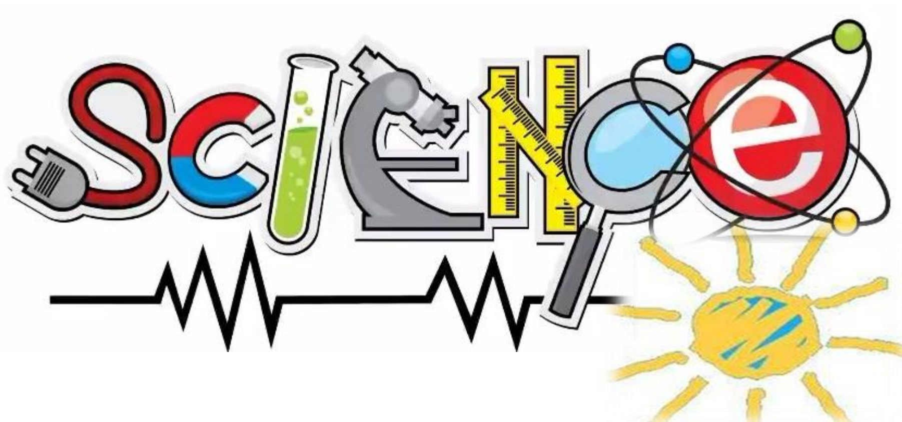
Name ________________________

1st Grade Science Remote Learning Packet

Week 5



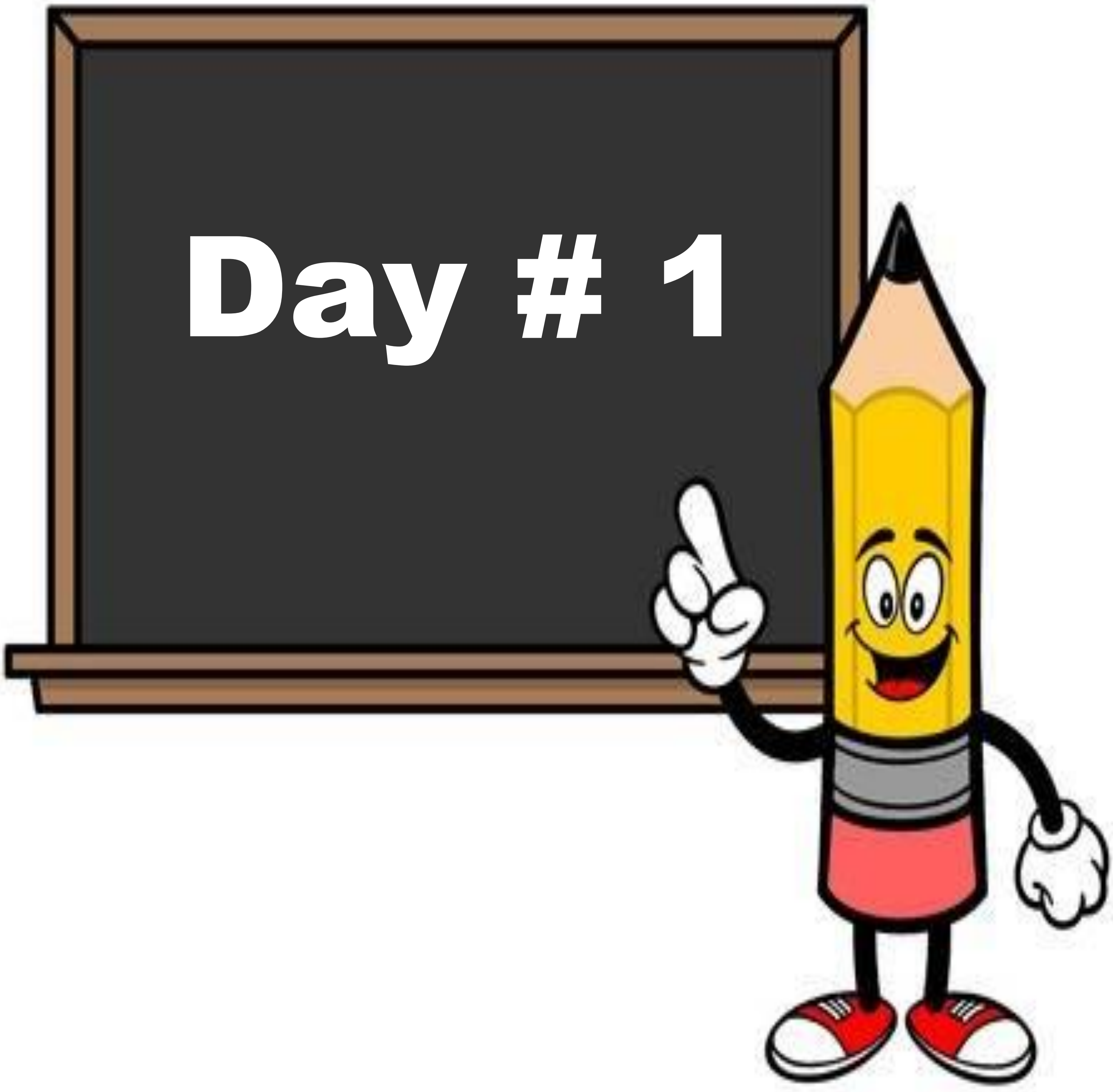
Dear Educator,

My signature is proof that I have reviewed my scholar's work and supported him to the best of my ability to complete all assignments.

______________________________ ______________________________

(Parent Signature) (Date)

Parents please note that all academic are also available on our website at www.brighterchoice.org under the heading "Remote Learning." All academic packet assignments are mandatory and must be completed by all scholars.


Day # 1

Name: ______________________________ ______Week 5 Day 1 Date: ___________________

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Exit Ticket: Where do sounds come from?

