USE HALLWAY AND/OR OUTDOORS

“Noise” vs. “Music” or sound waves

* Have one student volunteer … have him/her stand in the middle of the crowd of students
* Another student volunteers to stand on the outside of the crowd and read a statement in a normal tone of voice.

“Mary had a little lamb. Her father shot it dead. And now it goes to school with her between two hunks of bread.”

* Now have the crowd stand silently while the person reads the statement again to the person in the center.
  + NOISE: ***no recognizable wave pattern; waves have different f and λ***
  + MUSIC: recognizable wave patterns; wave have similar f and λ

# “Doppler Effect”

* Have students form a group in the middle of the hall.
* Have another student ride his skateboard from one end of the hall to the other … while making a noise at a consistent volume (or have him/her hold a noise device)
* Have the group describe how the sound changes as the skateboarder approaches them and then goes away from them again. ***As the skateboarder approaches you the pitch (frequency) increases because the waves are compressed together. As he/she goes away from you, the pitch decreases because the waves spread out again. As wavelength decreases (gets shorter), pitch (frequency) increases or gets higher.* If there is time, draw a picture to represent the Doppler Effect.**

# “Refraction of Sound” *(cold air should make one speak louder)*

* Have one student volunteer to be set apart
* The rest of the class spread out every ten paces in groups of two or three down the hallway … it is important that students remain silent in their groups.
* The lone student speaks very softly until the first group can hear him/her but not the next group down the hall. The first group raises their hand to let the speaker know that they heard.
* The speaker then speaks **louder (more amplitude)** until the first and second groups hear, but not the third group.
* Continue this process until all the groups can hear by adding one more group each time.
* Take the group outside and mark off the same distance between the groups and have the student repeat the process again.
* Ask the student if they spoke at the same **volume (amplitude)** in both settings.

# USE CLASSROOM

# “Diffraction of Sound”

* Use the guitar to demonstrate “beats” by making one of the two strings for the same tone a little out of tune
* “**Beats**” are produced by **interference** when the frequency and wavelength are slightly different

# “Reflection of Sound”

* An echo is an example of reflected sound … describe an echo
* If possible find a room with good “acoustics” which will echo
* Why can you hear an echo on a mountain top?

# LIGHT WAVES

# “Reflection of Light”

* Have students use glass in the cupboards and shelves at sides of the room
* Can they see themselves in the glass? Why?
* Turn off half the lights. Is their reflection more clear?

# “Diffraction of Light”

* Have students sit in their seats.
* Open the classroom door fully
* Turn off the lights and have students observe one type of diffraction
* Have students describe how the light enters the room (does it come in straight like “rays” or does it kind of “**bend**” around the corner and “pour in”?)

# “Refraction of Light”

* Can students think of or find any examples of light changing color when passing through a substance? (e.g. *the rainbow passes through water vapor; light passes through a “prism” – a clear piece of glass with some thickness)*
* The color change is produced by the **light waves slowing down** in a different substance or material than air.
* **White light** is when **all the wavelengths of light are blended together** and bleach out all the other colors … this is similar to “noise” for sound waves.