

## **S4P1-2: Sound and Light**

Dates: 10/19 – 11/19

### *Key Terms*

Light<sup>1</sup>

Transparent<sup>2</sup>

Translucent<sup>3</sup>

Opaque<sup>3</sup>

Reflection<sup>3</sup>

Refraction<sup>3</sup>

Lens<sup>2</sup>

Convex lens<sup>3</sup>

Concave lens<sup>3</sup>

Prism<sup>2</sup>

Spectrum<sup>2</sup>

Color<sup>1</sup>

ROY G BIV<sup>2</sup>

Rainbow<sup>1</sup>

Vibration<sup>2</sup>

Sound<sup>1</sup>

Sound wave<sup>2</sup>

Pitch<sup>2</sup>

Frequency<sup>3</sup>

Loudness<sup>2</sup>

Loud<sup>1</sup>

Soft<sup>1</sup>

High<sup>1</sup>

Low<sup>1</sup>

Attributes<sup>2</sup>

Physical<sup>2</sup>

Varied<sup>2</sup>

### *Framework for Teaching:*

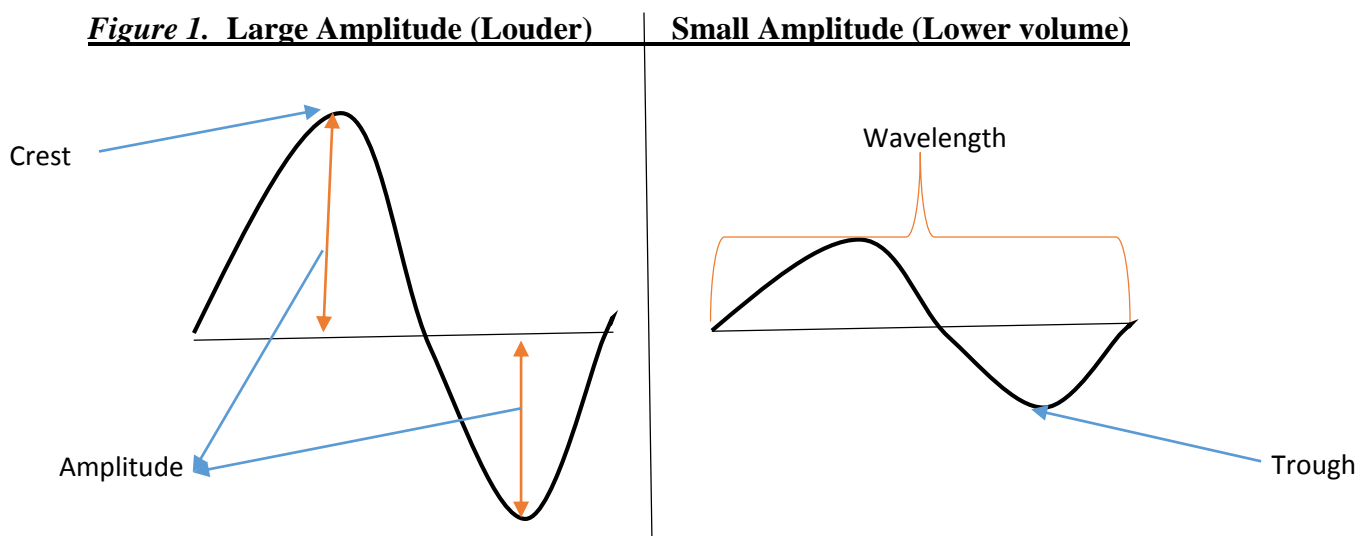
#### **Students Will Be Able To:**

1. Describe light using multiple examples.
2. Classify materials as transparent, opaque, and translucent.
3. Compare and contrast physical attributes of materials to understand why they are transparent, opaque, and translucent.
4. Classify materials as reflective or non-reflective.
5. Use a mirror and light to predict where the reflected ray will end up.
6. Describe and classify lenses as concave or convex.
7. Describe the attributes of a prism.
8. Compare and contrast concave lenses, convex lenses, and prisms.
9. Explain real world uses for concave lenses, convex lenses, and prisms.

10. Describe the relationship between vibrating objects and sound.
11. Relate the rate of vibration of an object to the characteristics of sound due to varied speeds of vibrations.
12. Relate pitch to frequency (vibration speed) and Loudness (volume) to amplitude.

**For the teacher to know for their own understanding and to avoid misconceptions:**

1. Waves transfer energy NOT matter. Although ocean waves appear to move water, it is actually energy that is transferring through the water. If ocean waves moved water instead of energy the waves would continue to move the water completely over the land.
2. Light is an electromagnetic wave and sound is a mechanical wave. Mechanical waves require a medium to travel (particles to vibrate). With no medium (i.e. vacuum) sound will not travel. Light can travel in space (i.e. vacuum).
3. Sound travels fastest through solids because the particles are closer together. Sound travels slowest through gases.
4. Light is a transverse wave and sound is a longitudinal wave. These are descriptions of the wave shapes.
5. Explicitly state certain conditions that cause pitch to vary. The faster the vibration the higher the frequency and therefore the higher the pitch.
6. The speed of sound cannot change unless it changes mediums (solid, liquid, gas). The reason the speed of sound can't change in the same medium (for example a string) is because as the frequency increases the wavelength decreases. The formula is wave speed = frequency x wavelength. If one goes up the other goes down therefore causing the wave speed to remain constant. Speed of sound can change if the sound moves from one medium (e.g. air) to a different medium (e.g. water).
7. The parts of a transverse wave are the crest and trough. The amplitude and wavelength describe both transverse and longitudinal waves. Figure .1 has two transverse waves.
8. Refraction is the bending of light and reflection is when light bounces off a reflective surface. Mirrors are considered opaque because light cannot move through them. Lenses are considered transparent because the light moves through a lens.
9. Concave lenses ALWAYS produce smaller images. Convex lenses can produce images that are larger, smaller, or the actual size (this depends on how far the lens is from what is being looked at).



### **Activities (Suggestions)**

- ✓ Sounds of Science (Picture Perfect)
- ✓ Mirror, Mirror (Picture Perfect)
- ✓ Lab: Path of Reflected Light (pg. 174 in text)
- ✓ Lab: Making Sound (pg. 158 in text)

### **Notes:**

This unit has vocabulary that is meant to be classified (e.g. transparent, translucent, and opaque). The intention of studying light and sound is to give students an introduction to the real world applications of waves. This introduction is key to students being able to build foundational knowledge. Waves are very abstract because they transfer energy (which is abstract) so using light and sound to draw interest leads students to make inferences about sound and light. These inferences must be guided using academic vocabulary otherwise students may develop misconceptions in upper grades. Lastly students must be able to visualize and draw the path of light. They must understand that materials vibrate to produce sound (i.e. strings, pipes, etc.). Both sound and light can be represented with pictures.