Gases 6: Graham's Law of Effusion Worksheet

1. Under conditions in which the density of carbon dioxide is 1.96 g/L and that of nitrogen gas is 1.25 g/L, which gas will effuse more rapidly? What will be the ratio of the rates of effusion of nitrogen to carbon dioxide?

2. A store receives a shipment of defective balloons. Each has a tiny pinhole of the same size. If one balloon is filled with helium and another is filled with air to the same volume and pressure, which balloon will deflate faster and how much faster? The density of helium at room temperature is 0.00016 g/mL and that of air is 0.0012 g/mL.

3. Under the same conditions of temperature and pressure, does hydrogen iodide (HI) or ammonia (NH_3) effuse faster? Calculate the relative rates at which they effuse.

4. Solar energy may some day be used to split water into hydrogen and oxygen and the hydrogen then used as a fuel. The different rates of effusions of hydrogen and oxygen from a mixture of the two and through a very tiny hole might be the basis of separating them. Which gas effuses more rapidly, and by what relative amount?

5. What is the molar mass of a gaseous element if at room temperature it effuses though a pinhole 2.16 times as rapidly as xenon? Which element is it?

6. An unknown gas effuses through a capillary (a very narrow blood vessel) in 60 seconds. The same volume of hydrogen escapes in 10 seconds. Calculate the molar mass of the unknown gas.