Graham's Law of Diffusion
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Description: Graham's Law of diffusion is illustrated qualitatively in this demonstration. A porous cup, connected to a flask containing water, is immersed in a hydrogen atmosphere. The diffusion of hydrogen through the cup causes an increase in pressure, which forces water out a bent section of glass tubing.

Materials: 250 mL Erlenmeyer flask. and two-hole stopper
Porous ceramic cup (AP1312 in Flinn Sc.) and one-hole stopper
Tall beaker (or cut-off 2-L plastic bottle) and glass tubing
Hydrogen gas (or helium gas from a balloon)

Procedure: 1) Set up the apparatus as shown below.
2) Invert and fill the tall beaker with hydrogen.
3) Immerse the porous cup in hydrogen and observe.
4) After the water spout dies out, remove the tall beaker and direct the students' attention to the water remaining in the flask. Bubbles will be rise from the tube.
5) Ask your students to explain their observations.

Discussion: In order to explain what is observed, the concept of molecules must be applied. Kinetic molecular theory states that, at the same temperature, all gases have the same kinetic energy. Therefore the lighter hydrogen molecules travel faster on average and hit the pores in the cup more often than the heavier air molecules. This results in hydrogen passing into the cup faster than air flows out, and the pressure inside the apparatus increases. The opposite occurs when the hydrogen filled beaker is removed.

Hazards: Hydrogen gas is flammable and should always be handled with extreme care. Don't let anyone slip on a wet floor.

Clean-up: Mop up the wet spot.

Reference: Shakhashiri, B.Z., *Chemical demonstrations: A Handbook for Teachers of Chemistry, vol. 2,* The University of Wisconsin Press, 1985, p. 142-146.