Diffusion of Gases

Purpose

To demonstrate the relationship between molar mass and diffusion rate of a gas.

Materials

- long glass tube open at each end
- HCl (conc)
- 2 rubber stoppers (to fit tube, with no holes)
- ring stand and clamp
- ammonia (conc)
- cotton balls
- 2 petri dishes

Procedure

1. Clamp the tube horizontally on the ring stand.
2. Fill petri dishes with NH_3 and HCl (seperately) and add cotton balls.
3. Take cotton ball from NH_3 petri dish, place in end of tube and stopper. Fully cover the Petri dish.
4. Quickly do same with HCl cotton ball, place at opposite end of tube and stopper.
5. Observe a white ring (ammonium chloride) form after a few minutes. It should be closer to the side in which you place the ammonia cotton ball.

Additional Information

1. The results are only semi-quantitative due to air.
2. Results do not follow Graham's Law of Effusion because the gases are diffusing through air.

Questions for the Students

I. What is the composition of the white ring which forms?

II. Why doesn't the ring form instantaneously (What are the velocities of NH_3 and HCl?)

III. Why doesn't the ring form in the center of the tube?

Disposal

1. Any remaining solutions can be diluted and poured down the drain with excess water.
2. The tube should be rinsed out **in the hood** with water, collecting the runoff in a large beaker 1/3 filled with water.
3. Make sure the whole tube is rinsed before cleaning in the sink.
4. The solution in the beaker can be poured down the drain with excess water and the cotton balls thrown in the trash.