



Grahams Law Worksheet

Directions: Show your work and answer using correct sig figs. Make sure your answers have units! Box your final answer.

1. Hydrogen sulfide, H_2S , has a very strong rotten egg odor. Methyl salicylate, $\text{C}_8\text{H}_8\text{O}_3$, has a wintergreen odor, and benzaldehyde, $\text{C}_7\text{H}_6\text{O}$, has a pleasant almond odor. If the vapors for these three substances were released at the same time from across a room, which odor would you smell first? Show your work and explain your answer.
2. What is the rate of effusion of methane, CH_4 , relative to the rate of effusion of acetylene, C_2H_2 ?
3. How many times faster will carbon monoxide effuse compared to carbon dioxide?
4. If the carbon dioxide in Problem 3 takes 32 seconds to effuse, how long will the CO take?
5. What is the relative rate of diffusion of NH_3 compared to He? Does NH_3 effuse faster or slower than He?
6. If the He in Problem 5 takes 20 seconds to effuse how long will the NH_3 take?

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7. A gas that smells fishy and is highly toxic diffuses 0.3431 times as fast as He. What is the molecular mass of the unknown gas? Would this gas be PH₃ or HCN?
8. What is the molecular weight of a gas that diffuses 1/9th as fast as hydrogen?
9. A volume of chlorine effused through a pinhole at a rate of 56.3 mL/s under constant temperature and pressure. At what rate would hydrogen cyanide, HCN (smells like bitter almonds and is toxic) effuse through the same hole under the same conditions?
10. Nitrogen effuses through a pinhole in 0.0119 L/s while an unknown gas diffused through the same pinhole at a rate of 0.0313 L/s. What is the molecular mass of the unknown gas? Identify the unknown gas.
11. A sample of N₂O effuses from a container in 42 seconds. How long will it take the same amount of I₂ to effuse from the same container under identical conditions?
12. If neon gas travels at 400 m/s at a given temperature, calculate the velocity of butane, C₄H₁₀, at the same temperature.