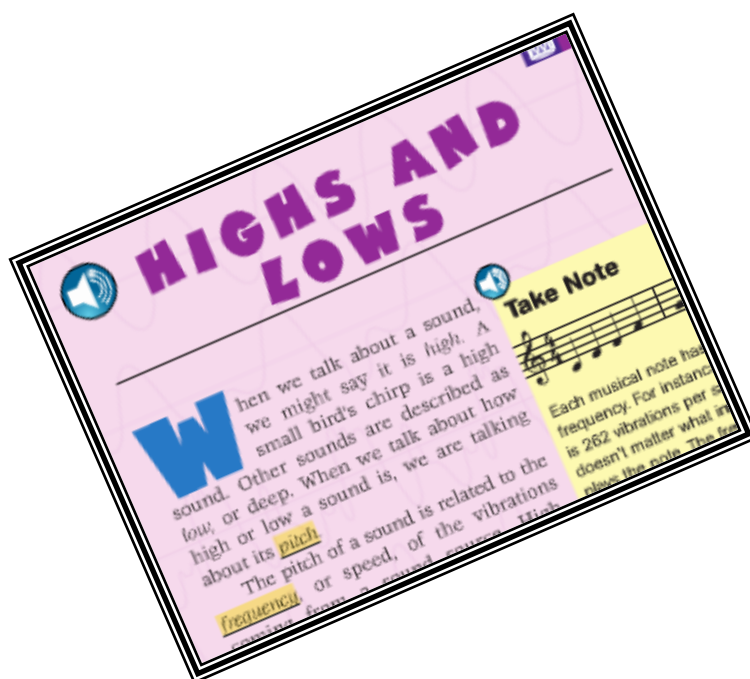


## Close Reading and Text Dependent Questions in Science

### Highs and Lows (Physics of Sound – Grade 3)

The text selection, *Highs and Lows*, is found in *FOSS Science Stories, Sound*, pgs. 11 - 13.



Look in the Student Learning Outcome (SLO) Documents for guidance on when this should be taught. These can be found on the BPS Science Department's website: <http://bpsscience.weebly.com/> You will find the Student Learning Outcomes documents organized there by grade level.



# HIGHS AND LOWS

**W**hen we talk about a sound, we might say it is *high*. A small bird's chirp is a high sound. Other sounds are described as *low*, or deep. When we talk about how high or low a sound is, we are talking about its *pitch*.

The pitch of a sound is related to the *frequency*, or speed, of the vibrations coming from a sound source. High-frequency vibrations move quickly. Low-frequency vibrations move slowly. High-frequency vibrations produce a sound with a high pitch. A sound with a low pitch comes from low-frequency vibrations.

Adjusting a sound source such as a musical instrument to produce a certain pitch is called *tuning*.



HIGH FREQUENCY = HIGH PITCH

LOW FREQUENCY = LOW PITCH



## GETTING IN TUNE

Most musical instruments make sounds in one of three ways. String instruments such as the guitar or violin make sounds with vibrating strings. Musicians either pluck the strings or move a bow across them. The strings are tightened or loosened with tuning pegs. Each string is tuned to a certain pitch.

### Take Note



Each musical note has a specific frequency. For instance, middle C is 262 vibrations per second. It doesn't matter what instrument plays the note. The frequency of middle C is always 262 vibrations per second.

Note (going up the scale)	Frequency (number of vibrations per second)	
Middle C	262	do
D	294	re
E	330	mi
F	349	fa
G	392	sol
A	440	la
B	494	ti
High C	524	do

The note at the top of the scale has exactly twice the frequency of the note at the bottom. Two notes, one of which has twice the frequency of the other, are said to be separated by an *octave*.

## Winds around the World

We're used to seeing and hearing many wind instruments. Tubas, saxophones, flutes, and clarinets are well known. But there are other wind instruments you may not know about.

Wind instruments all over the world vary in shape and sound. They all use a vibrating column of air to make sound. People throughout the world have tried using different materials to make music. They use what they find in their own lands. That is why many of these instruments work the same way but look different. However, some instruments from different parts of the world look a lot alike, too. Did you know that bagpipes are played in Europe, Asia, and Africa? People have always traded and moved from one country to another. Sometimes this spreads musical instruments to different parts of the world.

The *sheng* is a Chinese wind instrument. It has many pipes and is similar to a harmonica.

The *zurna* is a wind instrument of Turkey. It is similar to an oboe.

The Middle Eastern *nay* and the Swazi *umtshingo* are both types of flutes.

Australian Aborigines play the *digeridoo*. This instrument is a type of trumpet.

*Panpipes*, shown at right, are played in Latin America, Asia, and the Pacific Islands. The pipes are different lengths and are tied together. Each pipe is a simple flute.



Violin



Guitar



Cello

Other pitches can be produced by pressing down on the strings with the fingers. This shortens the strings, making higher pitches.

In wind instruments such as the flute or trombone, sound is produced by a vibrating column of air. Pitch is controlled by varying the length of this column of air.

