

(#7-3b)  
CHEMISTRY  
THE IDEAL GAS B

$$PV = nRT$$

$$R = .0821$$

Combined Gas Law

$$P_1V_1/T_1 = P_2V_2/T_2$$

$$T = \text{Kelvin}$$

1. What are the units on R?  $R = \frac{PV}{nT} = \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}}$
2. A sample of He gas has at STP has a volume of 5 L. How many moles are present?

$$5L \cdot \frac{1 \text{ mol}}{22.4 L} = 0.223 \text{ mol}$$

3. A balloon of Nitrogen gas at STP has a volume of 5 L. How many moles are present?

Same as #2. Ideal gases, the identity of gas is not a factor.

4. If a balloon has at STP contains 10 moles of He what is the volume?

$$10 \text{ mol} \cdot \frac{22.4 L}{1 \text{ mol}} = 224 L$$

5. What is the mass of helium in the previous problem?

~~224L~~  $1 \text{ mol} = 4g$   
 $10 \text{ mol} = 40g$

6. A balloon contains 1 gram of nitrogen at STP. What is the volume?

$$1g \cdot \frac{1 \text{ mol}}{28.5} \cdot \frac{22.4 L}{1 \text{ mol}} = 0.8 L$$

$\rightarrow N_2 = 28.5 \text{ mol}$

0.15 mol

7. A 1 gallon jug at 740 Torr and 25°C contains how many moles of air.

$\rightarrow 3.78 L$        $\rightarrow 298$        $PV = nRT$        $\frac{PV}{RT} = n$        $\frac{740 \cdot 3.78 L}{62.4 \cdot 298}$

8. What is the pressure in Torr of a 2L container at 212°F containing 1 mol of Oxygen gas.

$\rightarrow 100^\circ C = 373 K$

$$PV = nRT$$

$$P = \frac{nRT}{V} = \frac{1 \cdot 62.4 \cdot 373}{2 L} = 11637 \text{ Torr}$$

9. Two balloons, each 1 Liter in volume contain pure oxygen and Hydrogen at STP. How many moles are present of each?

$$1 L \cdot \frac{1 \text{ mol}}{22.4 L} = 0.0446 \text{ mol}$$

Both the same

10. The balloons from the previous problem are released into a rigid container 1 liter in size. Assuming no temperature change what is the new pressure?

$0.0446 \times 2 = 0.0892 \text{ mol}$        $PV = nRT$        $\frac{0.0892 \cdot 0.0821 \cdot 273}{1 L} = 2 \text{ atm}$

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

11. A spark ignites the gases from the previous problem creating water. What the mass of water produced during the reaction. (Write a balanced reaction.)

Skip