Hearing & Sound

How this relates to the curriculum:

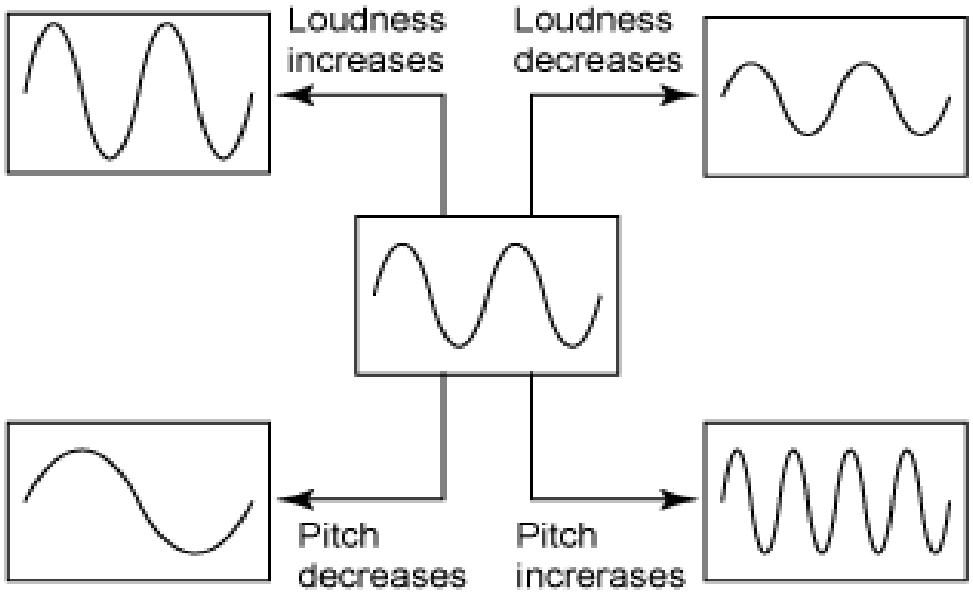
This relates to the Grade Four Hearing and Sound Unit. It can also be suitable to the Grade 1 Senses Unit, but they may not be aware of the more scientific names so try to keep to the basics as much as possible.

Introduction:

Tell the students to close their eyes and listen. Ask what they hear? Maybe they hear cars, or maybe tree rustling, or maybe people talking, or maybe the furnace.

All these things that they hear are called sounds. Sounds can come in many forms like music, noise, speech, etc.

So let's explain sound in a more scientific way. What comes to mind when we say waves? Ocean, light, sound, ripples? Sounds are made from waves like waves on an ocean. The loudness of a wave is due to its **amplitude**, or how big a wave is. The **pitch** (how high or deep) of the wave is due to its frequency, or how fast the source is vibrating. Rarely do we hear perfect waves; usually we hear a mixture of waves which makes the wave that enters our ears choppy. These mixtures of waves are unique to each noise we hear. Our brain is able to pick these choppy waves apart and, using our memory, can tell what is making the noise.



Materials:

- **1 Slinky**

Use the **slinky** to demonstrate to the class what a wave looks like.

1. Have each volunteer hold the slinky at each end and create a wave. Show how the amplitude and wavelength can be manipulated.
2. Ask them what a loud sound would look like and show them on the slinky.
3. Ask them what a quiet sound would look like and show them on the slinky.
4. Ask them what a high pitched loud sound would look like and show them on the slinky.

<u>Activity 1: Mystery Sounds (20 Minutes)</u> ***If you have a younger class or are short on time feel free to cut down on how many sounds they need to identify.***

Materials:

- Paper (supplied by class, 1 piece per student)
- Candy/Prizes (optional)

Have the kids write the numbers from 1-15 on their pieces of paper. Play the sound effects and see who can guess the most right. Make sure to pause after every sound to give them a chance to

think about what they are hearing.

Here is a link to the video for your own reference:

https://drive.google.com/file/d/0B-735-drF418ZkZTb0phZmpyd0U/view?usp=sharing

https://www.youtube.com/watch?v=srOizJrb8Ik (links are not working at the moment, however the sounds are embedded on slide 8, you should be able to click on the volume icon and play the associated sound on the presentation directy)

1. Bats*
2. Bees
3. Water draining/Bubbles
4. Cat
5. Chains
6. Chainsaw
7. Electric sparks/Taser
8. Fire crackling
9. Heartbeat
10. Leaves rustling
11. Lightning (or Thunder is more accurate)
12. Wind
13. Howling Wolf/Dog/Coyote (the breed used was a pug, if someone could detect that, then that's amazing ;))
14. Glass breaking
15. Bell

You can give them the answers at the end of the activity or give each answer as you go (if you

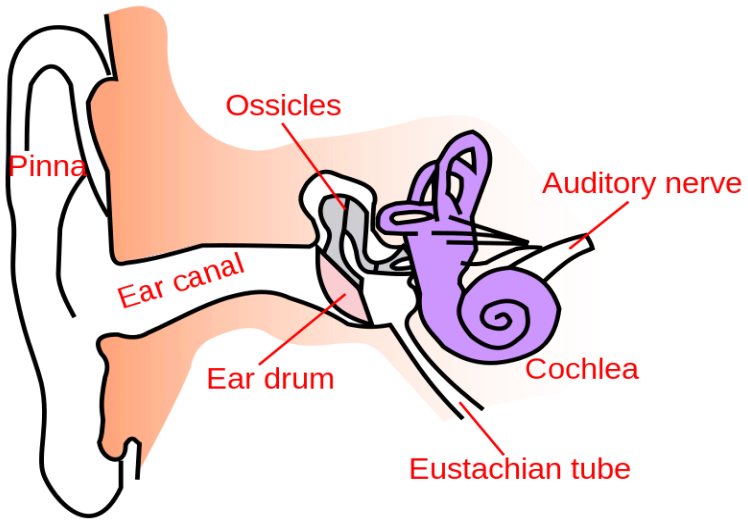
choose to hand out candy then it would be better to list the correct answers at the end).

