ANSWERS

Son of Gas volume and limiting reagent

CLeMis+ry: http://geoest.weebly.com

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

Name_____

Period_____

1. What does STP stand for? Standard temperature AND pressure
2. At STP what is the pressure? 1.0 atmosphere
3. At STP what is the temperature? 0°C
4. Describe all gases at STP, by filling in the blanks:

   1 moles of gas at STP = 22.4 liters of gas

5. 2. A 90.0 mL volume of helium was collected under a pressure of 740 mmHg. At what volume would the pressure of this gas be 700 mm Hg? Assume temperature is constant.

	Pressure
before	740 mmHg
after	700 mmHg
effect on volume	Should increase volume!

$$90.0\,mL \times \left(\frac{700\,mmHg}{740\,mmHg}\right) =$$

"Should decrease volume" because table says make top small

6. A small bubble rises from the bottom of a lake, where the temperature is 8°C and the pressure is 6.4 atm, to the water's surface, where the temperature is 25°C and pressure is 1.0 atm. Calculate the final volume (in mL) of the bubble if its initial ~~volume~~ was 2.1 mL

	T	P
before	281	6.4 atm
after	298	1.0 atm
effect on volume	Bigger	Bigger

$$2.1\,mL \times \left(\frac{298\,K}{281\,K}\right) \times \left(\frac{6.4\,atm}{1.0\,atm}\right) = 14.25\,mL$$

$= 14\,mL$

7. Determine the volume in liters of carbon dioxide that should be produced in the reaction between 100. g of carbon and 100. liters of O_2. ~~(Use the same three steps as in the previous problem above).~~ ← typo

① $C + O_2 \rightarrow CO_2$ Balanced equation!

$$100\,g\,C \times \left(\frac{1\ mol\ C}{12.01\ g\ C}\right) \times \left(\frac{1\ mol\ CO_2}{1\ mol\ C}\right) \times \left(\frac{22.4\ L\ CO_2}{1\ mol\ CO_2}\right) = 187\ liters\ CO_2$$

(12.01 from periodic table)

$$100\ liters\ O_2 \times \left(\frac{1\ mol\ O_2}{22.4\ LITER\ O_2}\right) \times \left(\frac{1\ mol\ CO_2}{1\ mol\ O_2}\right) \times \left(\frac{22.4\ L\ CO_2}{1\ mol\ CO_2}\right) = 100.\ liters\ CO_2$$

(22.4 from answer # 3 above)

ANSWER: 100 LITERS CO_2 WILL BE PRODUCED

8. Suppose 10.61 g of calcium was allowed to react with 8.61 liters of HCl gas to produce calcium chloride and hydrogen gas.

a. What is the balanced equation?

$1Ca + 2HCl \rightarrow 1CaCl_2 + 1H_2$

b. Which reactant is limiting? (Show both calculations.)

$10.61\ \text{g Ca} \times \left(\frac{1\ \text{mol Ca}}{40.08\ \text{g Ca}}\right)\left(\frac{1\ \text{mol } H_2}{1\ \text{mol Ca}}\right)\left(\frac{22.4\ \text{L } H_2}{1\ \text{mol } H_2}\right) = 5.930\ \text{Liters } H_2$

$8.61\ \text{L HCl} \times \left(\frac{1\ \text{mole HCl}}{22.4\ \text{L HCl}}\right) \times \left(\frac{1\ \text{mole } H_2}{2\ \text{mole HCl}}\right) \times \left(\frac{22.4\ \text{liter } H_2}{1\ \text{mole } H_2}\right) = 4.311\ \text{liters } H_2$

these both cannot be true. The smaller result is true!

ANSWER HCl is limiting reactant

c. Using the limiting reactant, solve for how many liters of hydrogen gas will form at Standard Temperature and Pressure.

Answer, see calculation in (B):
4.31 liters H_2 will form

DIATOMIC! DIATOMIC!

9. Suppose 55.00 L of nitrogen gas and 103.00 L of hydrogen gas are mixed and reacted to form ammonia (NH_3). Calculate the volume in liters of ammonia produced when this reaction runs to completion.

WRITE A BALANCED EQUATION FIRST! $\rightarrow 1N_2 + 3H_2 \rightarrow 2NH_3$

$55.00\ \text{L } N_2 \times \left(\frac{1\ \text{mol } N_2}{22.4\ \text{L } N_2}\right) \times \left(\frac{2\ \text{mol } NH_3}{1\ \text{mol } N_2}\right) \times \left(\frac{22.4\ \text{liter } NH_3}{1\ \text{mol } NH_3}\right) = 110\ \text{liters } NH_3$

$103.00\ \text{liter } H_2 \times \left(\frac{1\ \text{mol } H_2}{22.4\ \text{liter } H_2}\right) \times \left(\frac{2\ \text{mol } NH_3}{3\ \text{mol } H_2}\right) \times \left(\frac{22.4\ \text{LITER } NH_3}{1\ \text{mol } NH_3}\right) = 68.7\ \text{liters } NH_3$

ANSWER: 68.7 Liters NH_3 form

10. Gold (III) sulfide can react with fluorine to form gold(I) fluoride gas and S_8. Write a balanced reaction and then find how many liters at STP of AuF will form if you have 333.3 grams Gold (III) sulfide and 7.1 liters fluorine.

$8Au_2S_3 + 8F_2 \rightarrow 16AuF + 3S_8$

$333.3\ \text{g } Au_2S_3 \times \left(\frac{1\ \text{mol } Au_2S_3}{490.12\ \text{g } Au_2S_3}\right) \times \left(\frac{16\ \text{mol AuF}}{4\ \text{mol } Au_2S_3}\right) \times \left(\frac{22.4\ \text{liters AuF}}{1\ \text{mol AuF}}\right) = 31.1\ \text{Liters AuF}$

$7.1\ \text{liters } F_2 \times \left(\frac{1\ \text{mol } F_2}{22.4\ \text{Liters } F_2}\right) \times \left(\frac{16\ \text{mol AuF}}{8\ \text{mol } F_2}\right) \times \left(\frac{22.4\ \text{Liters}}{1\ \text{mol AuF}}\right) = 14.2\ \text{Liters AuF}$