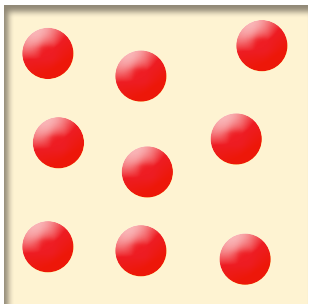
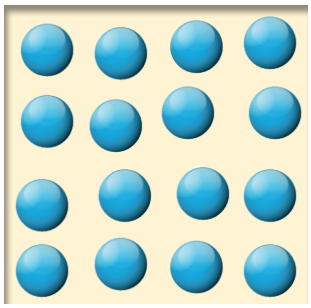
Can You Hear Me Better Now?

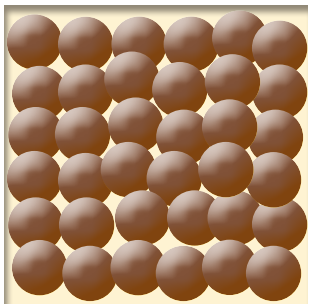
To reach our ears, vibrations, or sound waves, must travel from the source of the vibrations through something.



Air molecules are mostly made up of gases. There are spaces between the molecules.



Water molecules are closer together than air molecules.



The molecules in a solid are packed tightly together.

The molecules in water are closer together than in air. This allows sound waves to move through them much faster than through air molecules. The molecules in a solid are even closer together. Sound waves can move through a solid faster than through air or water.

You may have made a paper cup telephone before using two paper cups attached to each other by string. With the string held taught (stretched tight) the vibrations spoken into one cup would have travelled along the string to the other cup and into the ear of the other person.

Knowing that sound vibrations travel well through solid objects, what do you think will happen to sounds if they travel along different thicknesses of string in a paper cup telephone?

Would the sound be clearer or louder if the telephone were made with thin cotton thread? What about if it's made with thicker string or rope?

Let's Investigate

Apply your knowledge and predict what might happen before you start your experiment.

I predict that .....

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Equipment:

- Two paper cups
- Cotton thread
- String
- Raffia
- Rope
- A map pin
- Scissors
- Notebook and pen

Method:

1. Cut all of the thread, string and rope to 2 metres long.
2. Carefully use a pin to make a small hole in the base of each paper cup. Starting with the thinnest thread, pass each end through the holes in your cups and secure with a knot.
3. In a quiet setting and holding a cup each, stand with a partner so that the thread is taught.
4. Partner 1, whisper a short message into your cup. Partner 2, with your ear to your cup, listen to the short message. Record what you heard and how well you heard it. Repeat the short message three times to make the test fair.
5. Undo the knots in your thread and take your paper cup telephone apart.
6. Next, choose the next thickest thread or string to test. Adjust the hole in your cups, making it slightly bigger by carefully using your pin or scissors.
7. Assemble your paper cup telephone in the same way as you did with your first thread, securing the string in place with a knot. Make sure the length of the string between the two cups is the same as during the first test.
8. Repeat the whispering test. Ensure your string is taught and the volume at which you speak is the same. Record your results. Keep repeating with the other thicknesses of string or rope.

To make this test fair, every part of the experiment needs to stay the same, apart from the thickness of your string.

Results:

Type of string/thread	What did you hear? Was it quiet or loud? Was it clear or muffled?	Compared to the previous test, was it quieter or louder? Clearer or more muffled?

Conclusion:

My results show that .....

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What questions do you have about sound vibrations and how sound travels?

How could you investigate this further? .....

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