Name: _____

Physics 117

Quiz 4 (3/17/2003)

Use as far as possible formula and try to explain your reasoning.

A) Given that the oxygen molecule (O_2) has a mass of 32 amu how many oxygen molecules are in 1 gr of oxygen?

(Take the Avogadro number to be $N_A \approx 6 \cdot 10^{23}$)

Answer:

We know that in a mole of gas there is always an Avogadro's number of molecules $N_A \approx 6 \cdot 10^{23}$. If the oxygen molecule weights 32 amu then you need 32 gr to have a mole of this gas. So in 1 gr of the gas there are $N_A/32$ molecules$=1.88 \cdot 10^{22}$ molecules.

B) A bottle of Hydrogen with a pressure of 200 atm has a volume of 3 L.

Q-B1: *How many balloons can the bottle fill if each balloon has a volume of 0.5 L at a pressure 1 atm?*

(Consider the temperature of the gas to be constant during the process)

Answer:

Using the law of ideal gas and that T=constant in this case, we can write

PV=costant

Let's call V_b the volume of a balloon and N_b the number of balloons one can fill. Then:

$$P_i V_i = P_i V_f \Rightarrow V_f = \frac{P_i V_i}{P_f} \Rightarrow N_b V_b = \frac{P_i V_i}{P_f}$$

$$N_b = \frac{P_i V_i}{V_b P_f} = \frac{200 \cdot 3}{0.5 \cdot 1} = 1200 \ \ballons$$