$PV = nRT$

Name_____ Date_____ Hour_____

Boyle's, Charles', Amonton's and Avogadro's Gas Laws

$T_1 = 25°C + 273.15 = 298.15\,K$ (V_1) $T_2 = 97°C + 273.15 = 370.15K$

1) At 25°C, a gas has a volume of 55.6 mL. The temperature is increased to 97°C. Assuming that the pressure is constant, calculate the new volume. (V_2)

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{55.6\,mL}{298.15\,K} = \frac{V_2}{370.15\,K} \qquad \boxed{V_2 = 69\,mL}$$

(P_1) $T_1 = 185°C + 273.15 = 458.15K$

2) A gas has a pressure of 21 atm at 185°C. What will its pressure be at 24°C if the volume remains constant? (P_2) $T_2 = 24°C + 273.15 = 297.15K$

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

$$\frac{21\,atm}{458.15K} = \frac{P_2}{297.15K} \qquad \boxed{P_2 = 14\,atm}$$

(P_1) (V_1) (P_2)

3) At 7.89 atm, the volume of a gas is 54.8 L. The pressure is reduced to 2.78 atm. What is the new volume, assuming the temperature remains constant? (V_2)

$$P_1V_1 = P_2V_2$$

$$\frac{(7.89\,atm)(54.8L)}{2.78\,atm} = \frac{(2.78\,atm)(V_2)}{2.78\,atm} \qquad \boxed{V_2 = 156\,L}$$

(V_1)

4) Ammonia is manufactured for fertilizer. The truck hauling the ammonia can hold 450 KL of the gas, which is 20.0 moles. If a buyer only needs to purchase 225 KL of the gas, how many moles is the buyer receiving? (V_2) (n_2)

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

$$\frac{450\,KL}{20.0\,moles} = \frac{225\,KL}{n_2} \qquad \boxed{n_2 = 10\ moles}$$

$PV = nRT$

$T_1 = 23.5°C + 273.15 = 296.65K$

5) The number of moles and volume of a gas ~~is~~ are held constant in a container. At 23.5°C, the pressure of the container is at 536 mmHg. What was the pressure when the temperature was at 15.5°C?

(P_1 = 536 mmHg; P_2 = pressure)

$T_2 = 15.5°C + 273.15 = 288.65K$

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

$$\frac{536\ mmHg}{296.65K} = \frac{P_2}{288.65K}$$

$$\boxed{P_2 = 522\ mmHg}$$

$T_1 = 33°C + 273.15 = 306.15K$

6) The volume of a balloon outside on a hot day of 33°C was 8.7 L. (V_1) What ~~was~~ is the new volume (V_2) of the balloon after it was brought inside to the climate controlled temperature of 18.5°C?

$T_2 = 18.5°C + 273.15 = 291.65K$

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{8.7L}{306.15K} = \frac{V_2}{291.65K}$$

$$\boxed{V_2 = 8.3\ L}$$

7) The volume (V_1) of my beach ball when I left Wisconsin was 15.2 L, and the atmospheric pressure (P_1) was 0.998 atm. When I arrived in Colorado, the atmospheric pressure was 0.989 atm (P_2). Calculate the volume (V_2) of my beach ball at this pressure.

$$P_1V_1 = P_2V_2$$

$$\frac{(0.998\ atm)(15.2L)}{0.989\ atm} = \frac{(0.989\ atm)(V_2)}{0.989\ atm}$$

$$\boxed{V_2 = 15.3\ L}$$

(V_1, n_1)

55 − 20 = 35 L remain

8) A propane tank containing 55 L has 2.46 moles of the gas. If 20 L of gas is removed from the tank, how many moles remain?

$$\frac{V_1}{n_1} = \frac{V_2}{n_2}$$

$$\frac{55L}{2.46\ moles} = \frac{35L}{n_2}$$

$$\boxed{n_2 = 1.57\ moles}$$

9) Write a question that can be solved using Boyle's, Charles', Amonton's or Avogadro's Law. Then, solve your problem. Make sure you show your work!