Chem 130 *Coastline College*
Fall 2016 *Dupon*

Homework Set 7

(Distributed 10/26/16; Due on 11/2/16)

Read Chapter 13 in Zumdahl and complete the listed questions from the text: 18, 24, 30, 43, 50, 60, 71, 86; as well as the following problems:

A. A diver takes a balloon with a volume of 5.0 L from the water's surface where the pressure is 1.0 atm to a depth of 20 meters, where the pressure is 3.0 atm. What happens to the volume of the balloon?

P1V1 = p2V2 (1 atm)(5.0 L) = (3.0 atm)(? L) ? = 1.67L

The balloon shrinks

B. A helium-filled balloon is inflated to a volume of 2.5 L at a room temperature of 25°C is taken outside on a very cold evening at –25°C. What is the new volume assuming constant atmospheric pressure?

$\frac{V_1}{T_1} = \frac{V_2}{T_2}\frac{2.5\ L}{298\ K} = \frac{V2}{248\ K}$ **V2 = 2.08 L**

C. Pressurized carbon dioxide inflators are used to inflate bicycle tires in case of a flat tire. These inflators contain 16.0 g of CO2. At 25°C, how much pressure is provided by the inflator to a tire with a volume of 3.45 L?

16 g CO2 x 1 mole/44 g = 0.364 moles

pV = nRT $p = \frac{nRT}{V} = \frac{(0.364\ moles)(0.0821)(298\ K)}{3.45\ L} =$ **2.58 atm**

D. *Heliox* is a mixture of helium and oxygen gases used to fill tanks for scuba divers. I a 12.5 L tank contains 24.2 g helium and 4.32 g oxygen, find the partial pressure of each gas and the total pressure of the mixture.
24.2 g x 1 mole/4 g = 6.05 moles He 4.32 g x 1 mole/32 g = 0.135 moles O2

nT = 6.05 + 0.135 = 6.185 moles **pT =** $\frac{nRT}{V} = \frac{(6.185\ moles)(0.0821)(298\ K)}{12.5\ L} =$ **12.1 atm**

pHe = 6.05/6.185 = 0.978 pO2 = 0.135/6.185 = 0.022

Problems from Zumdahl:

Chapter 13

18. Boyle's Law: $V_1p_1 = V_2p_2$ (a) 423 mL (b) 158 mL (c) 8.67 L

24. Boyle's Law: $V_1p_1 = V_2p_2$ p2 = 20 atm

30. ***Charles' Law:*** $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ V_2 = 315 mL

43. Avogadro's Law $\frac{V_1}{n_1} = \frac{V_2}{n_2}$ V_2 = 435 L

50. ***pV = nRT (a) V = 5.02 L (b) 3.56 atm = 2700 mm Hg (c) T = 334 K***

60. $p_{He} = 5.07$ atm > $p_{Ar} = 3.5$ atm

71. p_T = 772 torr poxygen = $p_T - p_{water}$ = 772 torr – 26.7 torr = 745.3 torr

86. 1.25 g x 1 mole/12 g = 0.104 moles C so 0.104 moles of O_2 are required

$$V = \frac{nRT}{p} = \frac{(0.104 \text{ moles})(0.082\frac{\text{L atm}}{\text{mole K}})298 \text{ K}}{1.02 \text{ atm}} = 2.5 \text{ L}$$