

CHEM131 HOMEWORK #7 KEY

5-22. In (a) the pressure in the flask is less than 1 atm; the 1 atm side of the manometer is “pushing harder” on the mercury column than the flask side. In (b) the opposite is true and the  $P_{\text{flask}} > 1 \text{ atm}$ .

$$(a) P_{\text{flask}} = 760 - 118 = 642 \text{ torr} = (642 \text{ torr})(1 \text{ atm}/760 \text{ torr}) = 0.845 \text{ atm} = (0.845 \text{ atm})(1.013 \times 10^5 \text{ Pa/atm}) = 8.56 \times 10^4 \text{ Pa}$$

$$(b) P_{\text{flask}} = 760 + 215 = 975 \text{ torr} = (975 \text{ torr})(1 \text{ atm}/760 \text{ torr}) = 1.28 \text{ atm} = (1.28 \text{ atm})(1.013 \times 10^5 \text{ Pa/atm}) = 1.30 \times 10^5 \text{ Pa}$$

$$(a) P_{\text{flask}} = 635 - 118 = 517 \text{ torr}; (b) P_{\text{flask}} = 635 + 215 = 850 \text{ torr}$$

5-31.  $P = nRT/V = [(22.0 \text{ g CO}_2)/(44.01 \text{ g CO}_2/\text{mol})](0.08206 \text{ L atm/mol K})(300 \text{ K})/(4.00 \text{ L}) = 3.08 \text{ atm}$

With 740 torr = 740/760 = 0.974 atm of air present, the CO<sub>2</sub> pressure is still 3.08 atm and total  $P = 3.08 + 0.97 = 4.05 \text{ atm}$ .

5-36. Use  $P_1V_1/T_1 = P_2V_2/T_2$ .  $P_1 = 75 \text{ psi}$ ,  $T_1 = 19 \text{ }^\circ\text{C} + 273 = 292 \text{ K}$ ,  $V_1 = V_1$ .  $P_2 = ?? \text{ psi}$ ,  $T_2 = 58 \text{ }^\circ\text{C} + 273 = 331 \text{ K}$ ,  $V_2 = (1.04) V_1$ . Solve for  $P_2 = (75)(331)/(292 \times 1.04) = 82 \text{ psi}$ . The  $V_1$  terms cancel on either side of the equation.

5-40.  $P_{\text{total}} = P_{\text{N}_2} + P_{\text{H}_2\text{O}}$ ;  $P_{\text{N}_2} = P_{\text{total}} - P_{\text{H}_2\text{O}} = 760 - 17.5 = 743 \text{ torr}$

$n = PV/RT = (743/760)(250 \times 10^{-3})/(293 \times 0.08206) = 1.02 \times 10^{-2} \text{ mol}$  (note P must be in atm, V in L, and T in K)

$$(1.02 \times 10^{-2} \text{ mol})(28.02 \text{ g/mol}) = 0.286 \text{ g}$$

5-42. The partial pressure of each gas equals the number of moles of that gas divided by the total number of moles present (the mole fraction of that gas), times the total pressure.

$$(1.00 \text{ g})/(2.016 \text{ g/mol}) = 0.496 \text{ mol H}_2; (1.00 \text{ g})/(4.003 \text{ g/mol}) = 0.250 \text{ mol He}$$

$$P_{\text{H}_2} = \chi_{\text{H}_2} P_{\text{total}} = (0.496/0.746)0.480 = 0.319 \text{ atm}$$

$$P_{\text{He}} = \chi_{\text{He}} P_{\text{total}} = (0.250/0.746)0.480 = 0.161 \text{ atm}$$

Next H.W. 5:43,49,63,71,129\*

\*Challenge Problem