

Ch. 5 Review 2015 Answers

1 of 3

$$1a) 4.32g \text{ SO}_2\text{Cl}_2 \cdot \frac{1 \text{ mol SO}_2\text{Cl}_2}{134.96g \text{ SO}_2\text{Cl}_2} = 0.0320 \text{ mol SO}_2\text{Cl}_2$$

$$P = \frac{nRT}{V} = \frac{0.0320 \text{ mol} \cdot 0.0821 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}} \cdot 400 \text{ K}}{1.50 \text{ L}} = \boxed{0.701 \text{ atm SO}_2\text{Cl}_2}$$

$$1b) P_T = P_{\text{SO}_2\text{Cl}_2}^{\leftarrow \text{left}} + P_{\text{SO}_2} + P_{\text{Cl}_2}$$

$$P_{\text{SO}_2\text{Cl}_2} = 0.701 \text{ atm} - P_{\text{SO}_2\text{Cl}_2 \text{ used up}}$$

$$\leftarrow \text{left} \downarrow P_{\text{SO}_2\text{Cl}_2} = 0.701 \text{ atm} - P_{\text{SO}_2}$$

$$P_{\text{SO}_2} = P_{\text{Cl}_2}$$

$$P_T = (0.701 - P_{\text{SO}_2}) + P_{\text{SO}_2} + P_{\text{SO}_2}$$

$$1.26 \text{ atm} = 0.701 + P_{\text{SO}_2}$$

$$\boxed{P_{\text{SO}_2} = 0.559 \text{ atm} = P_{\text{Cl}_2}}$$

$$P_{\text{SO}_2\text{Cl}_2} = 0.701 - 0.559 = \boxed{0.142 \text{ atm}}$$

$$2a) i) n = \frac{PV}{RT} = \frac{0.903 \text{ atm} \cdot 0.0822 \text{ L}}{0.0821 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}} \cdot 305 \text{ K}} = 0.00296 \text{ mol } \text{C}_2\text{H}_2$$

$$P = 0.950 \text{ atm} - \left(\frac{35.7}{760}\right) = 0.903$$

$$ii) 0.200 \text{ g } \text{CaCl}_2 \cdot \frac{1 \text{ mol } \text{CaCl}_2}{64.10 \text{ g } \text{CaCl}_2} \cdot \frac{1 \text{ mol } \text{C}_2\text{H}_2}{1 \text{ mol } \text{CaCl}_2} = 0.00312 \text{ mol } \text{C}_2\text{H}_2$$

$$b) \frac{0.00296}{0.00312} = 0.949 \cdot 100 = 94.9\%$$

3a) Pressures are equal, same number of moles at the same volume and temperature will yield the same pressure.

b) $6.2 \cdot 10^{-21} \text{ J}$, same as N_2 molecules, since temp is the same.

c) H_2 have higher average speed, at same temp. lighter molecules have higher average speed. H_2 molar mass is 2.016 vs N_2 molar mass of 28.02.

d) lower the temperature, temp is a direct measure of kinetic energy.

ei) Pressure would double, pressure and volume are inversely proportional.

eii) no change, the temperature and thus the kinetic energy stay the same

4) For CH_4 $P_1 V_1 = P_2 V_2$

$$3.0 \text{ atm} \cdot 5.0 \text{ L} = 6.0 \text{ L} \cdot P_2$$

$$P_{\text{CH}_4} = 2.5 \text{ atm}$$

For C_2H_6 $0.55 \text{ atm} \cdot 1.0 \text{ L} = 6.0 \text{ L} \cdot P_2$

$$P_{\text{C}_2\text{H}_6} = 0.0917 \text{ atm}$$

$$P_T = P_{\text{CH}_4} + P_{\text{C}_2\text{H}_6} = \boxed{2.59 \text{ atm}}$$