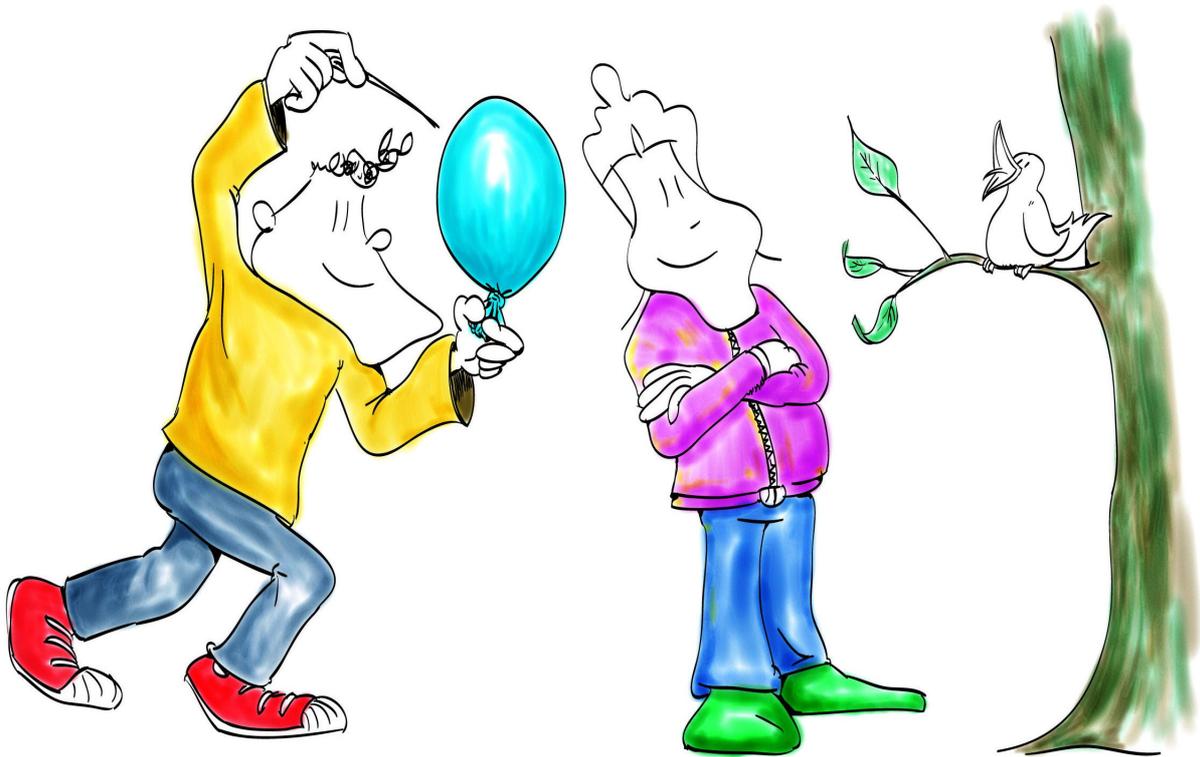


Unit I. What is sound?

Key Question: What is sound?



Student name:

Class:

.....



<http://www.cma-science.nl>

Activity 1. How are sounds made?

It is not difficult to make sounds but sometimes it is difficult to see how they are made.

- Collect the following objects: an elastic ruler (metal or plastic), a tuning fork, a drum, a rubber band stretched around a box, a bottle half filled with water.
- Use these objects to produce sounds.
- Investigate how these objects make sounds.

The following questions will help you in your investigation:

- How do I make the object produce the sound?
- What is the object doing as it produces the sound?
- How long does the sound last?
- How can I stop the sound?
- How can I make the sound louder?
- How can I make the sound higher?

OBJECT HOW TO MAKE SOUND	HOW DOES THE OBJECT MAKE SOUND?
Ruler Hold one end of a ruler on the edge of a table. Push down on the other end, and let it go.	
Tuning fork Strike a tuning fork. (Tip: To feel touch the ends of fork. To see place the tuning fork on the surface of the water.)	
Drum Tap the drum. (Tip: To feel touch the drum. To see place tiny pieces of paper on the drum).	

