Chemistry-4311
September 4, 2015

Quiz #1 **Name** Key

+5 1. Matching (Use a letter only once)

At constant n and T, the volume of an ideal gas is __i__ to pressure.

The equation for the average speed of an ideal gas is found from __a__.

$4.3 \times 10^4 \times 0.000020$ equals __c__.

According to the kinetic theory of gases, the average translational energy for a mole of N_2 molecules is __f__.

The mean free path is given by __d__.

a. $\langle c \rangle = \int cP(c)dc$
b. $mv^2/2$
c. 0.86
d. $\langle c \rangle / Z_1$
e. proportional
f. 3RT/2
g. $\langle c \rangle = cP(c)$
h. $Z_1/\langle c \rangle$
i. inversely proportional
j. 8.6×10^9

+2 2. From the kinetic theory of gases PV for a mole of a pure gas equals $M\langle v^2 \rangle/3$, where M is the molecular weight and $\langle v^2 \rangle$ is the average of the squared velocities of the gas molecules. Show that the root-mean-squared velocity, $\langle v^2 \rangle^{1/2}$, is $(3RT/M)^{1/2}$. $\langle v^2 \rangle^{1/2}$ is also called c_{rms}.

For one mole $PV = M\langle v^2 \rangle/3$ and $PV = RT$

$M\langle v^2 \rangle/3 = RT$, then $\langle v^2 \rangle = \frac{3RT}{M}$

$\langle v^2 \rangle^{1/2} = \left(\frac{3RT}{M}\right)^{1/2}$

+3 3. A pure gas at 1 atm pressure and 25 °C has a density of 1.8 g/L. What is the molecular weight of the gas?

$PV = nRT = \frac{m}{M}RT$

$PM = \frac{m}{V}RT = dRT$

$M = \frac{dRT}{P} = \frac{1.8\ g/L}{1\ atm} \times \frac{0.08206\ L\text{-}atm}{mol\text{-}K} \times 298K$

$= 44\ g/mol$