The Science of Sound

Lower Level

Standards:

K.GM.Cn1.A 1.GM.Cn1.A 2.GM.Cn1.A

Demonstrate how interests, knowledge, and skills relate to personal choices and intent when creating, performing, and responding to music (such as expressing personal preferences in music or how music is used in daily life).

Objectives:

Part 1: How does sound work?

- Discover the science behind sound
- Define resonance

Part 2: How does the human ear work?

- Discover how the auditory system functions
- Draw a sound wave traveling through the ear

Part 3: How do instruments work?

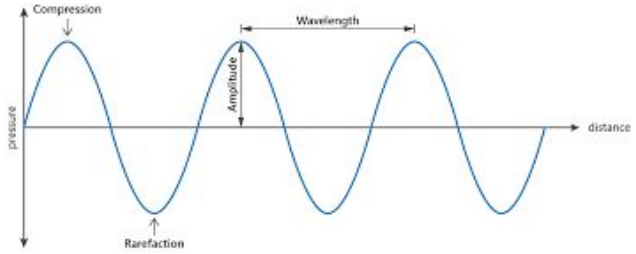
- Discover the four instrument families
- Create a new instrument

Parents & Guardians-

This packet is designed for your PK/K/1st/2nd grade scholar to complete

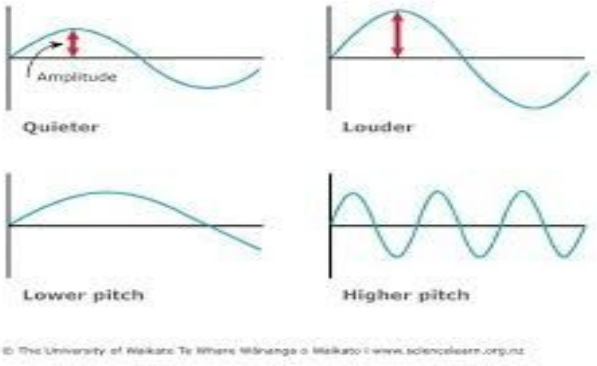
How Does Sound Work?

Sound is made when something **resonates**, or vibrates in a medium, like air or water. We call the vibrations made **waves**. These sound waves consist of **compressions** and **refractions-** areas of high and low. The picture below shows a traveling sound wave. Although they're invisible, we can see how they push on air and other objects.



Sound waves are measured from peak to peak. A human voice's wavelength is just over three feet long. The length of the sound wave determines the **pitch** (how high or low the sound is). The longer a wavelength is, the lower the pitch. The shorter a wavelength is, the higher the sound is.

Amplitude, or how loud or quiet a sound is, is measured by the "height" of the wave at its peak. Greater amplitude means a sound will be louder.



To see how sound waves can travel through air, water, and solid objects, try this experiment. Make sure to ask an adult for help before you start!

You will need:
A bowl
Plastic wrap
A large rubber band (big enough to go around your bowl)
A spoonful of sugar or salt

What to Do:

1. Wrap a sheet of plastic wrap over the bowl so that it's tight, and secure with the large rubber band. Be sure that the plastic wrap is tight and does not sag.

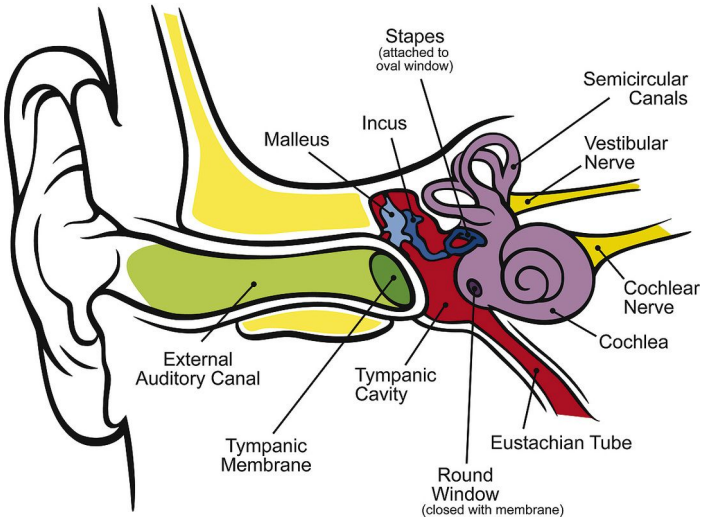
2. Place a tiny pinch of the sugar or salt crystals on the top of the plastic wrap, towards the middle.

