

# THE HIGHS AND LOWS OF SOUND

## **BENCHMARK AND TASKS**

**SC.C.2.1.2** The student knows that sound is caused by vibrations (pushing and pulling) to cause waves.

- The student recognizes that vibrating is a rapid back-and-forth movement.
- The student produces sound by vibrating objects.
- The student sees that pitch refers to the rate of vibrating.
- The student varies the pitch of a sound by changing the rate of vibrating.

## **KEY QUESTION**

How does the movement (vibration) of various objects affect the sound (pitch)?

## **BACKGROUND INFORMATION**

Pitch is the highness or the lowness of a sound. The pitch of the note played is determined by the length of the bar that is struck (e.g., a xylophone) or the level of the water in the bottle (e.g., musical glasses). The shorter the bar, the higher the note sounds; the longer the bar, the lower the note sounds. In contrast, the higher the water level, the lower the pitch. The lower the water level, the higher the pitch.

## **MATERIALS**

### **Teacher**

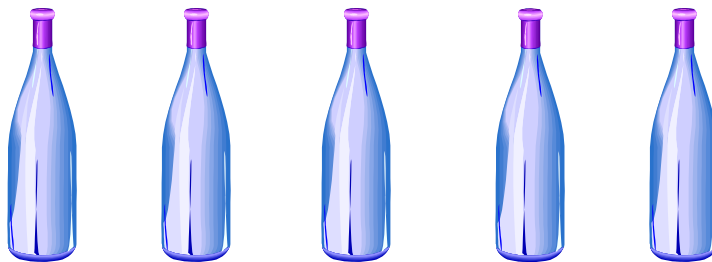
5 identical glass bottles filled to different heights with water  
food coloring

### **Per pair of students**

plastic ruler  
*Ruler Twang* response sheet

## **TEACHING TIPS**

Prepare bottles ahead of time. Bottles should all be the same size. When coloring water, use red and yellow to make orange water, and use blue and yellow to make green water.



## **ENGAGE**

1. Place the 5 bottles with different heights of water on the table and ask the students if the bottles will make a sound if they are hit with a pencil. The students should say, “Yes!”
2. Ask students to predict which bottle will make the highest sound or pitch.
3. Have several students come up to test the bottles using a pencil to cause the vibration. Help them to hear that the bottle with the least water has the highest pitch.

4. With the class, order the bottles from lowest to highest pitch.

### **EXPLORE**

1. Place a ruler on the table so that 10 inches of the ruler is extended beyond the edge. While holding down the end of the ruler against the table, push the extended end of the ruler down and then quickly release it. The ruler will make a “twanging” sound.
2. Ask: *How can you produce a high sound using the ruler? How can you produce a low sound using the ruler?*
3. Have students find a partner for Think/Pair/ Share to consider the question.
4. Give each pair a plastic ruler and each student a Ruler Twang response sheet. Students should follow the response sheet as they explore various sound concepts.

### **EXPLAIN**

1. Encourage the pairs to share their observations with the whole class. Discuss their responses on the *Ruler Twang* sheet. Ask: *What do you think would happen if you twanged the ruler at 8 inches? Why?*
2. Continue questioning to develop the concepts. The word **pitch** refers to high/low sounds. The shorter the ruler, the higher the pitch. The length is short, so it vibrates many times quickly. The faster it vibrates, the higher the pitch. As the length of the vibrating part gets longer, the vibrating slows down; thus the pitch gets lower. The longer the vibrating part, the slower the up-and-down movement and the lower the sound produced.

### **EXTEND/APPLY**

1. Either the classroom teacher or the school music teacher could demonstrate how sounds are produced and controlled in various musical instruments. Have students identify the source of vibrations when the instruments are played. Ask: *What causes the change in pitch on the instruments?*  
Show the students a wind instrument, such as a flutophone or a recorder. Cover all the holes with your fingers and blow through the recorder. While you are blowing, uncover one hole at a time (from the bottom to the top) of the instrument. Ask students to listen to the sounds. Sounds go up the scale. (When the vibrating air column grows shorter as the holes are uncovered, the pitch of the note goes up.) Blow through the recorder again. This time cover the holes with your fingers one at a time from the top to the bottom. Listen to the sounds. Sounds will go lower. (The column of air that is vibrating as you blow is getting longer; therefore, the pitch becomes lower.)  
Demonstrate with a stringed instrument - the shorter the string, the higher the pitch; the longer the string, the lower the pitch.
2. Listen to a piece of music for the variance in pitch. Use a “thumbs up” for pitch that goes up and “thumbs down” for pitch that goes down. Ask:  
*Why would there be a change in pitch throughout a song?*  
(Answers will vary: adds beauty, pleasure, a sense of movement, variety, etc.)

### **EXTENSIONS**

Show students a xylophone. Play the xylophone to demonstrate high and low pitch, hitting notes at random. Demonstrate that small objects vibrate fast and large objects vibrate slowly. Ask them what they heard as you played.

Ask:

*What is causing the sound?*

*What is vibrating?*

*Are the sounds alike?*

*How are they different?*

*What do you think causes the differences in sound?*

Hit two notes on the xylophone. Ask:

*Which note is higher?*

*Which note is lower?*

Do this several times. Ask:

*Which bars make the high notes?*

*Which bars make the low notes?*

Hit notes from low to high. Again, ask students to tell what they observed.

### **ASSESSMENT**

Teacher assessment through observation should include the following criteria:

- tasks have been completed by the student.
- student demonstrates ability to identify the source of a sound and how the vibration affects the pitch of the sound.
- level of detail and specificity found in the *Ruler Twang* worksheet.
- student's answers to questions should show evidence of conceptual knowledge.
- student demonstrates understanding by appropriately using acquired vocabulary.
- student's questions should be probing, on task, or reflect the processing of an essential concept.

## RULER TWANG

(Think/Pair/Share Response Sheet)

1.

How can you produce a low sound with your ruler?  
Draw a picture of the ruler on the table. Write a sentence to describe what you did.

2.

How can you produce a high sound with your ruler?  
Draw a picture of the ruler on the table. Write a sentence to describe what you did.

3. What is the difference with the ruler placement for high and low sounds?

4. Which will produce the highest sound – 3 inches, 5 inches, or 7 inches?

5. Which will produce the lowest sound – 3 inches, 5 inches, or 7 inches?

6. What do you think would happen if you twanged the ruler at 8 inches?