

## Review - Gas Laws

- 1) How are temperature and volume related? What is the law? *Charles*
- 2) How are pressure and temperature related? What is the law? *Direct* *Gay-Lussard's*
- 3) How are volume and pressure related? What is the law? *Direct* *Boyle's*
- 4) What is absolute zero and how was it determined? *Inverse* *OK, when V is zero*
- 5) Make the conversions below

$$-82\text{ C} = \underline{191}\text{ K}$$

$$285\text{ K} = \underline{12}\text{ }^\circ\text{C}$$

$$859\text{ mm Hg} = \underline{1.13}\text{ atm}$$

$$1.75\text{ atm} = \underline{1330}\text{ mm Hg}$$

- 6) A flask containing 155 ml of hydrogen gas is collected under 2.3 atm of pressure. What pressure would be required to collect 90 ml?  $(155)(2.3) = (90)P_2$  *3.96 atm*
- 7) A balloon filled with helium gas has a volume of 500ml at 1 atm. After the balloon is released it reaches an altitude where the pressure is only .5 atm. What volume does the balloon have now?  $(1)(500) = (.5)V_2$  *1000 mL*
- 8) At standard temperature a gas has a volume of 275ml. If the temperature is increased to 130°C, what is the new volume?  $\frac{275}{273} = \frac{V_2}{403}$  *406 mL*
- 9) A helium balloon has a volume of 2.75L at 20°C. The volume decreases to 2.46L on a cold day. What is the temperature that causes the balloon to occupy 2.46L?  $\frac{2.75}{293} = \frac{2.46}{T_2}$  *262 K*
- 10) The volume of a gas is 27.5ml at 22.0°C and 740mmHg. What will its volume be at 15.0°C and 755mmHg?  $\frac{(740)(27.5)}{295} = \frac{(755)V_2}{288}$  *26.3 mL*
- 11) A 700ml gas sample at STP is compressed to 200ml and the temperature is increased to 30°C. What is the pressure of the gas?  $\frac{1(700)}{273} = \frac{P_2(200)}{303}$  *3.88 atm*
- 12) Before a trip from New York to Boston, the pressure in an auto tire is 1.8atm at 20°C. At the end of the trip the gauge reads 1.9atm, what is the temperature outside when the second reading was taken?  $\frac{1.8}{293} = \frac{1.9}{T_2}$  *309 K*
- 13) A gas is mixture of carbon dioxide and nitrogen is found to have a total pressure of 1.2 atm. If the partial pressure of the nitrogen is .80 atm, what is the partial pressure of the carbon dioxide?

$$P_{\text{CO}_2} + P_{\text{N}_2} = P_{\text{TOT}}$$

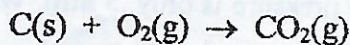
$$P_{\text{CO}_2} + .8 = 1.20$$

$$P_{\text{CO}_2} = .40\text{ atm}$$



- 15) What is the molar volume of all gases at STP?  $22.414 \text{ L/mole}$
- 16) Calculate the number of liters occupied by 5.6 mole of oxygen at STP.  $5.6 \text{ mole} \times \frac{22.414 \text{ L}}{\text{mole}} = 126 \text{ L}$
- 17) Calculate the number of moles in 36L of oxygen at STP.  $36 \text{ L} \times \frac{1 \text{ mole}}{22.414 \text{ L}} = 1.60 \text{ mole}$
- 18) What is the mass of .75L of carbon dioxide at STP?  $.75 \text{ L} \times \frac{\text{mole}}{22.414 \text{ L}} \times \frac{44.01 \text{ g}}{\text{mole}} = 1.5 \text{ g CO}_2$
- 19) What volume will 30g of methane gas (CH<sub>4</sub>) occupy at STP?  $30 \text{ g CH}_4 \times \frac{\text{mole}}{15.0347 \text{ g}} \times \frac{22.414 \text{ L}}{\text{mole}} = 45 \text{ L}$
- 21) What is the molar mass of a gas that has a mass of 3.5g and a volume of 20L?  $20 \text{ L} \times \frac{\text{mole}}{22.414 \text{ L}} = .89 \text{ mole}$   $\frac{3.5 \text{ g}}{.89 \text{ mole}} = 3.9 \text{ g/mole}$

For #22-25 use the equation below



- 22) How many liters of carbon dioxide are produced from 25g of carbon?  $25 \text{ g C} \times \frac{\text{mole}}{12.01} \times \frac{1 \text{ CO}_2}{1 \text{ C}} \times \frac{22.414 \text{ L}}{\text{mole}} = 47 \text{ L}$
- 23) How many grams of oxygen will produce 2.25L of carbon dioxide?  $2.25 \text{ L} \times \frac{\text{mole}}{22.414 \text{ L}} \times \frac{1 \text{ O}_2}{1 \text{ CO}_2} \times \frac{32 \text{ g}}{\text{mole}} = 3.2 \text{ g O}_2$
- 24) How many liters of oxygen will produce 3.5g of carbon dioxide?  $3.5 \text{ g CO}_2 \times \frac{\text{mole}}{44.01 \text{ g}} \times \frac{1 \text{ O}_2}{1 \text{ CO}_2} \times \frac{22.414 \text{ L}}{\text{mole}} = 1.78 \text{ L O}_2$
- 25) How many grams of carbon will produce 275ml of carbon dioxide?  $.275 \text{ L CO}_2 \times \frac{\text{mole}}{22.414 \text{ L}} \times \frac{1 \text{ C}}{1 \text{ CO}_2} \times \frac{12.01 \text{ g}}{\text{mole}} = .147 \text{ g C}$

26) What pressure is exerted by 1.35 mole of HF gas in a 2.5 L container at 320 K?

$$P(2.5) = (1.35)(.0821)(320) \quad P = 14 \text{ atm}$$

27) What volume is occupied by 2.00 mole of hydrogen gas at 300 K and 1.25 atm?

$$(1.25) V = (2.00)(.0821)(300) \quad V = 39 \text{ L}$$

28) How many moles of gas are in 1.25 L at 250 K and 1.06 atm?

$$(1.06)(1.25) = n (.0821)(250) \quad n = .0646 \text{ mole}$$

29) What mass of O<sub>2</sub> gas would there be in a 5.60 L container at 1.75 atm and 250 K?

$$(1.75)(5.60) = n (.0821)(250)$$

$$n = .477 \text{ mole O}_2 \times \frac{32 \text{ g}}{\text{mole}} = 15.3 \text{ g O}_2$$

88