(#4-3b)
Chemistry
IDEAL GAS LAW A

$PV = nRT$

Combined Gas Law
$P_1V_1/T_1 = P_2V_2/T_2$
T = Kelvin

1. What is the difference between an Ideal gas and a non-ideal gas?
Ideal - No interaction - All particles act the same

2. What is the combined gas law?
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

3. The combined gas law is simply the combination the these three gas laws?
$P_1V_1 = P_2V_2$ $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

4. What is the ideal gas law?
$PV = nRT$

5. A flask contains $O_{2(g)}$, first at stp and then at 100°C. What is the pressure at 100°C.
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \rightarrow \frac{P_1V_1T_2}{T_1V_1} = P_2$ 373K $\frac{1 \cdot 373K}{273} = 1.36atm$
V = constant
$PV = nRT$? ?

6. Aerosol containers often carry the warning that they should not be heated. Suppose such a container were filled with a gas at 2.5 atm and 22°C, and suppose that the container may rupture if the pressure exceeds 8.0 atm. At what temperature is the rupture likely to occur.
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \rightarrow T_2 = \frac{P_2V_2T_1}{P_1V_1}$ $\frac{8 \cdot 295}{2.5} = 944K$
V = constant
$-273 \rightarrow 671°C$

273
22
295

7. R is called the universal gas constant. It has a value of .08206(Latm/molK)
What is the pressure exerted by 0.508 mol O_2 in a 15.0L container at 303K?
$PV = nRT$
$P = \frac{nRT}{V}$ $\frac{0.508 \cdot .0821 \cdot 303K}{15.0L} = 0.84atm$
0.94 atm → 291

8. What is the volume occupied by 16.0g ethane gas (C_2H_6) at 720 torr (760 T = 1atm) at 18°C?
$16g \cdot \frac{1mol}{30g} = 0.53mol$ (30g/mol)
$PV = nRT$ $V = \frac{nRT}{P} = \frac{.53 \cdot 0.0821 \cdot 291}{0.94atm} = 13.4L$

9. What is the temperature, in degrees Celsius, at which 15.0g O_2 will exert a pressure of 785 Torr in a volume of 5 L.
$15g \cdot \frac{1mol}{32g} = 0.468mol$
$PV = nRT$ $\frac{PV}{nR} = T$ $\frac{785 \cdot 5L}{.468 \cdot 62.4} = 134.4K - 273 = -138°C$

10. Calculation of Molecular mass or molar mass. Other wise known as the mass (g)/ mole. Calculate the molecular mass of a gas if 0.550g of the gas occupies 0.200L at 0.968 atm at 298K.
0.550 g ← given ← $PV = nRT$
n mol
$n = \frac{PV}{RT}$ $\frac{0.968atm \cdot 0.20L}{.0821 \cdot 298} = 0.00791mol$
$\frac{0.550g}{.0079}$
69.5 g/mol

11. The comment arose one day "science has nothing to do with my life". The student, in the next desk over, replied "your breathing aren't you?". With that said, your diaphragm, a muscle just below your lungs contracts and expands with every breath. Explain how this works, and which of out three basic laws explains this?
This muscle changes volume of Lungs
$P_1V_1 = P_2V_2$ causing change in pressure.