

Diffusion

Overview: Everything living produces some sort of odor. Flowers use them to entice bees to pollinate them. We know that the tastes of foods are enhanced by the way that they smell. As humans, each of us even has own unique odor. In this lab, we look at the diffusion of scents. They start in one place, but often end up spread around the room and can be detected by many people.

Materials

- onion
- lemon
- ground cinnamon
- garlic (fresh, one clove)
- garlic press
- coffee grounds (fresh)
- kitchen knife (with adult help)
- cutting board
- fan (variable-speed)
- stopwatch or clock with a second hand
- assistants

Experiment

1. Start in a room big enough so that you can prepare the foods at one end and your friends or family members can be at the other end, but positioned so they can't see what you're doing.
2. On a new sheet of paper, create a map of the room showing the locations of your partners, the source of the odor, and the fan (which will help with the scent diffusion). Create a new map for each smell. This will be your data table as well.
3. Turn on the fan and begin with the onion. Ask an adult to help you with cutting the onion into several small pieces. Be sure to hold the chopped pieces up in front of the fan. Ask your partners to raise their hands when they smell the onion. If they don't smell it, they can leave their hands down.
4. Note on the onion map where its smell is detected. Indicate with a line the farthest area where the onion is smelled. This is its leading edge.
5. Check in with your partners once per minute for five minutes. Ask them to raise their hands and repeat the process of noting the areas where the smell is detected. Each time you check, draw a line to indicate the farthest area the smell reaches. This will give you an idea of how fast and how far the smell diffused.
6. Repeat steps 3 and 4 with each item: cut and smash the lemon and press the garlic.

Reading

Many factors affect how quickly odors diffuse. First, the air is constantly moving. As the air molecules in the room are colliding with each other (and with the odor molecules) they help to move the smells farther through the room. Second, the fan makes a huge difference. It accelerates the natural process of air and odor molecules and moves them much farther and faster than they would go otherwise. Finally, the air temperature plays an important role. If the temperature is higher, the air and odor molecules will move faster.

As humans, we can boast about 10,000,000 smell cells in our noses. This seems pretty impressive...unless you compare us to canines. Dogs have more than 200,000,000 smelling cells in their nasal cavities!

Exercises

1. Which odors travel the farthest?
2. Which ones travel the fastest?
3. Why do we use the fan?
4. Does air temperature matter?

Answers to Exercises: Diffusion

1. Which odors travel the farthest? (answers vary – check your data table)
2. Which ones travel the fastest? (answers vary – check your data table)
3. Why do we use the fan? (It accelerates the natural process of air and odor molecules and moves them much farther and faster than they would go otherwise.)
4. Does air temperature matter? (The higher the air temperature, the faster the air and odor molecules will move.)