

**Chapter 6 Humans in the Biosphere****Observing Decomposition****Introduction**

More and more people are starting to put garbage in their gardens. You might think this practice would endanger health, smell bad, and damage the garden. But if it is done properly, it is safe, free of unpleasant odors, and beneficial to plant growth. Thanks to the action of helpful bacteria (which are often assisted by burrowing creatures such as worms), the garbage breaks down to form a dark-colored, nutrient-rich substance called compost. In this investigation, you will explore the process of making compost.

**Problem**

How can garbage be changed into compost?

**Pre-Lab Discussion**

Read the entire investigation. Then, work with a partner to answer the following questions.

1. Why can you assume that the decomposer bacteria need air in order to break down the materials in the bottle?

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2. What else besides air do the bacteria need to make the compost?

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3. Why can you infer that the bacteria causing unpleasant smells are harmed or killed by oxygen?

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4. Why should you tell your teacher if the contents of the bottle start to become warm?

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5. Do you think the height of the contents of the bottle will change over time? Explain your reason.

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**Materials** (*per group*)

2-L clear plastic soda bottle  
small nail or push pin  
scissors  
topsoil  
150-mL beaker  
scraps of paper  
grass clippings

weeds and leaves  
uncooked vegetable  
and fruit scraps  
glass-marking pencil  
cheesecloth  
rubber band  
plastic fork

foam meat tray  
plastic gloves

## Safety



Wear your goggles and laboratory apron at all times during this investigation. Use caution with the nail and scissors to avoid cutting yourself or others. Be careful to avoid breaking the glass beaker. Wear plastic disposable gloves and wash your hands well with soap after working with plant material, soil or compost. Note all safety alert symbols next to the steps in the Procedure and review the meaning of each symbol by referring to Safety Symbols on page 8.

## Procedure

1. Carefully poke holes in the sides and bottom of the soda bottle with the nail. Use Figure 1 as a guide. **CAUTION:** *Be very careful and take your time.* Take turns making the holes—there are many to make.

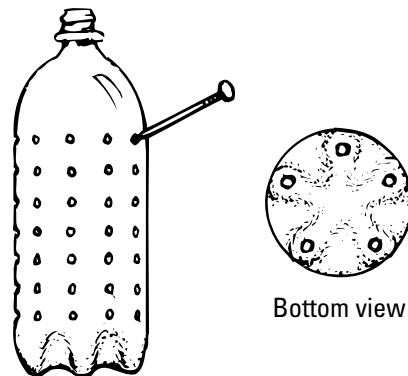


Figure 1

2. Using the nail, poke a large hole near the top of the bottle at the point where the sides become vertical and the plastic thins out. Starting this hole, carefully cut off the top of the bottle with the scissors as shown in Figure 2. **CAUTION:** *Be careful when working with sharp objects.*

