CHEM 3423 001 Spring 2026 **Name:** Key
ID:

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

1: An ideal gas occupies a volume V of 0.75dm³ at a pressure P of 3.0×10^5 Pa. What is the new volume of the gas maintained at the same temperature T if the pressure P is reduced to 1.0×10^5 Pa?

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

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

2. It takes a certain gas three times as long to effuse through an orifice as the same amount of oxygen (M = 32 g/mol). What is the molar mass of the gas?

$$rate \propto \frac{1}{\sqrt{M}} \Rightarrow \frac{rate(A)}{rate(O_2)} = \frac{1}{3} = \frac{\sqrt{M_{O_2}}}{\sqrt{M_A}}$$

$$\Rightarrow \sqrt{M_A} = 3\sqrt{M_{O_2}}$$

$$\Rightarrow M_A = 9\,M_{O_2} = 288\,g/mol$$

3. What is the total kinetic energy of 3 mol of an ideal monoatomic gas confined to 10 l at 200 kPa?

$$E_{kin} = \frac{3}{2}nRT \qquad PV = nRT$$

$$\Rightarrow E_{kin} = \frac{3}{2}PV = \frac{3}{2}\cdot 10\cdot 10^{-3}\,m^3 \cdot 200\cdot 10^3\,Pa$$

$$= 3000\,J$$