

Sound ▪ *Design Your Own Lab*

Changing Pitch

Problem

When you blow across the mouth of a bottle, you can play a “note.” What determines the pitch you hear?

Skills Focus

developing hypotheses, controlling variables, designing experiments

Suggested Materials

1-L soda bottle

2-L soda bottle

250-mL graduated cylinder

metric ruler

straw

water

Design a Plan  Review the safety guidelines in Appendix A.

1. Practice making a sound by using a straw to blow across the mouth of a 1-L bottle. Then blow across the mouth of a 2-L bottle in the same way. Compare the pitches. Record your observations in your notebook.
2. Add 250 mL of water to both the 1-L bottle and the 2-L bottle. Blow across the mouth of each bottle, and compare the pitches. Record your observations in your notebook.
3. Analyze your observations from steps 1 and 2 to predict what may have affected the pitches. For example, measure the height of the air column, and calculate the volume of air in each bottle. (*Hint:* Subtract the volume of water in the bottle from the total volume of the bottle.)
4. Develop a hypothesis about what determines the pitch of the sound produced by blowing across the mouth of a bottle. Record your hypothesis in your notebook.
5. Design an experiment to test your hypothesis. Create a data table to record information about the variables. Write your plan. (*Hint:* You can change the height of the air column in a bottle by changing the amount of water in the bottle.)
6. After receiving your teacher’s approval of your plan, conduct your experiment and record the results in your notebook.

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Analyze and Conclude

Write your answers in the spaces provided.

1. **Observing** Describe the pitch of the sound produced by each bottle in Steps 1 and 2.

2. **Designing Experiments** Did your experiment support your hypothesis? Explain.

3. **Controlling Variables** Identify the manipulated and responding variables in your experiment.

4. **Inferring** If you had a 1-L bottle that contained 250 mL of water, what would you do to produce a higher-pitched sound?

5. **Drawing Conclusions** What is the relationship between the height of the air column and the pitch of the sound produced by blowing across the mouth of a bottle?

6. **Communicating** Based on your results, describe how you could use a set of bottles as a musical instrument.



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Changing Pitch *(continued)*

More to Explore

Use a set of tuning forks or a pitch pipe to “tune” five bottles to match the notes C, D, E, F, and G. What can you conclude about the pitches of the five notes from the height of the air column in each bottle? Use the bottles to play the following notes: E D C D E E E D D D E G G E D C D E E E D D E D C.