Rubber band (stretched around box) Pluck the rubber band.	
Bottle (filled with water) Blow across the top of the bottle	

1. Can you find any similarities between the ways these objects produce sound?

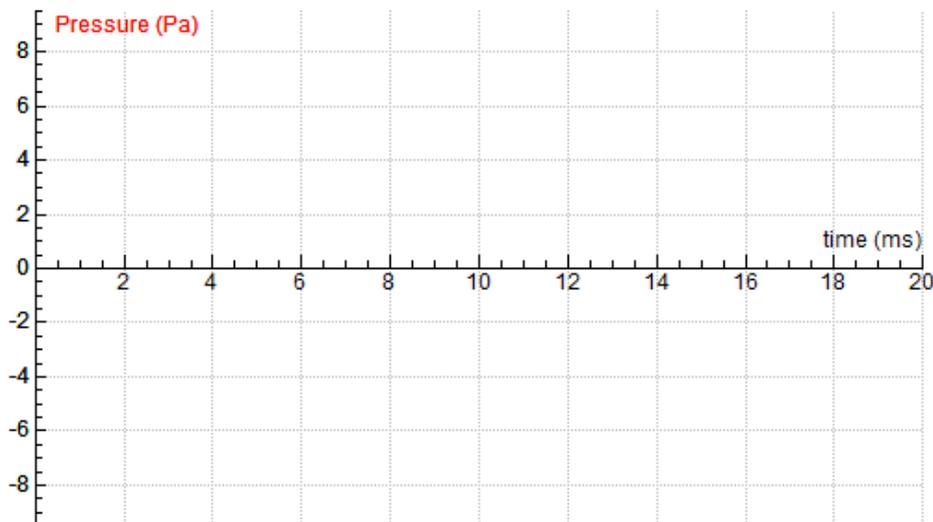
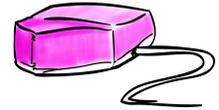
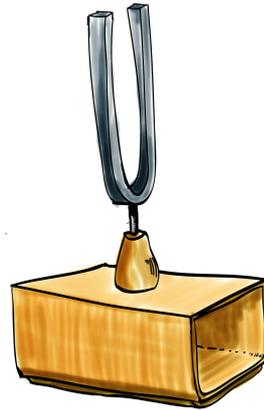
I think sound is produced _____

2. Can sound move things? Give examples.

Activity 2. Make sound visible

With the €Sense sound sensor and the computer you can make sound visible. A sound sensor is built-in in €Sense. Can you tell where the sound sensor is located?

- Place a tuning fork near the €Sense.
- Strike the tuning fork and start the measurement.
- On the graph you see a picture of the recorded tuning fork sound. This picture is called sound waveform. Draw this picture below.



