<--> <u>The Combined Gas Law - In Class Practice</u> <-->

1. A container of neon gas initially has a volume of 1.15 L, a pressure of 0.950 atm, and a temperature of 30.0˚C. What will be its new pressure if the temperature is lowered to 15.0˚C and its volume is increased to 2.85 L?

P_i=

V_i=

T_i=

P_f=

V_f=

T_f=

2. When liquid nitrogen was poured over the 1.85 L balloon at room temperature (22˚C), its temperature dropped to 77 K. What was the new volume of the balloon?

P_i=

V_i=

T_i=

P_f=

V_f=

T_f=

3. A container of methane gas is at STP. The container is placed in a hot car, which warms it to 45.0˚C. What will be its new pressure, in psi?

P_i=

V_i=

T_i=

P_f=

V_f=

T_f=

4. <u>The potato chip problem</u>: A bag of cajun-spiced potato chips is packaged & sold in New Orleans, where the atmospheric pressure is 1.00 atm. The volume of air inside the bag is 2.50 L. You buy the chips & drive them to Denver, where the atmospheric pressure is 605 mmHg. What will be the volume of the air in the bag in Denver?

Ans (IRO): 0.364 0.483 3.14 3.50 17.1 **Units (IRO)**: atm L L L psi

<--> Practice Problems -- Ideal Gas Law <-->

1. What temperature (K) would 2.50 moles of chlorine gas have at 591 mmHg in a 25.0 L tank?

P=

V=

n=

R= 0.0821

T=

2. Under what pressure (atm) could 55.8 grams of SO_3 could fit in a 1.00 dm x 2.00 dm x 4.00 dm box at 85.0˚C? ($1\ dm^3 = 1\ L$)

P=

V=

n=

R= 0.0821

T=

3. What is the pressure (in psi) inside the 1200 mL tank of sulfur hexafluoride containing 171 grams of gas at 299 K?

P=

V=

n=

R= 0.0821

T=

4. How many ***molecules of nitrogen*** can fit in your lungs at STP? (approx. volume lungs is 5.8 L)

P=

V=

n=

R= 0.0821

T=

How many molecules of oxygen...?

Ans (IRO): 0.012 0.041 2.56 94.8 350 1.6×10^{23} 1.6×10^{23}
Units (IRO): g atm psi mol K molecules molecules

Other uses for the IDEAL GAS LAW:

What is the density of the air in this room? *(assume standard room conditions of 1 atm & 25 ˚C)*

29.26 g of gas has a volume of 15.2 L at 815 mmHg & 25.0 ˚C.
What is the molecular weight of this gas?

$$N_2 \quad + \quad H_2 \quad \text{--->} \quad NH_3$$

How many g of N_2 will completely react with 1.50 L of H_2 at 2.5 atm & 305 K?

packet 6 objectives (know this for quiz)

- WS 6.1- how different things work (drinking straws, suction cups, vacuums, barometers)
- WS 6.1- how to convert between different pressures
- WS 6.2- definition of STP, how to convert ˚C into K
- WS 6.3- how to use combined gas law to solve problems
- WS 6.4- how to use ideal gas law for density problems, molecular weight problems
- WS 6.3 & 6.4- know the relationships between pressure, volume, temperature, density (direct vs inverse)
- WS 6.5- use Dalton's law to calculate partial pressures of gases; how gases behave when they share a container
- WS 6.6- use Graham's law to calculate the velocity of gases; know about the gas effusion demos
- WS 6.7- how to read a phase diagram for a specific substance, especially methane (we did a demo with this)
- WS 6.8- be able to describe the evaporation and boiling processes
- WS 6.11- basic info from student presentations
- Boyle's Law Lab- calculate atmospheric pressure from lab data
- Cartesian diver lab- how the gas laws apply to the operation of the divers
- Absolute Zero lab- know how to interpret the graph you made
- Wet Dry Ice Lab- be familiar with the phase diagram for CO_2

Know this for bonus points (or for the make-up quiz):

- how to calculate suction cup lift (WS 6.1 class notes),
- gas stoichiometry (WS 6.4 side 2)

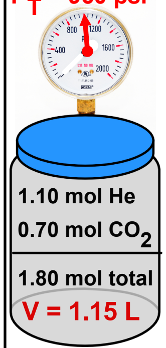
WS 6.5 Dalton's Law & Partial Pressure

P_T = 960 psi

What is the partial pressure of each gas?

P_T = 960 psi

What is the temperature (˚C) of this mixture?



P =

V =

n =

R = 0.0821

T =

WS 6.6 Graham's Law

<u>Graham's Law</u>

$$mv^2_{(A)} = mv^2_{(B)}$$

H_2 & SF_6 share the same container.

Which will move faster?

If the H_2 is moving at 825 mph, what's the velocity of the SF_6?