Preliminary Quiz Gases Version A

Air is blown into a balloon giving it a volume of 3L at STP.

a. How many moles of gas are in the balloon?

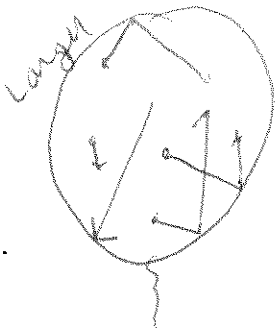
$PV=nRT \quad \frac{PV}{RT}=n \quad \frac{1\cdot 3}{.0821\cdot 273}=0.133\,mol$

b. What is the average kinetic energy of the balloon?

0°C

c. Draw 5 gas particles using vector arrows showing the average kinetic energy.

Not all equal



d. The balloon has its temperature raised to 25°C. Redraw the balloon, including your particles and the vector arrows.

Same # of particles, just longer arrows on average

e. Using the kinetic molecular theory, explain why and how the balloon changed.

→ more collisions with inside wall pushes walls to a larger volume.

f. Using the combined gas law, calculate the new volume of the balloon.

P constant use Kelvin

$\frac{P_1V_1}{T_1}=\frac{P_2V_2}{T_2} \quad \frac{T_2V_1}{T_1}=V_2 \quad \frac{298\cdot 3L}{273}=$ **3.27L**

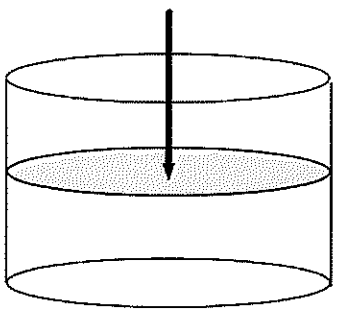
g. If 1 of the 5 particles is Oxygen and 4 are N_2 what is the partial pressure of the O_2 gas?

$\frac{1}{5}=.2\times 1atm=$ **0.2atm** or $\left(\frac{1}{5}\right)\cdot 0.133mol=0.026mol$

$PV=nRT \quad P=\frac{nRT}{V} \quad \frac{0.266\cdot .0821\cdot 273}{3L}=$ **0.2atm**

Preliminary Quiz Gases Version B

A piston has the volume of 2.24L at STP when filled with pure oxygen gas (O_2).



a. How many moles of gas are in the piston?

$PV=nRT \quad \frac{PV}{RT}=n \quad \frac{1\cdot 2.24}{.0821\cdot 273}=0.1\,mol$

b. How many grams of gas are in the piston?

$.1mol \mid \frac{32\,g}{1\,mol}=3.2g\ O_2$

c. The volume of the container is reduced to 0.56L, In terms of kinetic molecular theory explain how the following changes:

- Average kinetic energy — No change same temp
- Pressure Same speed, but less room so more collisions = more pressure

d. Using the combined gas law, calculate the new pressure after compressed?

$\frac{P_1V_1}{T_1}=\frac{P_2V_2}{T_2} \quad P_1V_1=P_2V_2 \quad 1\cdot 2.24=P_2\cdot .56 \quad P_2=4$

e. A student pulls the piston up to 4L, and warms it to 25°C, what is the new pressure?

$\frac{P_1V_1}{T_1}=\frac{P_2V_2}{T_2} \quad \frac{P_1V_1T_2}{T_1V_2}=P_2 \quad \frac{1\cdot 2.24\cdot 298}{273\cdot 4L}=$ **0.61 ATM**