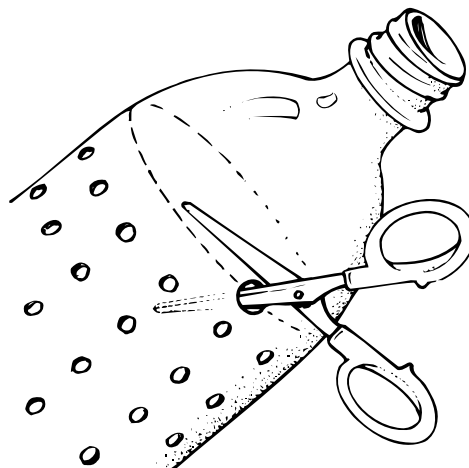
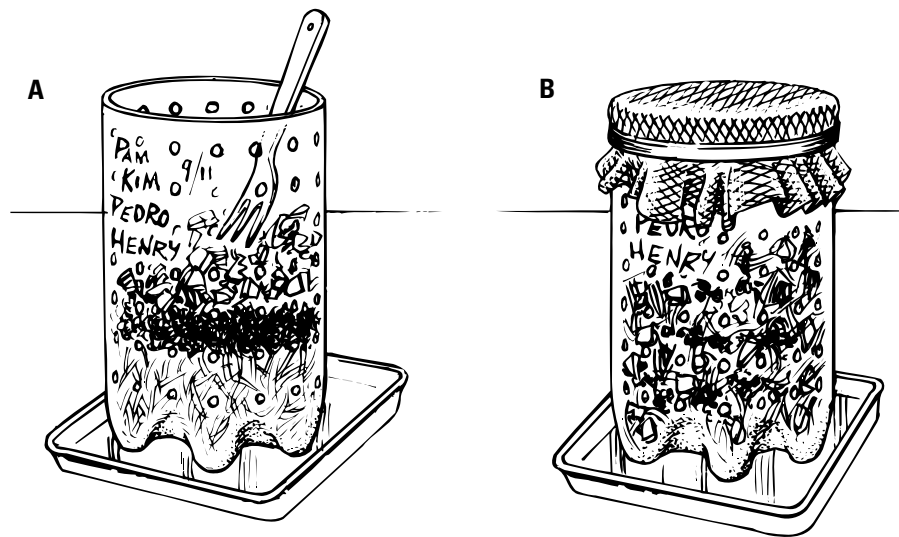


Figure 2

3. Label your bottle with the names of the people in your group and the date. Then put the bottle on the meat tray as shown in Figure 3A.
4. Fill the bottle about one-third full with grass clippings. Add 100 mL of soil, then 20 mL of water. The contents of the bottle should be moist but not soaking wet. If the contents are still dry, add a little more water. **CAUTION:** *Wear plastic gloves when handling plants. Be sure not to break any glassware.*
5. With the scissors, cut the paper, leaves, weeds, and vegetable and fruit scraps into pieces no larger than 1 cm across. Fill the bottle about one-half full with the cut-up materials.
6. Use the plastic fork to mix the contents of the bottle well. If any materials fall onto the meat tray, lift the bottle, remove the tray, and dump the tray's contents into the bottle. Then put the tray back under the bottle.
7. Make a mark on the outside of the bottle to indicate the height of the contents. Cover the bottle with a piece of cheesecloth. Secure the cheesecloth with the rubber band (see Figure 3B). Then place the bottle in a warm location. **CAUTION:** *Wash your hands well before leaving the laboratory.*



**Figure 3**

8. Twice a week, observe the contents of the bottle. Touch the sides of the bottle and note whether the bottle feels warm or cool to the touch. **CAUTION:** *If the bottle feels hot, notify your teacher immediately.*
9. After you have made your observations, add some water if the contents are dry. Once a week, mix the contents with the fork and mark their height on the side of the bottle. Write the date next to the new mark. Make sure you replace the cheesecloth when you have finished making your observations. **Note:** *If the contents start to smell bad, like rotten eggs or vinegar, mix the contents every time you make your observations.*

## Analysis and Conclusions

1. **Observing** How did the contents of the bottle change over time?

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2. **Observing** How did the level of the bottle's contents change over time?

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3. **Observing** How long did it take for the contents of the bottle to finish decomposing?

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4. **Observing** What does your "finished" compost look like?

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5. **Inferring** How did the materials in the bottle change?

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6. **Inferring** Some decomposer bacteria use oxygen, a substance that makes up about 21 percent of the air you breathe. Others do not use oxygen, but are not harmed by it. Still others are slowed down or even killed by oxygen. What can you infer about decomposer bacteria and making compost?

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7. **Inferring** If the materials in a compost heap are not mixed regularly, it may start to smell bad. Explain why this might occur.

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8. **Predicting** Predict what would have happened if the bottle and the materials in it had been sterilized. Would your results have been the same?

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## Going Further

Design an experiment to test how the formation of compost is affected by one of the following factors: light, heat, moisture, air.