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Seeing Sound Worksheet Answer Key

Instructions: At each activity station, complete the questions below.

Station 1: Oobleck Dance

1. Observe how oobleck responds to a range of low-frequency sounds. At which frequency does oobleck dance most wildly?

   The answer depends on the consistency of the oobleck, but expect it to be in the range of 30-60 Hz. At frequencies higher than 60 Hz, Oobleck dances much less.

2. Do sound waves need high or low amplitude in order for oobleck to dance? How can you tell?

   Oobleck responds best to high amplitude waves (produced by high volume). If the volume is lowered, oobleck dances less.

Station 2: Sound Visualization

1. Can you see that sound is a wave? How can you tell?

   Wave-like patterns are visible in the grain or water when the petri dishes are touching a speaker.

2. Can you feel that sound is a wave? How can you tell?

   When touching the speaker, vibration can be felt. The vibration of the speaker causes the air to move in a wave that our ears can sense.

3. How do high- and low-frequency sounds change what the water (or grain) looks like?

   Patterns are seen in the water (or grain) so long as the volume is sufficiently turned up. These patterns change with the frequency of the sound.

4. Do high-frequency sounds have long or short wavelengths?

   High-frequency sounds have short wavelengths.

Station 3: Testing homemade Speakers

1. How does the yogurt cup speaker make sound? How do you hear this sound?

   Full answer: The electric current running through the magnet wire creates an electromagnet with positive and negative poles, just like any other magnet. The stereo constantly changes the direction of the current (with changes in the music), and therefore the positive and negative ends of the electromagnet keep changing. The electromagnet coil is thus sometimes attracted to, and sometimes repelled from, the permanent magnet. So, the coil moves towards or away from the permanent magnet, and vibrates the yogurt cup as it moves. The cup, in turn, vibrates the air around it, creating a sound wave that reaches your ears. This sound wave vibrates your eardrums, which is interpreted by your brain as sound.

   Simple answer: The electromagnet coil jumps when the music is played, which makes the yogurt cup speaker shake. When the speaker shakes, a sound wave is created that travels to your eardrums. This tapping on the eardrum is translated as recognizable sound by your brain.

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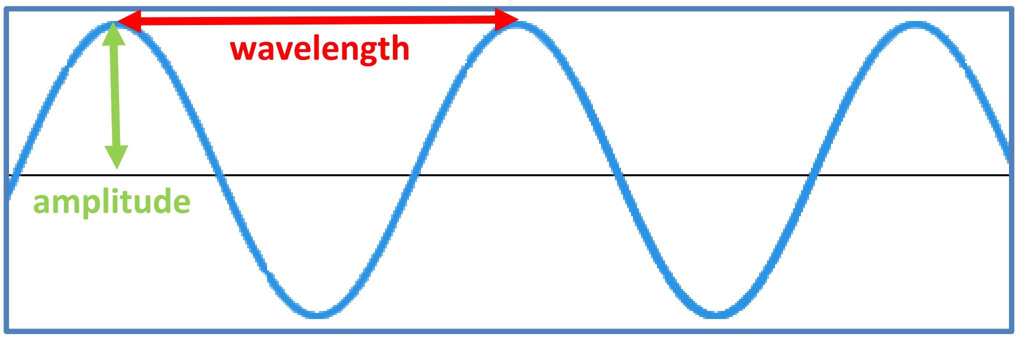
2. Using the materials in the box, how were you able to amplify the sound from the yogurt cup speaker as much as possible? What did you discover?

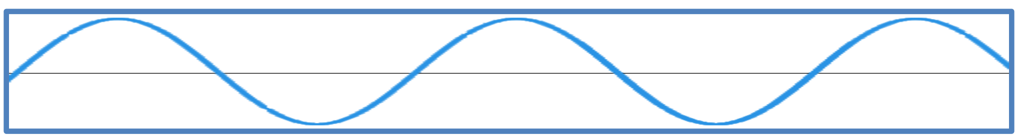
   Many possible answers. Often Styrofoam amplifies more than paper, but creates a "tinny" sound because the foam is stiff enough to vibrate substantially. Stacks of foam cups and bowls often produce very loud speakers. Alternatively, paper plates do not vibrate very much and so do not amplify very well. The shapes and orientations of the objects matter, too. For example, a foam cup amplifies more if pointed outward rather than inward.

Station 4: Practice Problems

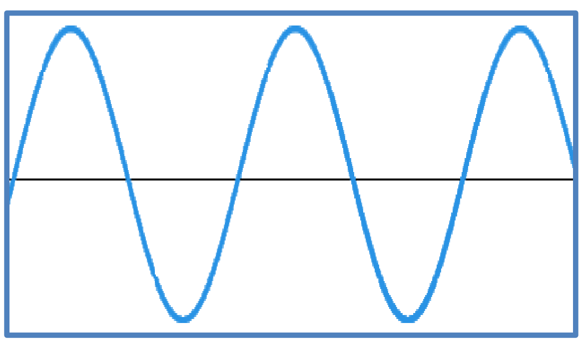
1. Label amplitude and wavelength on the drawing of Wave 1.



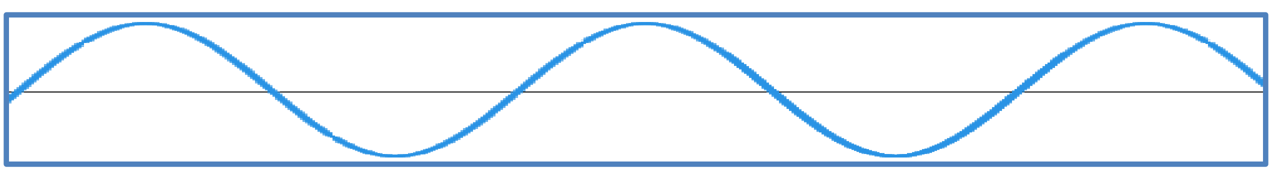
2. In the box below, draw a wave with the same wavelength as Wave 1, but lower amplitude.



3. In the box below, draw a wave with higher frequency than Wave 1, but the same amplitude.



4. In the box below, draw a wave with lower frequency and amplitude than Wave 1.



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Station 5: How Do Stringed Instruments Make Sound?

1. Take a length of string and pull it just tight enough to hear a sound when the string is plucked by a teammate. Is this a high- or low-frequency sound? Does this sound have high or low pitch?

   This is a low-frequency sound, and has low pitch. ____

   ____

   ____

2. Pull the string tighter. Does this sound wave have higher or lower frequency than before? Is the pitch higher or lower than before?

   The frequency and pitch are both higher.____

   ____

   ____

3. If you pluck the string more strongly so that the sound is louder, what happens to the sound wave?

   The wave amplitude increases. ____

   ____

   ____

4. Pluck the string on top of a petri dish with water. Do you see evidence that the sound made by the string is a wave?

   Patterns are seen in the water that look like ripples. These ripples are caused by sound waves moving through the water. ____

   ____

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5. Why do you think stringed instruments have many strings, some tighter and looser?

   The tighter strings make high-frequency noises while the looser strings make lower frequency noises. When several of these strings are played together, we can play a musical chord! (Like on a guitar.) ____

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