3. Get close to the sugar crystal and say something loudly! What happens to the crystals? Do they move?

4. Experiment with louder and softer words or sentences to watch the sugar crystals react to the sound vibrations!

While you might think it's your breath making the crystals jump and move, but it's actually the sound vibrations. Try different sounds besides ordinary speech and see how the crystals come to life!

How Do My Ears Work?



Have you ever wondered how sound makes it from the source to your brain? Or how your brain interprets sounds? You can thank your auditory system for being able to do that.

The **auditory system** has two parts: your ears and your brain. Working together, they turn sound waves into electrical signals in milliseconds so you can hear.

The **pinna,** or **outer ear** is the part that we can see. Your outer ear is made of cartilage, which makes it flexible. It's cup-shaped, so that sound waves in the air can movel into the ear canal.

The **middle ear**, or auditory canal ends with your **tympanic membrane,** or ear drum. This membrane is very thin, and works just like a drum head. When sound waves hit it, it begins to **resonate**, or vibrate with the sound wave.

On the other side of the ear drum are three **ossicles**- the smallest bones in your body. They are the **incus,** (ink-us) the **malleus** (mal-ee-us) and the **stapes**. When they begin to vibrate, they amplify the sound, or make it louder for the inner ear.

The **inner ear** has the organ called the **cochlea** (co-klee-ah), which is snail-shaped, and filled with fluid. When the sound wave hits the cochlea, the basilar membrane inside begins to resonate, causing the fluid inside to move. Tiny hair-like cells called **stereocilia** (ste-re-oh-sill-ee-ah) turn the resonance into electrical signals. The **auditory nerve** takes these electric signals to the brain.

All of this takes 0.05 seconds- less than a blink of an eye!

1. Draw a sound wave moving through the ear.

We have two ears to help us determine the direction of sound. Try this: cover one ear while you're listening to music, watching tv, or listening to the radio. Then, cover the other. Were you able to hear the direction of the sound as well?

How Do Instruments Work?

All instruments resonate. **Resonance** is the vibration of sound through a medium, like air or water. When you hit, shake, strum, or blow air into an instrument, you create resonance by pushing the air with **sound waves.**

There are four main groups, or **families** of instruments. They are **strings**, **woodwinds**, **brass**, and **percussion.**

The Strings Family includes instruments that have strings, like violins, guitars, banjos, and harps. Most of these instruments are strummed or plucked, like the guitar, banjo, and harp. The violin family (which includes the violin, viola, cello, and bass) use a **bow.** Bows look like sticks, and have a length of **horsehair** on them.. This hair sticks to the strings as it's pulled across, and creates a unique sound.

The Woodwind Family relies on air to create resonance. Flutes and piccolos need air blown across the mouthpiece. Other instruments in this family, like clarinets, saxophones, oboes, and bassoons, use a **reed** to split the airstream, creating the sound.

The Brass Family also rely on air to create their sound, Unlike the woodwinds, brass instruments use **valves** to help change pitch. These instruments include trumpets, trombones, french horns, and tubas.

The Percussive Family are instruments that are hit, shaken, or scraped to create sound. This family is the largest of the instrument families. Drums, maracas, triangles, xylophones, bells, and more make up this diverse group of instruments.

People all over the world have created instruments out of lots of different things- like vegetables, wood, metal- even animal skin and bones.

Instructions:

Create your own instrument.

Instrument name: _____

How do you play your instrument? Circle your choice(s)

- Blow into a mouthpiece
- Hit shake scrape
- Pluck bow strum
- Something else: _____

What is your instrument made out of?

_____

Draw a picture of your instrument.