Energy Explorations Outline

Station 3

**Sound Pitch Station**

**Materials:**

Palm Pipes Xylophone

Plastic ruler Ukulele

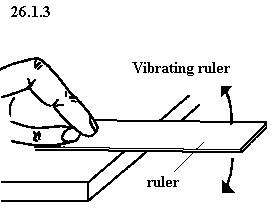
Wavelength/Frequency Graphic Palm Pipe Song Graphics

Decibel meter Decibel meter Graphics

**Introduction to Sound Pitch:**

* Can someone tell me what is sound pitch? *Let students answer. Sound Pitch is how high or low a sound is.*
* What are some sounds that have a high pitch? *Take various answers. Whistle, siren, soprano in choir, flute*
* What are some sounds that have a low pitch? *Take various answers. Bass drum, thunder, tuba, baritone or bass voice in a choir.*
* *Show Graphic #1.* Pitch is the term used to describe the frequency of sound waves.
  + An object that vibrates fast has a high frequency and makes a high pitched sound.
  + An object that vibrates slowly has a low frequency and makes a low pitched sound.

**Activity #1: Ruler & Ukulele**

* **Ruler Demo-**The pitch of a sound depends on what is vibrating. When we change something about what is vibrating, we can change the pitch of the sound it makes.
  + Most musical instruments change the pitch of the sounds they make by changing the length, thickness, tension, or composition of what is vibrating.
  + We are going to change the pitch of this ruler, by changing the length of the ruler.
    - Hold the ruler firmly on the table with about two inches hanging over the edge of the table. Flick the end of the ruler to hear the sound. Repeat if necessary for all students to hear.
    - Gradually repeat, adding two inches at a time to the length of ruler handing off the table. What do you observe as the length of the ruler increases? *As the vibrating end of the ruler gets longer, the pitch gets lower and the vibrations become longer and slower.*
* **Ukulele-**Many musical instruments have strings, columns of air or pieces of metal that vibrate. The pitch is changed by changing the length of the strings.
  + Demonstrate the changing pitch on the ukulele. Hold down one string near the top of the instrument and pluck the string. Gradually move your hand closer to the body, shortening the length of the string that is vibrating. What happens to the pitch? *It gets higher.* Why? *The frequency of the waves is faster.*
  + *Give each student in your group the opportunity to try.*
  + It’s hard to see on the ukulele, but the strings have different thickness. So the pitch can change both by the length of the vibrating string, but also the thickness of the string.

**Activity #2: Xylophone**

* **A Xylophone** is a percussion instrument. Based on what we learned about changing the length of stringed instruments, how does the length of the “bar” affect the pitch? *The longer bars have a lower pitch and the shorter bars have a higher pitch.* 
  + Hit the xylophone and then put your finger on it. Why does the sound stop? *By putting your finger on the metal you stop it from vibrating.*
  + *Allow each student in your group the opportunity to try playing the xylophone.*

**Activity #3 Decibel Meter**

* A **Decibel Meter** is a device that measures sound level by calculating the pressure of the sound waves traveling through the air from a source of noise. **Remember** that sound travels as a compression or transverse wave.
* Turn on the Decibel meter. What is the reading on the meter? *Answer will vary.*
* Bring the meter one inch from the Xylophone’s longest “C” bar. Measure the loudness three times – hitting the bar gently, medium and hard. Discuss the readings.
* Repeat the above activity using the Xylophone’s shortest “C” bar. Compare the results.
* With the decibel meter 1 inch away, hit any bar with medium strength. Note the readings.
* Repeat above with the same bar and hitting strength but move the decibel meter approximately

10 feet away. Compare the loudness. *The reading is greater* *closest to the source.*

* As a group, hypothesis where in the room the sound is the greatest. Using the decibel meter, test the top two places.
* Show students Noise Level Chart. Discuss what happens to your eardrum in the pink and red areas of the chart. The hair cells in your ears can become damaged and or the eardrum loses flexibility and possibly can rupture.

**Activity #4: Palm Pipes**

* So far we have looked at changing pitch on stringed and percussion instruments. *Show students the palm pipes.* We know to produce a sound, we must have a vibration.
* Demonstrate by hitting one palm pipe in the palm of your hand. What is vibrating in this instrument? *The column of air inside the pipe.*
* *Hand out the different palm pipes, one to each student. Have them take turns striking them on their palms.*
  + Observe and discuss how the pitch changes depending on the length.
    - Shorter tubes produce higher pitched sounds
    - Longer tubes produce lower pitched sounds. *Refer students back to Graphic #1.*
    - What instruments can you think of that change the length of a column of air to change their pitch? *Flute, clarinet, chimes*.
  + Compare the shortest key on the xylophone to the shortest of the palm pipes. What do they have in common? *They are the highest notes.*
  + Compare the longest key on the xylophone to the longest of the palm pipes. What do they have in common? *They are the lowest notes.*
  + Which is louder? Why? *The xylophone because solids conduct sound better than air.*
  + Form a band by organizing the students to play a simple song using Palm Pipes Song Graphics. *If you do not have enough students in your group, you can play some of the palm pipes too.*

**Complete Student Worksheet Questions:**

*Note to Leaders: Ask these questions to the students. Do not just give them the answers. If incorrect answers are given, talk the students through the correct answer. You may need to refer back to the definition.*

What is the frequency of a sound wave called? **PITCH**

As a string or air column gets shorter, its pitch becomes **HIGHER.**