

SHOW ALL WORK TO RECEIVE CREDIT

$$PV = nRT \quad \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad P_1 V_1 T_2 = P_2 V_2 T_1 \quad R = \frac{0.0821 \text{ L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} = \frac{62.4 \text{ L} \cdot \text{torr}}{\text{mol} \cdot \text{K}}$$

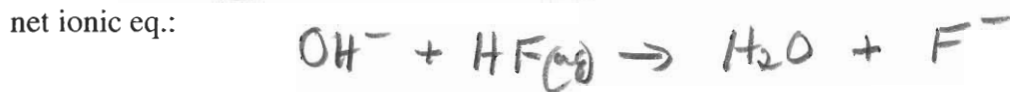
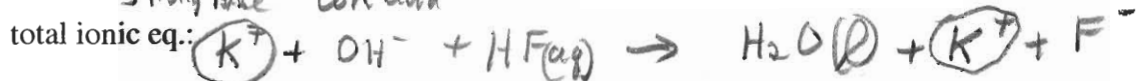
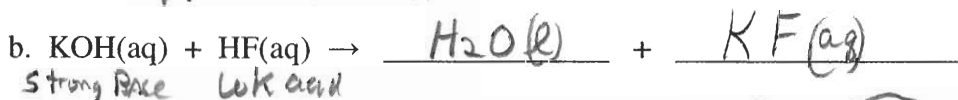
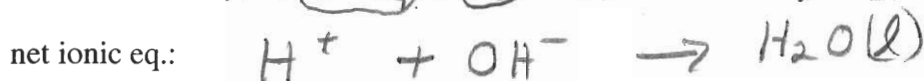
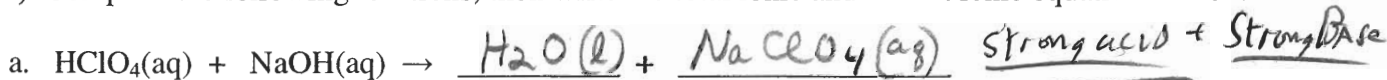
1. (4 Pts) A balloon containing 3.0 L of CO_2 at 22°C and a pressure of 725 torr is placed in a freezer at -7°C . Assume the pressure does not change and calculate the new volume of the balloon.

$$\begin{aligned} P_1 &= 725 \text{ torr} & P_2 &= \text{same} \\ V_1 &= 3.0 \text{ L} & V_2 &= ? \\ T_1 &= 295 \text{ K} & T_2 &= 267 \text{ K} \end{aligned} \quad V_2 = \frac{P_1 V_1 T_2}{P_2 T_1} = \frac{(3.0 \text{ L})(267 \text{ K})}{295 \text{ K}} = \boxed{2.7 \text{ L}}$$

2. (5 Pts) Determine the temperature in K of 95.0 g of N_2 gas if the volume of the container is 8.00 L and the pressure is 850 mmHg.

$$\begin{aligned} P &= 850 \text{ mmHg} \\ V &= 8.00 \text{ L} \\ n &= \frac{95.0 \text{ g}}{28.02 \text{ g/mol}} = 3.39 \text{ mol} \\ R &= 62.4 \text{ L} \cdot \text{torr} / \text{mol} \cdot \text{K} \end{aligned} \quad PV = nRT \quad T = \frac{PV}{nR} = \frac{(850 \text{ torr})(8.00 \text{ L})}{(3.39 \text{ mol})(62.4 \text{ L} \cdot \text{torr} / \text{mol} \cdot \text{K})} = \boxed{32.1 \text{ K}}$$

3. (6 Pts) Complete the following reactions, then write the total ionic and the net ionic equations for each.



4. (5 Pts) Determine the density of O_2 gas at 25°C and 725 mmHg. (Atomic mass of O is 16.00).

$$\begin{aligned} \text{Density} &= \text{g/mL or g/L (for gases)} \\ P &= 725 \text{ mmHg} \\ V &= ? \\ n &= \text{assume 1 mol } \text{O}_2 (32.0 \text{ g}) \\ R &= 62.4 \text{ L} \cdot \text{torr} / \text{mol} \cdot \text{K} \\ T &= 298 \text{ K} \end{aligned} \quad PV = nRT \quad V = \frac{nRT}{P} = \frac{(1 \text{ mol})(62.4 \text{ L} \cdot \text{torr})(298 \text{ K})}{(725 \text{ torr})} = 25.65 \text{ L} \quad D = \frac{32.00 \text{ g}}{25.65 \text{ L}} = \boxed{1.25 \text{ g/L}}$$

5. (5 Pts) A 0.540 g sample of air at 25°C and a pressure of 710 mmHg, occupies a volume of 500 mL. Determine the average molar mass of the air.

$$\begin{aligned} \text{molar mass} &= \text{g/mol} \\ P &= 710 \text{ mmHg} \\ V &= 500 \text{ mL} = 0.500 \text{ L} \\ n &= ? \\ R &= 62.4 \text{ L} \cdot \text{torr} / \text{mol} \cdot \text{K} \\ T &= 298 \text{ K} \end{aligned} \quad PV = nRT \quad n = \frac{PV}{RT} = \frac{(710 \text{ torr})(0.500 \text{ L})}{(62.4 \text{ L} \cdot \text{torr} / \text{mol} \cdot \text{K})(298 \text{ K})} = 0.0191 \text{ mol} \quad \text{molar mass} = \frac{0.540 \text{ g}}{0.0191 \text{ mol}} = \boxed{28.3 \text{ g/mol}}$$