Quiz #5 Week: Sept. 19 -Sept. 21
Name _____ Chemistry 331

Equations:

$$PV = nRT \ , \ V_m = \frac{V}{n} \ , \ U_m = \frac{3}{2}RT \ , \ u = \sqrt{\frac{3RT}{M}} \ , \ E = \frac{h^2 n^2}{8mL^2}$$

$$P = P_o \exp\left\{-\frac{Mgh}{RT}\right\} \ , \ U = q + w \ , \ \delta w = -PdV \ , \ P_1V_1 = P_2V_2$$

R = 8.31 J/mol-K = 0.08206 L-atm/mol-K

PLEASE INCLUDE UNITS IN YOUR ANSWER!

1. What is the pressure at the top of K-2, 9000 m above sea level?

Solution Assume that the atmospheric M is the average of 80% N_2 and 20% O_2. Thus, M = 29 g/mol or 0.029 kg/mol

P = P_0 exp{-Mgh/RT }
= (1 atm) exp{-(0.029)(9.8)(9000)/(8.31)(298) }
= 0.35 atm (gasp)

The pressure is _____.

2. A. What is the work of expansion for an ideal gas from 0.01 L to 1 L against a constant pressure of 1 atm?

w = -PΔV = - (1 atm)(1 L – 0.01 L) = -0.99 L-atm
w = -0.99 L-atm * 1e-3 m^3/ dm^3 * 1.01325e5 Pa/ atm = 91.2 Pa * m^3 = -91.2 J

Answer in L-atm = _____.
Anser in Joules = _____.

B. How many moles of gas are there in the expansion in part A assuming the temperature is 298 K?

$P_1V_1 = P_2V_2 = nRT$
n = PV/RT = (100 atm * 0.01 L) / (0.08206 L-atm/mol-K * 298K)
n = 0.0409 moles

Moles of gas = _____.