Chemistry-4311
September 13, 2013

Quiz #2 **Name** Key

R = 8.314 J/mol-K = 0.08206 L-atm/mol-K = 1.987 cal/mol-K, $N_A = 6.02 \times 10^{23}$

1. Matching (Use a letter only once)

The expression for the mean free path is $\langle c \rangle / Z_1$ and its unit is g .

The rate of effusion for helium is a than that for argon.

A mathematical statement of the first law of thermodynamics is e .

The expression for the work associated with the reversible isothermal expansion/compression of an ideal gas is d .

The heat for a temperature change is given by b .

a. faster
b. $q = \int C dT$
c. collisions/time
d. $w = -nRT\ln(V_2/V_1)$
e. $\Delta U = q + w$
f. $\Delta U = 3RT/2$
g. distance
h. $q = \int dT/C$
i. slower
j. $w = -P_{ex}\Delta V$

2. An ideal gas expands from 1.0 liter to 9.0 liters against a constant external pressure of 1 atm. Calculate the work for the process in L-atm and also in joules (J).

$w = -P_{ex}\,\Delta V = -1\ atm\,(9-1)\,L = -8\ L\text{-}atm$

(P_{ex}: ↑ +1; -8: ↑ +1)

$w = -8\ L\text{-}atm \times \dfrac{8.314\ J/mol\text{-}K}{0.08206\ L\text{-}atm/mol\text{-}K} = -810.5\ J$ +1

3. Carbon dioxide, CO_2, has a heat capacity of 29 J/K-mol. What is the heat when 22 g of CO_2 are heated from 25 to 100 °C?

$22\ g / 44\ g/mol = 0.5\ mol$

$q = n\,\bar{C}\,\Delta T = 0.5\ moles \times \dfrac{29\ J}{K\text{-}mol} \times (100-25)$

$= 1,088\ J$