

CCT Weekly Science Practice

A. SONOROUS SCIENCE: MUSICAL BOTTLES



The science of sound is all about vibrations. Some musical instruments produce sound from vibrating strings, others from vibrating membrane and still others from resonating columns of air.

How do musical instruments make the sounds that they do? All sound is made by vibrations that travel through the air. Specifically, these vibrations cause patterns of air compressions and rarefactions that travel as a wave. This is how sound itself is a wave.

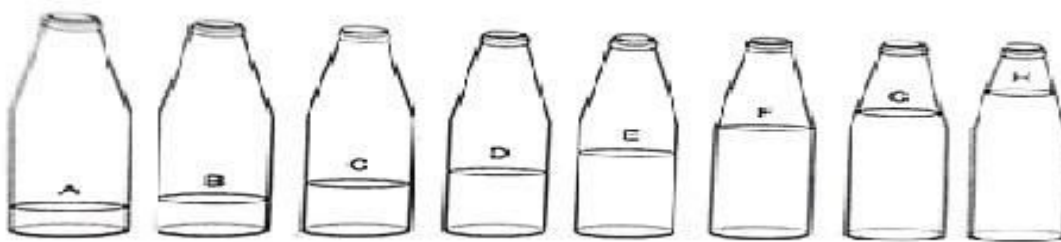
Pitch is the way that our ear and brain order sounds based on their frequency (vibrations per second). Rapid vibrations (high frequency) that reach your ear are categorized as a "higher" pitch, while slower vibrations (low frequency) are categorized as a "lower" pitch.

In fact we can try creating music by blowing air or tapping across bottles filled with varying levels of water.

When you hit the bottle with the spoon, the glass vibrates, and it's these vibrations that ultimately make the sound. It is seen that tapping an empty bottle produces a higher-pitched sound than tapping a bottle full of water. More water means slower vibrations and a deeper tone. Adding water to the bottle dampens the vibrations created by striking the glass with a spoon. The less water in the bottle, the faster the glass vibrates and the higher the pitch. The more water you add to the bottle, the slower the glass vibrates, creating a lower pitch.

The same bottle that makes a low-pitched sound when you tap it with a spoon makes a high-pitched sound when you blow across the top. When you blow into the bottle, you are making the air vibrate, not the glass. An empty bottle produces a lower pitch because there's lots of air in the bottle to vibrate. Adding water to the bottle decreases the amount of air space, which means there is less air to vibrate. With less air, the vibrations happen more quickly and produce a higher pitch.

Look at the arrangement of glass bottles and answer the questions that follows:



Question 1:

Which bottle will produce the highest pitch if we tap the bottle with a spoon? Which bottle will produce the lowest pitch?

Question 2:

How do the bottles differ between the highest pitch to the lowest pitch?

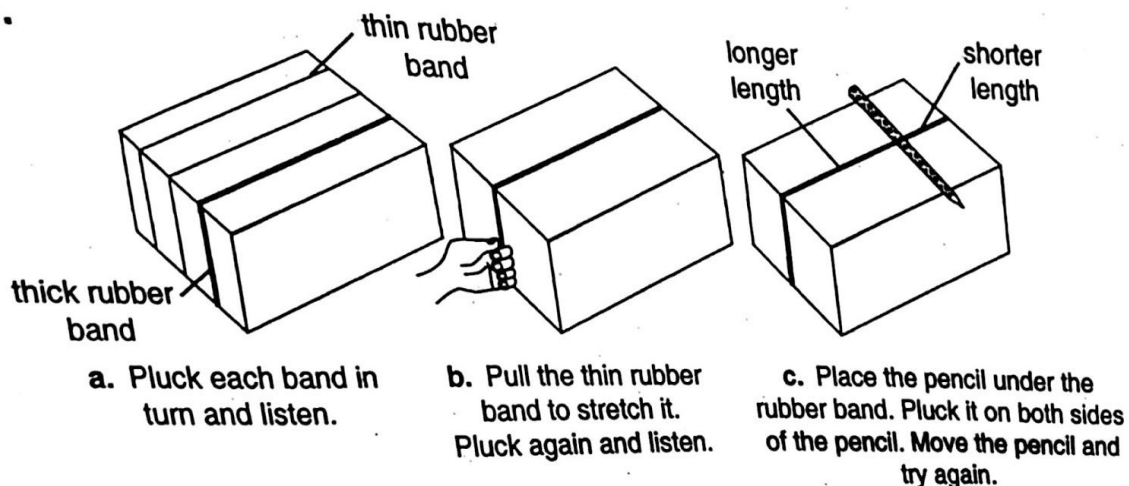
Question 3:

