

# *n* Is for Number Pressure and Number Density

Name \_\_\_\_\_

Date \_\_\_\_\_ Period \_\_\_\_\_


## Purpose

To explore how number density affects gas pressure.

## Materials

- handout—Earth's Atmosphere
- 2 ring stands
- 2 burette clamps
- approximately 3 ft of clear tubing
- wash bottle
- uncapped large syringe
- balloon
- cork
- water

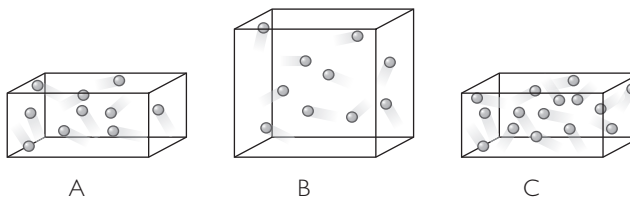
## Safety Instructions

 Wear safety goggles for Part 2.

## Part I: The Atmosphere

Use the handout on Earth's atmosphere to help you answer these questions.

1. Give two reasons why the air pressure decreases as the altitude increases.
  
2. Use the kinetic theory of gases to explain why the gas pressure increases as the number of gas molecules in a container increases. Assume that the temperature does not change.
  
3. The illustrations show three samples of air at the same temperature. List the samples in order of increasing gas pressure. Explain your reasoning using the kinetic theory of gases.

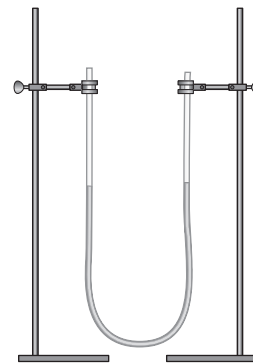


4. The number of gas molecules per unit of volume (such as  $1 \text{ cm}^3$ ) is called the number density of a gas. List the three samples of air in Question 3 in order of increasing number density.

## Part 2: Balancing Air Pressure

### Procedure and Questions

1. Hold the two ends of a piece of plastic tubing so that it forms a U shape with both ends pointing up.
2. Use a wash bottle to fill the tubing with water so that it reaches a level about halfway up each side.
3. Use two ring stands with burette clamps to hold the tubing when you want to free up your hands.
4. Find three ways to get the water levels to stay at different heights. Do not use your mouth on the tubing. You can use the syringe, cork, and balloon if you wish. Describe or draw a diagram of each.



5. In general, is there greater air pressure on the side where the water is higher or on the side where it is lower? Explain your thinking.
6. Is the number density of the gas,  $n/V$ , greater on the side where the water level is higher or on the side where it is lower? Explain your thinking in terms of the kinetic theory of gases.
7. Suppose you have water levels at equal heights. You put a stopper on one side and leave the other side open. The next day, the water level on the open side is lower. Has a high or low air pressure system moved in? Explain.
8. **Making Sense** Explain how air pressure is related to the number density of a gas.