HOMEWORK!

The Ideal Gas Law

CHeMis+ry: http://genest.weebly.com

Stop in for help every day at lunch and Tues, Weds., &Thurs after school!

After-hours question? Email me at home: eagenest@madison.k12.wi.us

GAS

answers

Name: Period:

1. What pressure is exerted by 0.693 moles of oxygen in a 7.55 L vessel at 18°C?

This is a "now" problem.

$PV = nRT$

$\frac{PV}{V} = \frac{nRT}{V}$

$P = \frac{nRT}{V}$

$P = \frac{(0.693\ \text{mol})(0.0821\ \frac{\text{L·atm}}{\text{mol·K}})(291\ \text{K})}{(7.55\ \text{L})}$

$P = 2.19\ \text{atm}$

2. Carbon monoxide, a poisonous gas, has a formula of CO. How many moles of carbon monoxide occupies a volume of 0.445 L at 333 kelvins and 1.5 atm?

This is a now problem.

$PV = nRT$

$\frac{PV}{RT} = \frac{nRT}{RT}$

$\frac{PV}{RT} = n$

$\frac{(1.5\ \text{atm})(.445\ \text{L})}{(0.0821\ \frac{\text{L·atm}}{\text{mol·K}})(333\ \text{K})} = n$

$0.024\ \text{mol} = n$

3. A gas filled weather balloon with a volume of 80.0 L is released at sea level at 102.0 kPa pressure and 27.0°C. The balloon expands to final volume of 835.0L at maximum altitude, where the temperature is 0.00°C. What will be the pressure at this time?

(This is before + after)

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Fix the units

$27.0°C + 273 = 300\ K$

$0°C + 273 = 273\ K$

Fix the units

$102\ kPa \times \left(\frac{1\ atm}{101\ kPa}\right) = 1.009\ atm$

$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

(#3 cont'd)

$\frac{T_2}{V_2} \cdot \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \cdot \frac{T_2}{V_2}$

	1	2
V	80.0 L	835.0 L
P	1.009 atm	?
T	300 K	273 K

$\frac{T_2}{V_2} \cdot \frac{P_1V_1}{T_1} = P_2$

$\frac{T_2P_1V_1}{V_2T_1} = P_2$

$\frac{(273\ K)(1.009\ atm)(80.0\ L)}{(835.0\ L)(300\ K)} = P_2$

$0.0880\ atm = P_2$

4. A gas filled weather balloon contains 33.0 L of air at 10.0°C at a pressure of 745. Torr. How many moles of gas are in the balloon? (Useful converter: 760 torr = 1.00 atm)

Fix the units

$10.0^{\circ}C + 273 = 283\ K$

and also:

$745\ torr \times \frac{1\ atm}{760\ torr} = 0.980\ atm$

This is the "Now" formula:

$PV = nRT$

rearrange:

$\frac{PV}{RT} = n$

$$\frac{(0.980\ atm)(33.0\ L)}{\left(0.0821\ \frac{L \cdot atm}{mol \cdot K}\right)(283\ K)} = n$$

$1.39\ mol = n$

$125.0\ kPa \times \frac{1\ atm}{101\ kPa} = 1.2376\ atm$

5. At what temperature would you need to have He to have 5.75 moles occupy a volume of 45.0L at a pressure of 125.0kPa?

formula

$PV = nRT$

$\frac{PV}{nR} = T$

$\frac{(1.2376\ atm)(45.0\ L)}{(5.75\ mol)(0.0821\ \frac{L\ atm}{mol\ K})} = T$

$118\ K = T$

6. Carbon monoxide, a poisonous gas, has a formula of CO. How many moles of carbon monoxide occupies a volume of 0.445 L at STP?

$PV = nRT$

Rearranges to

$\frac{PV}{RT} = n$

$\frac{(1.00\ atm)(0.445\ L)}{(0.0821\ \frac{L\ atm}{mol\ K})(273\ K)} = n$

$0.0198\ mol = n$

→ recall that Standard Temperature & Pressure is 0°C and 1 atm

7. What is the pressure of 25.00 moles of methane at 50.0°C if it occupies a volume of 60.0L?

fix!

$50°C + 273 = 323\ K$

$PV = nRT$

$P = \frac{nRT}{V}$

$P = \frac{(25.00\ mol)(0.0821\ \frac{atm\ L}{mol\ K})(323\ K)}{(60.0\ L)}$

$P = 11.0\ atm$