Why does blowing across the top of the bottle and tapping the bottle produce different sounds?

B. VIBRATIONS ON A PLUCKED STRING

Look at the boxes below. Rubber bands have been tied over these.

3.



Question 4:

Fill in the blanks appropriately.

- (a) The thin rubber band produces the note of _____ pitch (higher/lower) than the thick rubber band.
- (b) Tightening the rubber band will _____ the pitch of the note. (increase/decrease)

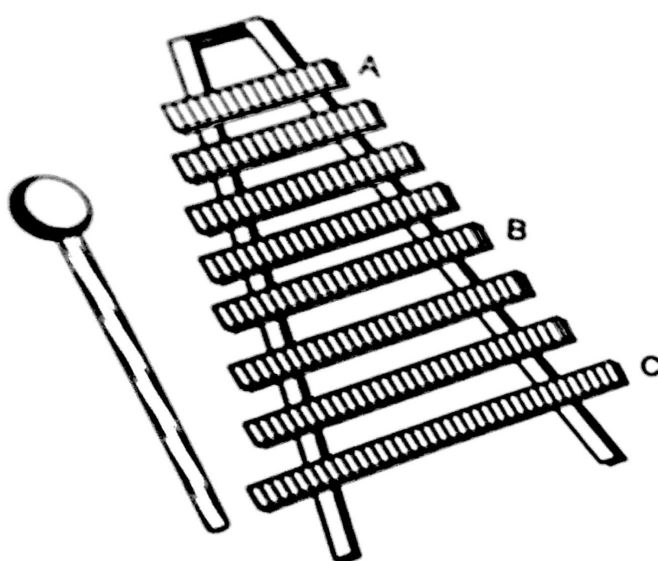
Question 5:

What change if any, does placing the pencil make on the sound produced?

Question 6:

Compare and contrast the sounds produced in the Original rubber band arrangement and when a pencil is placed in the centre.

C. XYLOPHONE



Question7:

Which of the three metal bars A, B and C of the given Xylophone produces note of highest pitch when tapped with a mallet? Which one produces note of lowest pitch?

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Answer Key:-

1. Bottle- A. This is because there is less amount of water which makes glass vibrate faster. Bottle H will produce the lowest pitch as it has maximum amount of water which dampens the vibrations.
2. The bottles contain different amounts of water. By changing the amount of water from minimum to maximum, we can change the pitch from highest to lowest.
3. This is because tapping causes the glass to vibrate, whereas blowing causes the air column to vibrate.
4. (a) Higher
(b) increase
5. The pencil absorbs some of the sound and makes the length of the rubber band shorter. The shorter length causes the band to vibrate faster and produces a higher pitch.
6. The original rubber band arrangement will produce lower pitched sounds than those made when the pencil is placed in the center. Putting the pencil underneath has the effect of stretching the rubber band.
If the pencil is placed in the center, the longer side will produce low, long, heavy sounds, while the shorter side will produce the high, short sounds.
7. Bar A of Xylophone produces sound of highest pitch. Bar C produces sound of lowest pitch. This is because frequency is inversely related to length of the vibrating rod.

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