Energy Explorations Outline

Station 3

**Sound Pitch Station**

**Materials:**

Set of “Palm Pipes” (hollow PVC tubes) Xylophone

Plastic ruler Plastic dishes

Pencils, unsharpened Rubber bands (#33 size work well)

Wavelength/Frequency graphic Palm Pipe Song graphic

**I. Introductions**

**II. Review of Important Ideas**

1. Sound energy travels in waves.

* Sound waves are produced when something vibrates and the vibrations travel through a medium such as air, solid and liquids.
* All waves can be described by their wavelength and frequency.
* Wavelength is the distance between waves.
* Frequency is the number of vibrations per second.

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.

1. 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.
* 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 or air columns.

**III. Activities and Demos**

1. **Ruler Demo/Activity** – Demonstrate and then have students try. Hold the ruler with about 2 inches hanging over the edge of the table. Place one hand firmly on the ruler at the table’s edge and flick the end of the ruler to hear the sound. Gradually add an inch at a time to the length of ruler hanging over the edge of the table. Observe the sound difference as the length of the ruler increases.

* The pitch will become lower as the length of the vibrating part of the ruler increases.
* As the vibrating part of the ruler becomes longer, the vibrations will become slower and more clearly visible.

1. **Rubber Band/Dish Activity** – *Start out with the rubber band stretched around the longest part of the plastic dish with the pencil acting as the “bridge”. Pluck the rubber band when the pencil is closest to the end of the dish, making the vibrating rubber band the longest possible. Observe the sound made. Give students the dishes and demonstrate how to gradually shorten the length of the vibrating rubber band by continuing to move the pencil.*

* The pitch will increase as the pencil shortens the length of the rubber band that is vibrating.
* Discuss how musical instruments such as guitars use this concept.

1. **Xylophone** – Strike the different keys on the xylophone. How does the length of the “bar” affect the pitch? *The longer bars have a lower pitch and the lower 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.*
2. **Palm Pipes Activity** – *Demonstrate by hitting one palm pipe in the palm of the hand.*

* This can be used as a musical instrument. It doesn’t have strings. So what is vibrating? (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
* Try organizing the students to “play” a simple song.

*Discuss how musical instruments such as flutes and chimes use this concept.*

* 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? *The xylophone-solids conduct sound better than air.*

**IV. Closing**

A. Students return materials to the table.

B. Fill in booklet or worksheet.

C. Farewells and reminders.

D. Straighten up and re-set station.

*Question(s) in student booklet:*

The frequency of a sound wave is called its  **PITCH** .

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