together from the pressure wave. The molecules compress together and bounce apart as the pressure wave transfers through the particles toward our ears.

Waves that move quickly have a shorter wavelength, so the sound gets to our ears more frequently. Our brains interpret that quick-moving wave frequency as a higher-pitched sound. A stick that has a long overhang has a longer bounce up and down, so the pressure wave does not repeat as quickly. This means that the slower vibration has a longer wavelength and makes a lower-pitched sound. A shorter ruler vibrates more frequently and has a higher-pitched sound. Try playing a ruler by holding one end on the table, repeatedly striking the hanging end while sliding the ruler off and on the table.

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