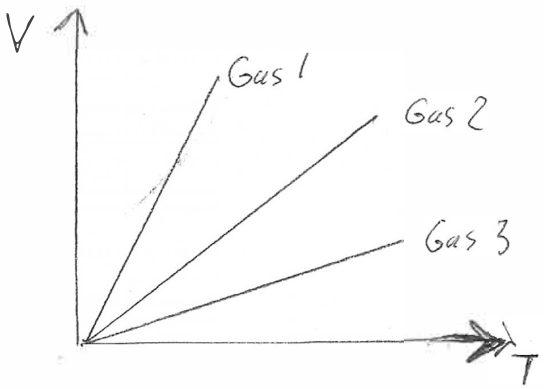
**CHEM 3423 001 Spring 2024** **Name:** Key
**ID:**

**Worksheet #2** (Total number of points you can get is **3 pts**)

1. Suppose we have three containers, filled with three types of gas, $H_2$, $N_2$, and $O_2$, but you do not know which container is filled with which gas. Pressure P and total mass m of the included gas are the same in each container. Measuring volume V and temperature T allows you to draw the following graph:




$PV = nRT \Rightarrow V = \frac{nR}{P}T = \frac{1}{M}\frac{mR}{P}T$

$\frac{1}{M_1} > \frac{1}{M_2} > \frac{1}{M_3} \Rightarrow M_3 > M_2 > M_1$

$\Rightarrow$ gas 1 : $H_2$
gas 2 : $N_2$
gas 3 : $O_2$

Find out the type ($H_2$, $N_2$, or $O_2$) of gas 1, 2, and 3. Hint: Use what you know about the relation between the molar masses M of the three gases.

2. An ideal gas occupies a volume V of 0.75dm$^3$ at a pressure P of 3.0 x 10$^5$ Pa. What is the new volume of the gas maintained at the same temperature T if the pressure P is reduced to 1.0 x 10$^5$ Pa?

$PV = nRT \Rightarrow V = nRT\frac{1}{P}$

$P_{new} = \frac{1}{3}P_{old} \Rightarrow V_{new} = 3V_{old} = 2.25\ dm^3$

3. A certain substance, used as a manometer fluid, has a density of 1.047 g/cm$^3$. What pressure P will lead to a column of 4.0 mm?(g=9.8 m/s$^2$)

$P = \rho g h = \frac{1.047 \cdot 10^{-3}\ kg}{10^{-6}\ m^3} \cdot 9.8\ \frac{m}{s^2} \cdot 4.0 \cdot 10^{-3}\ m$

$= 1.047 \cdot 9.8 \cdot 4.0\ \frac{N}{m^2}$

$= 41.04\ Pa$