When Sato strummed the guitar, what happened to the string to make the sounds, or music?

a) The strings are making noise.
b) The strings are vibrating.
c) The strings are moving.

Head Harp

Learn a little string theory.

Wrap a string around your head and pluck it to play music.
Keywords:

vibration
instrument
sound
string

Tools and Materials

A piece of string at least 3 feet (1 meter) long

To Do and Notice

Place the middle of the string behind your head, pull the string across your ears, and hold the two free ends together in front of your face. The string should cross over the opening in each ear. Pluck the string, and listen to the tone it makes.

You can hear your string, but the sounds are so quiet you will not disturb other people even if they are close to you.

How can you change the sound? Pull the string tighter, or make it looser, and listen to the change in pitch. Change the length of the string by sliding your hand along the string while keeping the tension as constant as possible. Then listen to the change in pitch.

What's Going On?

In this activity, you can actually hear how a string's frequency of vibration depends on its tension and length. When you pull the string tighter, you increase the tension in the string, so the pitch of the sound you hear increases. When you keep the tension constant and decrease the length of the string, the pitch also increases.

You're hearing the resonant frequencies of the string. The frequency is inversely proportional to the length of the string, and proportional to the square root of the tension in the string. The different pitches you hear are produced by the different frequencies of the vibrating string. High-pitched sounds are produced by higher frequency vibrations, and low-pitched sounds are produced by lower frequencies.

Going Further

Many city bus services do not allow people to play loud music on buses. We find that if you wrap a string around your head and play music, not only will you abide by city laws, but you'll find yourself with more room as others move away from you.

 

Pipes of Pan

When you hold a seashell to your ear, you can hear a steady roar.

This simple construction allows you to separate the hum of background noise into some of its different frequencies.

Keywords:

instrument
music
resonance
frequency
pitch
friend
exhibit-based

Tools and Materials

- 11 cardboard tubes from paper towel rolls (other cardboard tubing, or even PVC pipe can also be used, in sufficient quantity to make the pipes described in Assembly Step 1)
- 2-foot (60-centimeter) length of wood board (exact width or thickness is not critical; the board shown in the photos is a piece of ordinary 1 x 3 pine shelving, which is actually 2 1/2 inches wide and 3/4 inch thick)
- Scissors (or a hacksaw or PVC cutter if you are using PVC pipe)
- Tape
- Hot glue gun and glue sticks (not shown)

Assembly

1. Cut and tape the cardboard or plastic tubing to create six tubes of varying lengths. For example, you could make tubes that are 1/2 foot, 1 foot, 1 1/2 feet, 2 feet, 2 1/2 feet, and 3 feet (15 cm, 30 cm, 45 cm, 60 cm, 90 cm, respectively). If you are using 11-inch paper towel tubes, you can keep things simple by taping whole and half sections together to create pieces that are 1/2 tube, 1 tube, 1 1/2 tubes, 2 tubes, 2 1/2 tubes, and 3 tubes in length.

2. Use hot glue to attach the tubes to the board in order of size, as shown in the photo above.

To Do and Notice

Listen through each tube and compare the sounds you hear. (This activity works best in a room with a fair amount of background noise.)

The background noise in a room is a mixture of many sounds with different pitches. Normally, these pitches blend, but you can separate them by listening through different tubes. Notice that you hear high-pitched sounds in the shorter tubes and low-pitched sounds in the longer tubes. Which tubes give the loudest sounds? Which give the softest sounds?

Listen to how the sounds change as you move your ear up against the end of the pipe, so that the end is actually sealed off by your ear.

What's Going On?

Most of the sounds we hear are mixtures of many different frequencies. For example, at any one time, you may be hearing the sounds of voices, traffic, pigeons, wind, machinery, and your own footsteps. Each of these sources itself consists of a range of frequencies.

Pipes of Pan uses the principle of resonance to separate sound into individual frequency components. Any object has a frequency or set of frequencies, called its natural frequencies, at which it "likes" to vibrate. For example, a pendulum swinging by itself, with no pushing, will always oscillate at the same frequency. You can change this natural frequency by changing the length of the pendulum. In fact, an object's natural frequency, in general, depends on its size: The bigger it is, the more slowly it tends to vibrate.

In this Snack, the “object” that’s vibrating is the air inside the tubes. The longer the column of air in the tube, the more slowly it tends to vibrate. Because each tube has a different length, it selects out a different set of frequencies from the mishmash of background noise, and ignores the other frequencies. When you put your ear to the longest tube, you hear the lowest frequencies; when you listen to the shortest tube, you hear the highest frequencies, and so on.

When you close off one end of the tube with your ear, the resonant frequencies become even lower. The lowest resonant frequency of a tube closed at one end is half that of the same-length tube open at both ends. An explanation of why this is so is beyond the scope of what we can reasonably include here, but it is commonly covered in many high school and college physics texts.

Going Further

Pan pipes—the ancient musical instrument used worldwide—also consist of an array of tubes of different lengths. The air inside these pipes is set into motion by blowing into the pipes, instead of by nearby sound sources. (Otherwise they wouldn’t play very loudly!) The Exploratorium’s full-sized Pipes of Pan exhibit could also be played this way—but only by a 30-foot-tall piper!

Organ pipes are also an array of different-sized tubes. Air is blown into these pipes, causing them to produce sounds. All aerophones (woodwinds and brass instruments) operate on the same principle: They are single tubes whose length can be changed by a musician using valves, slides, or keys.

Your ear contains a resonant tube as well—open on the outside and closed on the inside by the eardrum. The resonances of this tube affect the range of sounds you can hear.

Name: ______________________________________Week 5 Day 1 Date: ___________________

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1. Draw a musical instrument making sounds.

2. The instrument makes sounds by…