8.42: convert the following values into mmHg:

(a) standard pressure: 1 atm = 760 mmHg

(b) $25.3\ \cancel{psi} \times \frac{760\ mmHg}{14.7\ \cancel{psi}} = 1310\ mmHg$

(c) $7.5\ atm \times \frac{760\ mmHg}{1\ atm} = 5.7 \times 10^3\ mmHg$

(d) $28.0\ in.\ Hg \times \frac{25.4\ mmHg}{1\ in\ Hg} = 711\ mmHg$

(e) $41.8\ pa \times \frac{1\ mmHg}{133.32\ pa} = .314\ mmHg$

8.48: The pressure of gas in a 600.0 mL cylinder is 65.0 mm Hg. What is the new volume when the pressure is increased to 385 mmHg?

$$\frac{(65.0\ mmHg)(600.0\ mL)}{(385\ mmHg)} = \frac{(\cancel{385\ mmHg})(V_2)}{\cancel{385\ mmHg}}$$

$V_2 = 101\ mL$

8.55: a hot-air balloon has a volume of 875L. What is the original temperature of the balloon if its volume changes to 955L when heated to 56°C?

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad \frac{875L}{T_1} = \frac{955L}{56°C} \qquad 56°C + 273 = 329K$$

$$\frac{875L}{T_1} = \frac{955L}{329K} \longrightarrow T_1 = \left(\frac{955L}{329K}\right) = 2.90 / 875L = 3.32 \times 10^{-3}\ K$$

8.70 : How many molecules are in 1.0 L of O_2 @ STP? How many grams of O_2?

$O_2 = 16 \times 2 = 32g$

@STP $\rightarrow$ 1 mol = 22.4 dm^2

$1.0 L = 1 dm^3 \longrightarrow \frac{1 dm^3}{22.4 dm^2} = 4.5 \times 10^{-2}$ mol

$(4.5 \times 10^{-2} \text{ mol})(6.023 \times 10^{23}) = 2.7 \times 10^{22}$ O_2 molecules/L

$\frac{2.7 \times 10^{22} \ O_2 \text{ molecules/L}}{6.023 \times 10^{23}} = .045 \times 32g = 1.4g$

8.72 : What is the mass of CH_4 in a sample that occupies a volume of 16.5 L @ STP?

1 mole of CH_4 contains 22.4 L of CH_4

$CH_4 = 12.01 + (1.001 \times 4) = 16.014g$

16.0g of CH_4 contains 22.4L of CH_4

$\frac{16.0g}{22.4\cancel{L}} \times 16.5\cancel{L} = 11.8g$ of CH_4

8.73 : Assume that you have 1.75g of deadly gas hydrogen cyanide, HCN. What is the volume of the gas @ STP?

$HCN = 1.001 + 16.00 + 15.00 = 32.001g$

1 mol of HCN = 22.4L of HCN

$\left(\frac{1.75\cancel{g}}{22.4L}\right) \Big/ 32.001\cancel{g} = 2.44 \times 10^{-3}$ L of HCN

8.88: If partial pressure of oxygen in air at 1.0 atm is 160 mmHg, what is the partial pressure on the summit of Mt. Whitney, where atmospheric pressure is 440 mmHg?

$P_{O_2} = 160\ mmHg$ $(P_{total}) = 1\ atm = 760\ mmHg$

$$\frac{P_{O_2}}{P_{total}} \times 100\% \rightarrow \frac{160\ \cancel{mmHg}}{760\ \cancel{mmHg}} \times 100\% = \underline{21\%}\ O_2$$

$P_{total} = 440\ mmHg$

$$\frac{21\ \cancel{\%}}{100\ \cancel{\%}} \times 440\ mmHg = 93\ mmHg$$

8.89: Scuba divers who suffer from decompression sickness are treated in hyperbaric chambers using heliox (21% O_2, 79% He) at pressures up to 120 psi. Calculate partial pressure for $\underline{O_2}$ (in mmHg).

$P_{O_2} = 21\%$ $P_{He} = 79\%$ $P_{O_2} = 0.21 \times 120\ psi \Rightarrow 25.2\ psi$

$$25.2\ \cancel{psi} \times \frac{760\ mmHg}{14.7\ \cancel{psi}} = 1.3 \times 10^3\ mmHg$$

8.94: The heat of vaporization of water $= 9.72\ \frac{kcal}{mol}$

a) $$3.00\ \cancel{mol}\ H_2O \times \frac{9.72\ kcal}{1\ \cancel{mol}} = 29.16\ kcal = 29.2\ kcal$$

b) $H_2O = (1.001 \times 2) + 16 = 18.002\ g$

$$320\ \cancel{g} \times \frac{1\ mol}{18.002\ \cancel{g}} = 17.8\ mol\ \text{steam in } 320\ g\ \text{steam}$$

$$17.8\ \cancel{mol} \times \frac{9.72\ kcal}{1\ \cancel{mol}} = 173\ kcal$$

8.95 : patients w/ high body temp. are often given "alcohol baths". Heat of vaporization of isopropyl alcohol = 159 cal/g. How much heat is removed from skin by evaporation of 190g of isopropyl alcohol?

$$190\cancel{g} \times \frac{159\text{ cal}}{1\cancel{g}} = 30.2 \times 10^3\cancel{cal} \times \frac{1\text{ kcal}}{1000\cancel{cal}} = 30.2\text{ kcal}$$