CENTRAL SCIENTIFIC COMPANY

OPERATING INSTRUCTIONS

Bromine Tubes Set
No. 72710-22

1. Introduction

The diffusion properties of gases can be demonstrated using the Bromine Tubes Set.

Caution! This product has been designed for safe use. A minimal amount of bromine is contained in each tube to adequately demonstrate the phenomenon of diffusion. Exercise the standard laboratory precaution when handling this or any other type of glassware. If a tube should break, avoid inhaling the bromine vapors or contacting any liquid bromine.

2. Description

This set of tubes is designed to meet the requirements of the IPS and other instructional programs. The set comprises two glass tubes about 12 inches long, each sealed on both ends. One tube contains bromine vapor and approximately one-half atmosphere of air, and the other tube contains bromine gas and a small amount of liquid bromine. These tubes are used to demonstrate the principle of gas diffusion. Bromine is used because its reddish color is easily visible, and its change of state from gas to liquid to solid is achieved at temperatures easily attainable in science labs.

3. Setup

Prepare a dry-ice and alcohol bath to cool each tube. Use denatured ethyl alcohol or isopropyl alcohol, neither of which are included with this set. Purchase “dry ice” (frozen carbon dioxide) locally. Crush the dry ice and make a slurry of dry ice and alcohol.

4. Experimental Procedure

4.1 Cool the tube containing bromine gas and air in the mixture of dry ice and alcohol. As the gas cools, the reddish-brown bromine will begin to solidify at the bottom of the tube.

4.2 After the bromine solidifies, remove the tube from the dry ice and alcohol mixture. Place the tube upright and let it stand at room temperature.

4.3 As the bromine warms, the gas moves slowly up the tube until it is evenly dispersed.

4.4 Repeat Steps 4.1 and 4.2, using the other tube which contains bromine gas and a small amount of liquid bromine.

4.5 As this tube warms to room temperature, the bromine melts and the color is the same throughout the tube. The color will continue to darken as more of the bromine melts.

4.6 Place a card to cover both ends of the tube. Note that it is difficult to determine in which direction the gas is moving.

Note that when there is no air in the tube, the bromine gas diffuses quickly throughout the tube, but for the tube with air inside, the rate of diffusion is slower.

5. Theory

Gas molecules intermingle or diffuse because of their random thermal motion and subsequent collisions with each other. The rate of diffusion increases with temperature, and decreases as the pressure of the gases increases. Standard physical science texts should be consulted for a more thorough explanation of the gas kinetic theory

6. Maintenance

The Bromine Tubes Set needs no special maintenance. If you should experience any difficulty with this piece of equipment, please contact Central Scientific Company, giving details of the problem. To ensure better service, please do not return any apparatus to Central Scientific Company until you have obtained our authorization to do so.

Written 11/89