3. Describe this graph in your own words.

4. Look for a pattern in the graph that repeats. Make a drawing that shows this pattern.

5. Can you call this pattern a vibration? Why?

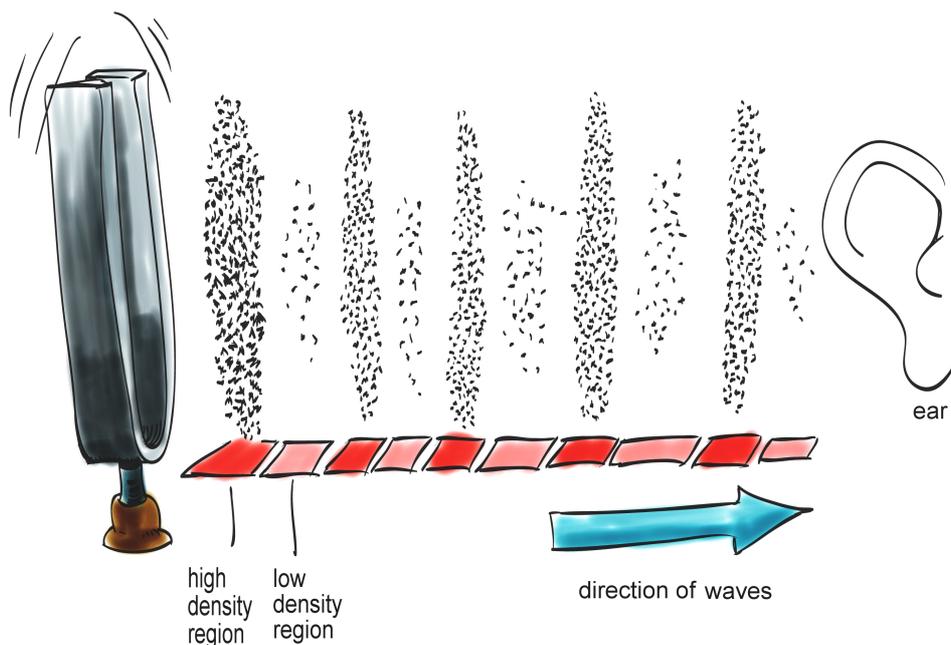
6. How many vibrations appear in the recorded sound graph?

Explanation

The patterns in the sound graph are a record of sound vibrations.

A vibration means moving back and forth in a regular way. In this case the forks of the tuning fork vibrate and move the air molecules around. The air molecules vibrate and they bump the molecules next to them. This creates a pattern of high and low-density regions, in which air molecules are crowded together or spread apart. The sound pattern travels through the air. It is the "bumping energy" that moves across the room, not the air molecules! Sound travelling through air is just like 'the wave' that fans do in a big sport arena. The wave of people standing up and sitting down travels quickly around the arena, but of course no *people* actually travel ... just the energy of their wave.

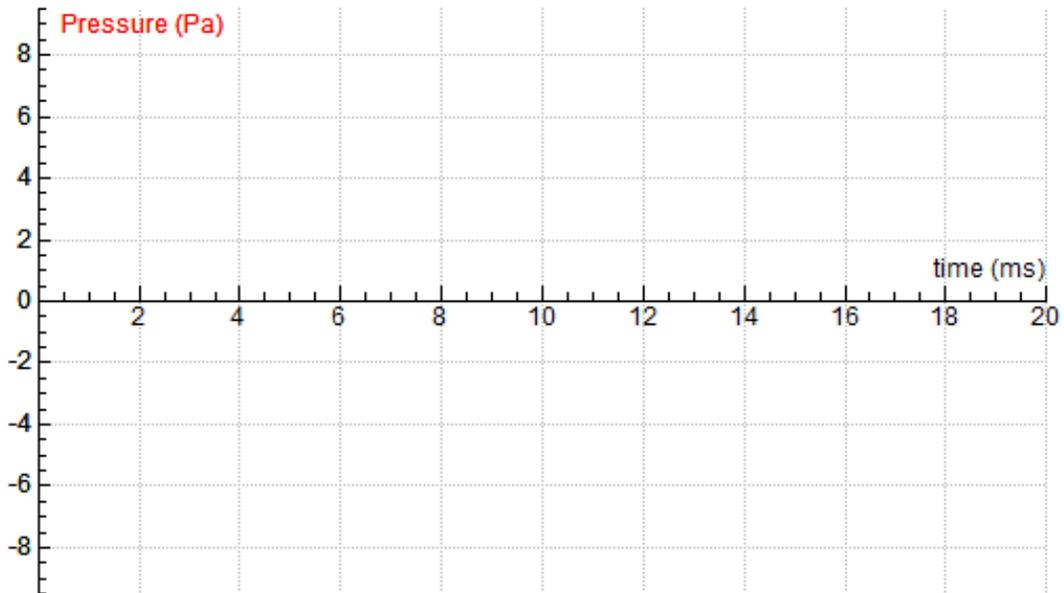
When these vibrations come to your ear you hear it and when it comes to the sound sensor it makes the sound sensor vibrate. Via the computer these vibrations are recorded and displayed on the screen.



