

# ANSWERS

**Soñ of Gas volume and limiting reagent**  
**Chemistry** - <http://geocities.weebly.com>  
 Stop in for help every day at lunch and Tues & Thurs after school!



Name \_\_\_\_\_

Period \_\_\_\_\_

## Standard temperature and pressure

1. What does STP stand for? \_\_\_\_\_
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!

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

because table says "should decrease volume" 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

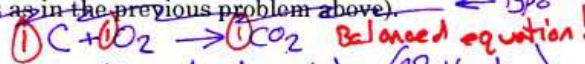
	T	P
before	281	6.4 atm
after	298	1.0 atm

effect on volume ← effect Bigger Bigger

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

= 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<sub>2</sub>. ~~Use the same three steps as in the previous problem above.~~ ← typo



100 gram C ×  $\left( \frac{1 \text{ mol C}}{12.01 \text{ gram C}} \right) \times \left( \frac{1 \text{ mol CO}_2}{1 \text{ mol C}} \right) \times \left( \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} \right) = 187 \text{ liters CO}_2$

from periodic table

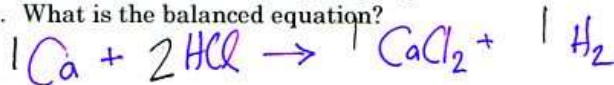
100 liters O<sub>2</sub> ×  $\left( \frac{1 \text{ mol O}_2}{22.4 \text{ LITER O}_2} \right) \times \left( \frac{1 \text{ mol CO}_2}{1 \text{ mol O}_2} \right) \times \left( \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} \right) = 100. \text{ liters CO}_2$

from answer # 3 above

ANSWER: 100 LITERS CO<sub>2</sub> 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?



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

$$10.61 \text{ gram Ca} \times \left( \frac{1 \text{ mol Ca}}{40.08 \text{ gram Ca}} \right) \times \left( \frac{1 \text{ mol H}_2}{1 \text{ mol Ca}} \right) \times \left( \frac{22.4 \text{ LITER H}_2}{1 \text{ mol H}_2} \right) = 5.930 \text{ Liters H}_2$$

$$8.61 \text{ L HCl} \times \left( \frac{1 \text{ mole HCl}}{22.4 \text{ LITER HCl}} \right) \times \left( \frac{1 \text{ mole H}_2}{2 \text{ mole HCl}} \right) \times \left( \frac{22.4 \text{ liter H}_2}{1 \text{ mole H}_2} \right) = 4.31 \text{ liters H}_2$$

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

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

ANSWER HCl is limiting reactant

Answer, see calculation in (B):  
4.31 liters H<sub>2</sub> will form

9. Suppose 55.00 L of nitrogen gas and 103.00 L of hydrogen gas are mixed and reacted to form ammonia (NH<sub>3</sub>). Calculate the volume in liters of ammonia produced when this reaction runs to completion.

WRITE A BALANCED EQUATION FIRST!  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$

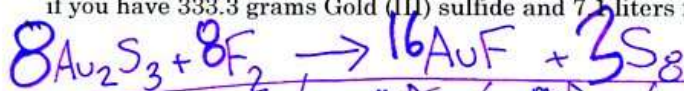
$$55.00 \text{ L N}_2 \times \left( \frac{1 \text{ mol N}_2}{22.4 \text{ L N}_2} \right) \times \left( \frac{2 \text{ mol NH}_3}{1 \text{ mol N}_2} \right) \times \left( \frac{22.4 \text{ liter NH}_3}{1 \text{ mol NH}_3} \right) = 110 \text{ liters NH}_3$$

$$103.00 \text{ liter H}_2 \times \left( \frac{1 \text{ mol H}_2}{22.4 \text{ liter H}_2} \right) \times \left( \frac{2 \text{ mol NH}_3}{3 \text{ mol H}_2} \right) \times \left( \frac{22.4 \text{ LITER NH}_3}{1 \text{ mol NH}_3} \right) = 68.7 \text{ liters NH}_3$$

ANSWER: 68.7 liters NH<sub>3</sub> form

10. Gold (III) sulfide can react with fluorine to form gold(I) fluoride gas and S<sub>8</sub>.

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.



$$333.3 \text{ gram Au}_2\text{S}_3 \times \left( \frac{1 \text{ mol Au}_2\text{S}_3}{490.42 \text{ gram Au}_2\text{S}_3} \right) \times \left( \frac{16 \text{ mol AuF}}{8 \text{ mol Au}_2\text{S}_3} \right) \times \left( \frac{22.4 \text{ LITER AuF}}{1 \text{ mol AuF}} \right) = 31.1 \text{ Liters AuF}$$

$$7.1 \text{ liters F}_2 \times \left( \frac{1 \text{ mol F}_2}{22.4 \text{ LITER F}_2} \right) \times \left( \frac{16 \text{ mol AuF}}{8 \text{ mol F}_2} \right) \times \left( \frac{22.4 \text{ LITER AuF}}{1 \text{ mol AuF}} \right) = 14.2 \text{ Liters AuF}$$