A flute's pitch is controlled by placing the fingers over the holes in it. This shortens or lengthens the column of air that vibrates inside the flute.







Trombone



Flute



Panpipes



Bongos



Kettledrum

A trombone player's lips vibrate against the mouthpiece when the player blows. The player tenses and relaxes the lips to produce different pitches. The player also controls the pitch by moving a slide back and forth. This changes the length of the column of air inside the trombone.

With percussion instruments such as the kettledrum, sound is made by striking the surface. Pitch depends on the *tension* (tightness or looseness) of the surface. The kettledrum can be tuned to various pitches. This is done by loosening or tightening the surface of the drumhead.

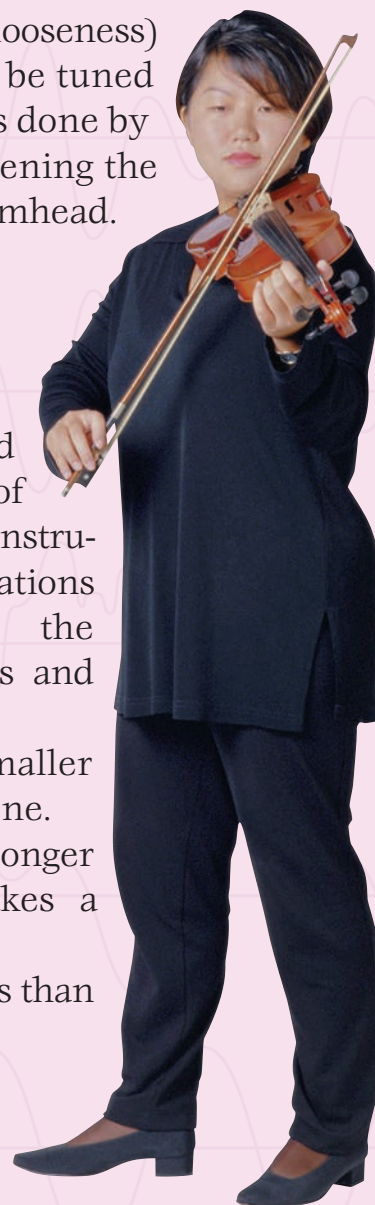
## BIG SOUNDS, SMALL SOUNDS

Tuning varies the pitch of sound an instrument makes. But the size of the instrument is important also. Big instruments generally make lower vibrations than small ones. The smaller the instrument, the faster the vibrations and the higher the sound.

Inside a flute, there is a smaller column of air than inside a trombone.

A cello has a bigger body and longer strings than a violin. It also makes a deeper sound.

Bongo drums make higher sounds than bass drums.



## **Highs and Lows (Physics of Sound – Grade 3) Student Questions**

- 1. What does the author mean by “high” and “low” in paragraph 1?**
- 2. What does author mean by the word frequency?**
- 3. What are three ways that instruments make noise according to paragraph 4?**
- 4. According the article, what are some ways that pitch can be changed?**

5. What does the word frequency in paragraph 2 indicate about pitch?
6. How is pitch changed when using a string instrument?
7. Compare and contrast high and low pitched string instruments versus high and low pitched sounds in a drum.
8. According to the text, how are pitch and frequency related?

## **Highs and Lows (Physics of Sound – Grade 3)**

### **Sample Answers**

- 1. What does the author mean by “high” and “low” in paragraph 1?**

*The author is describing what a sound’s pitch can sound like.*

- 2. What does author mean by the word frequency?**

*The author is talking about the speed of the vibrations coming from the source of the sound.*

- 3. What are three ways that instruments make noise according to paragraph 4?**

*The three ways instruments make sound according to the text are; vibrating strings, a vibrating column of air, or by striking a surface*

- 4. According the article, what are some ways that pitch can be changed?**

*With string instruments the string can be longer for low pitches, and shorter for higher pitches. With wind instruments the column of air is made shorter or longer to change the pitch of the sound. With percussion instruments like drums the drum top can be made looser for low pitch sounds and tighter for higher pitch sounds*

- 5. What does the word frequency in paragraph 2 indicate about pitch?**

*When there is a high frequency sound the speed of the vibrations is faster and makes a high pitch sound. When there is a low frequency sound the speed of the vibrations is slower and makes a lower pitch sound.*

- 6. How is pitch changed when using a string instrument?**

*In a stringed instrument the pitch can be made higher by shortening the string, and making the string longer can lower the pitch.*

- 7. Compare and contrast high and low pitched string instruments versus high and low pitched sounds in a drum.**

*In a string instrument you need to make the string longer for a low pitch and shorter for a high pitch sound. With a drum, you need to tighten the drum to make a higher pitch sound and loosen the drum to make a low pitch sound.*

- 8. According to the text, how are pitch and frequency related?**

*According to the text if there is a high pitch sound being made the frequency will be faster, and if there is a low pitch sound being made the frequency will be slower.*