● How do you think the recorded sound waveform fits the picture above? Try to draw the sound waveform on the top of this picture.

Activity 3 – Changing sound - hard and soft

- Hit the tuning fork hard and record the sound waveform.
- Draw with a blue pen the recorded waveform in the graph below.
- Then hit the fork softly and record the sound once more. Make sure to keep the same distance between the tuning fork and the sensor. Draw the new sound waveform in the graph below but now with a red pen.



7. Compare the blue and red sound waveforms, how do they differ?

8. How many vibrations appear in the blue and how many in the red graph?

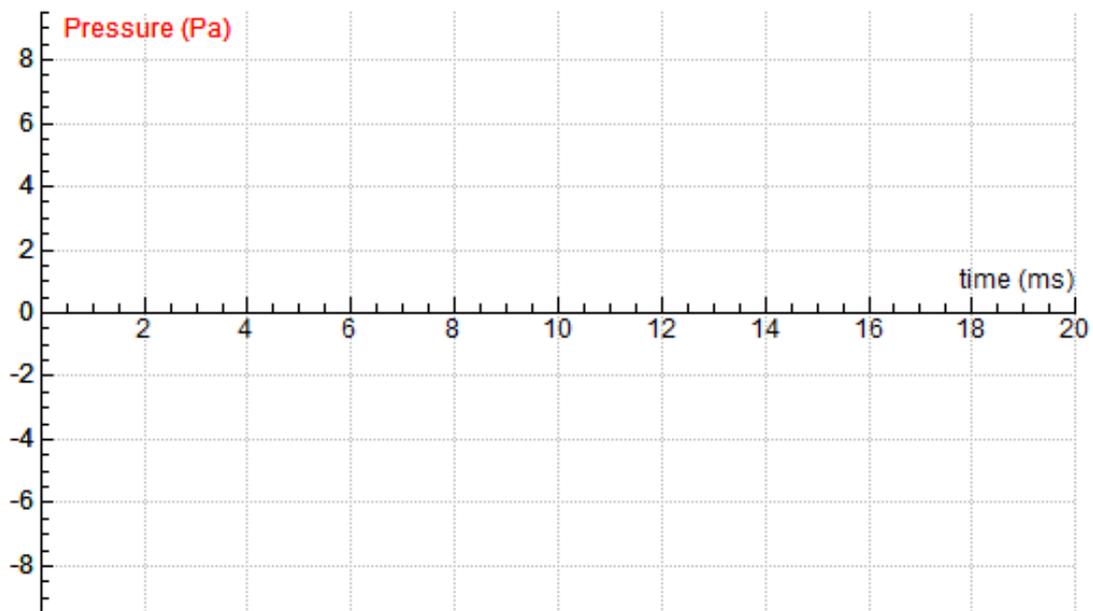
9. What do you think, what feature in the sound waves shows you how loud the sound is?

Check your hypothesis by changing the loudness of the sound and comparing the recorded sound waveforms.

Activity 4 – Changing sound - high and low

In this experiment you will use two tuning forks of different tunes.

- Hit the first tuning fork, then the second tuning fork. Compare the sounds. Which tuning fork gives a higher-pitched sound? _____
- Strike the first tuning fork and record the sound graph.
- Draw with a blue pen the recorded sound waveform in the graph below.
- Then strike the second tuning fork. To make fair comparisons try to get sound of the same loudness. Record the sound and draw its sound waveform with a red pen.



10. Compare the blue and red graphs. How many vibrations appear in the blue and how many in the red graph?

11. What do you think, what feature in the sound waveform shows you how high the sound is?

Questions

- A.** In the picture below you see a sound waveform of a loud sound.



Draw below the waveform of the same sound but played softer.

- B.** In the picture below you see a sound waveform of a high-pitched sound.



Draw below the waveform of a low-pitched sound.