Reminders 11-15-10:

-Exam 3 Average 72%; Some are memorizing equations especially noticeable in problems 2 and 4.

-How Many Still Planning to Enroll in 2B?

-Read Chapters 10 & 11.

-Heat Transfer Lab Canceled. Last lab of semester is Next Week. Movie with Report on the week of the 29th.

-Momentum Lab; Some of you have not turned in the rewrite (present grade is zero). Some that have turn in edited version have not turned in old version too (I won't grade it until old version is turned in).

-Quiz Monday Chapter 10 and 11.

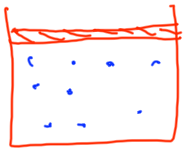
Objectives:

-Gas Laws

-Kinetic Theory of Gases

-Calorimetry

- **If 25.50 moles of an helium gas is at 10°C and gauge pressure of 0.350 atm, calculate the volume of He gas under these conditions in m³. How many molecules are in the vessel? What is the temperature of the gas if it is compressed to 1/2 its volume at a gauge pressure of 1atm?**



$n = 25.50\,m$

$T_i = 283\,K$

$P_{gauge} = 0.350\,atm$

$P_{TOTAL} = 1\,atm + .350\,atm$

$= 1.350\,atm$

$PV = nRT$

$V = \frac{nRT}{P} = \frac{(25.50\,moles)(8.314)(283K)}{(1.350\,atm \cdot 101300\,\frac{Pa}{atm})}$

$= \boxed{0.439\,m^3}$

particles $N = nN_A$

$= (25.50\,moles)(6.02\times10^{23}\,\frac{mol}{mol})$

$= 1.53\times10^{25}\,molecules$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ $\quad V_2 = \frac{1}{2}V_1$

$\frac{P_1\cancel{V_1}}{T_1} = \frac{P_2\cancel{V_1}}{2T_2}$ $\quad \frac{P_1}{T_1} = \frac{P_2}{2T_2}$

$T_2 = \frac{P_2}{2P_1}T_1 = \frac{(2\,atm \cdot 101{,}300\,\frac{Pa}{atm})}{2(1.350\times101{,}300)}283$

$= 210\,K$

$= -63°C$

An automobile tire is pumped to a gauge pressure of 200kPa when it is at 20°C. After the car have been driven at high speed, the temperature has been increased to 50°C. Assuming the volume is unchanged, find the new gauge pressure. Repeat, if the tire expands by 10 percent.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \qquad P_2 = \frac{T_2}{T_1} P_1$$

$$P_2 = \frac{(323K)}{(293K)} (301kPa) = 332kPa$$

$$P_{2\,gauge} = (332 - 101)kPa = \underline{231kPa}$$

Now $V_2 = 1.1 V_1$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \;;\; \frac{P_1 V_1}{T_1} = \frac{P_2 1.1 V_1}{T_2}$$

$$\frac{P_1}{T_1} = \frac{1.1 P_2}{T_2} \qquad P_2 = \frac{T_2}{1.1 T_1} P_1$$

$$= \frac{(323K)}{(293K)} \frac{1}{1.1} (301)$$

$$= 302kPa$$

$$P_{2\,gauge} = (302 - 101)kPa = 201kPa$$

A student eats 4 burritos for dinner (2000 Calories of food). He wishes to do an equivalent amount of work by lifting a 50 kg mass. Assume he raises the mass a distance of 2.00m and that no work is done when the weight is dropped to the floor. Assume perfect conversion of chemical energy into mechanical energy (not true by a factor of 6!). How many times must he lift the mass? How long will it take him if he lifts the weight every 5 seconds?

$2000\,\text{Cal} = (2000 \times 10^3)\,\text{cal}$

$= (2 \times 10^6\,\text{cal})(4.186\,\text{J/cal})$

$= 8.372 \times 10^6\,\text{J}$

How much work is required to lift weight?

$mgh = (50\,\text{kg})(9.80\,\text{m/s}^2)(2.0\,\text{m})$

$= 980\,\text{J}$

$\#\,\text{lifts} = \dfrac{8.372 \times 10^6\,\text{J}}{980\,\text{J/lift}} = 8540\,\text{lifts}$

$\dfrac{8540\,\text{lifts} \cdot 5\,\text{s/lift}}{3600\,\text{s/hr}} = \underline{12\,\text{hrs}}$

Title: Nov 15-1:40 PM (4 of 4)