**Most kids will think sound number one is a squeaky wagon, but explain to them that 'unfamiliar' sounds can sometimes be mistaken for more familiar ones. How does this apply?* Sometimes our memory doesn't work in the case of the unfamiliar sounds like that of bats flying out of a cave as we heard earlier!

How do our ears work?

(https://www.hearinglink.org/wp-content/uploads/2016/02/Human-Ear-Diagram.jpg = another picture to help since it is hard to draw.) Our ear is like small drum. These sound waves travel into our ear and hit a little membrane called the eardrum. The eardrum is connected to small bones and when the eardrum vibrates it makes the small bones vibrate too. (FUN FACT: These are the smallest bones in your body!) The last bone is connected to another drum on an organ that looks like a snail, called the **cochlea**. When that drum vibrates it makes the fluid inside the cochlea move tiny little hairs. Nerves can sense these hairs movements and send the signal to the brain, which interprets the sound from our memory and knowledge.

FACT: OTHER PARTS INSIDE YOUR EAR HELP YOU STAY BALANCED



<u>Activity 2: Pop Bottle Resonance (5 Minutes)</u>

Materials:

- 2 Pop bottles with differing amounts of water in them

Video Events

1. A bottle is filled with water ¾ to the top.
2. Air is blown over the bottle.
3. Water is poured out and air is blown over the bottle again. The sound is lower in pitch than the previous
4. Step 3 is repeated twice more and the pitch slowly decreases each time.

Discuss: Which bottle produced the high and low sounds? Why?

Explain how resonance works. By blowing air across the top of the bottle, you cause air particles to move inside the bottle. These particles, if traveling at the correct velocity, will create a wave in the bottle, and as we already learned, waves make sound. The less water there is inside the bottle, the larger wave that will be produced. The larger wave will have a lower sound (pitch) because of the lower frequency (or wavelength) of the wave being produced.

Different sizes of bottles and different materials (glass or plastic) can also produce different pitches of sound. The opposite happens if you tap a bottle because the water is what vibrates vs the air in the experiment.

More water = smaller space to form the wave and therefore higher frequency (less space between waves)

Activity 3: Demonstration of How the Eardrums Work

Materials:

- **Plastic Bowl**
- **Plastic Wrap**
- **Elastic Band**
- **Bag of salt**

We are going to make a model of how the eardrum (also called the “tympanic membrane”) in our ears work and see how exactly sound travels through air.

Video Event:

1. A piece of plastic wrap is placed over a plastic bowl and an elastic band is used to secure it to the cup. This plastic represents the eardrum.
2. 2-3 teaspoons of salt is placed on top of the plastic wrap.
3. A when a sound is made, the salt jumps up and down.

   Your voice produces sound waves (changes in air pressure) that causes our plastic wrap to vibrate and the salt to move. Sound waves vibrate the eardrum in much the same way.

Activity 4: Tuning forks (10 Minutes)

Materials:

- Tuning Forks (4)
- Pen/Stick - supply your own

Video clip

Play only 30 seconds of the clip (from 0:08 to 0 38)

Each tuning fork is made to produce a particular note, like a key on a piano or guitar! Hitting the fork causes it to vibrate, but we can't see the vibrations. The vibrating fork causes a sound wave to travel through the air, and into our ears. *(Bang the fork with a pen, stick or just against a table if need be for all to hear).* Each tuning fork produces a different sound, and can be used to help tune pianos or other instruments.

Since sound waves travel through the air, hitting the tuning fork close to the ear will make it sound different than hitting it far away *(Close to the ear will induce a humming tone).*

Activity 5: Harmful Noises

If you have time you can brainstorm with the kids about good and bad noises. Make a chart on the board and have them list off noises that can hurt your ears.

Most harmful noises are loud. Explain that any loud noise that you are exposed to for a long period of time or hear the noise often can cause hearing damage. That is why you should not listen to your iPod or music very loud. Noise is measured in decibels; a typical conversation is around 60 dB which you can listen for a long time before it hurts you. Listening to your music at

loud volumes can reach up to 100 dB and can cause permanent damage after only 15 minutes a day! Really loud noises like thunder, fireworks or a gunshot can cause immediate damage to your ears.

If you damage your ear by listening to a loud noise for a long time you can wreck particular areas of the ear, especially the cochlea. If part of the cochlea is damaged, you may never be able to hear a particular note again.

Brainstorm on ways to protect your ears, such as wearing hearing protection if you are working in a loud environment, or turning down you music.

(One example is to wear earplugs when I go to loud concerts.)