

37. Calculate the empirical and molecular formula for the following compound.  
 skip
38. Complete the following reaction:  
 $2\text{C}_2\text{H}_2 + 5\text{O}_2 \rightarrow 4\text{CO}_2 + 2\text{H}_2\text{O}$
39. How many atoms enter the reaction? 18 How many atoms leave the reaction? 18
40. How many molecules of carbon dioxide produced? 4
41. How many atoms of oxygen gas are consumed? 10

For questions 42-45 complete the word problem by predicting the product, write the balanced equation and identify the type of reaction.

42. Ammonia when heated produces **nitrogen gas and hydrogen gas**  
 Type of reaction: **decomp**  
 Equation:  
 $2\text{NH}_3 \rightarrow \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$
43. Carbon reacts with ferric oxide produces **carbon dioxide and iron**  
 Type of reaction: **single replacement**  
 Equation:  
 $3\text{C} + 2\text{Fe}_2\text{O}_3 \rightarrow 3\text{CO}_2 + 4\text{Fe}$
44. Chlorine gas and potassium bromide react to form **potassium chloride and bromine gas**  
 Type of reaction: **single replacement**  
 Equation:  
 $\text{Cl}_2(\text{g}) + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2(\text{g})$
45. Silver nitrate and sodium chloride react to form **silver chloride and sodium nitrate**  
 Type of reaction: **double replacement**  
 Equation:  
 $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$

Find the mass in one mole of:

46.  $\text{Hg}_2(\text{SO}_3)$  481.25 g/mol
47.  $\text{Al}_2\text{O}_3$  101.96 g/mol
48.  $\text{Ca}(\text{MnO}_4)_2$  277.96 g/mol

How many moles are in the following:

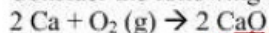
49. 98g of  $\text{H}_2\text{SO}_4$  1.0 mol  $\text{H}_2\text{SO}_4$
50. 7g of  $\text{N}_2$  0.2 mol  $\text{N}_2$
51. 0.051g of  $\text{NH}_3$  0.0030 mol  $\text{NH}_3$

## STP

Find the volumes of the following:

- 1 mol = 22.4 L
52. 1 mole of oxygen gas 22.4L O<sub>2</sub>  
 53. 3.5 moles water 78.4L H<sub>2</sub>O  
 54. 10.0 moles of nitrogen gas 224L N<sub>2</sub>

Consider the following equation:



55. How many moles of CaO would be produced by 6 moles of Ca?

$$3 \text{ mol Ca} \times \frac{2 \text{ mol CaO}}{2 \text{ mol Ca}} = 3 \text{ mol CaO}$$

mol → mol 1 step

56. How many grams of CaO would be produced by 54.3 grams of oxygen gas?

$$54.3 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{32.00 \text{ g O}_2} \times \frac{2 \text{ mol CaO}}{1 \text{ mol O}_2} \times \frac{56.08 \text{ g CaO}}{1 \text{ mol CaO}} = 190. \text{ g CaO}$$

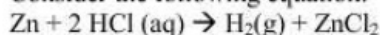
mass → mass 3 steps

57. How many liters of oxygen gas would be needed to produce 23.7 grams of CaO?

$$23.7 \text{ g CaO} \times \frac{1 \text{ mol CaO}}{56.08 \text{ g CaO}} \times \frac{1 \text{ mol O}_2}{2 \text{ mol CaO}} \times \frac{22.4 \text{ L O}_2}{1 \text{ mol O}_2} = 4.73 \text{ L O}_2$$

mass → vol. 3 steps

Consider the following equation:



58. How many grams of Zn are needed to produce 11.2L of hydrogen gas?

$$11.2 \text{ L H}_2 \times \frac{1 \text{ mol H}_2}{22.4 \text{ L H}_2} \times \frac{1 \text{ mol Zn}}{1 \text{ mol H}_2} \times \frac{65.39 \text{ g Zn}}{1 \text{ mol Zn}} = 32.7 \text{ g Zn}$$

vol → mass 3 steps

Complete the following word problems.

59. A gas at STP occupies 4L, if the pressure was lowered to 560mmHg what would the new volume be?

$$(4\text{L})(760 \text{ mmHg}) = (V_2)(560 \text{ mmHg}) \quad V_2 = 5\text{L}$$

60. The pressure exerted by a confined gas at 250K is 600 mmHg. What pressure would be exerted at 750K?

$$\frac{600 \text{ mmHg}}{250 \text{ K}} = \frac{P_2}{750 \text{ K}} \quad P_2 = 2000 \text{ mmHg}$$

61. A gas at 4 atm and 350K occupies a volume of 52.3cm<sup>3</sup>, what is the new volume if we bring everything to STP?

$$\frac{(52.3 \text{ cm}^3)(4 \text{ atm})}{350 \text{ K}} = \frac{V_2(1 \text{ atm})}{273 \text{ K}} \quad V_2 = 200 \text{ cm}^3$$

62. How many grams of oxygen gas are present if it occupies 2.62L at 285°C and 3.42 atm?

$$(3.42 \text{ atm})(2.62 \text{ L}) = n(0.0821 \text{ Latm/molK})(558 \text{ K}) \quad n = 0.196 \text{ mol} \rightarrow 6.26 \text{ g O}_2$$

63. We need to inflate a balloon to a volume of 1.250L with 0.2494g of helium, if the pressure is 1.26atm what temperature do we need (in °C)?

$$(1.26 \text{ atm})(1.250 \text{ L}) = (0.06235 \text{ mol})(0.0821 \text{ Latm/molK})(T) \quad T = 34.7^\circ \text{C}$$

64. What is the molarity of a glucose solution if there is 0.20 mol of glucose dissolved in 750ml of water?

$$M = \frac{0.20 \text{ mol}}{0.750 \text{ L}} = 0.27 \text{ M}$$

$$63. (1.26 \text{ atm})(1.250 \text{ L}) \left( \frac{4.00 \text{ g}}{\text{mol}} \right) = (0.2494 \text{ g}) \left( 0.0821 \frac{\text{Latm}}{\text{molK}} \right) T$$

master equation - Stoich.

$$\text{amt. given} \times \frac{1 \text{ mol given}}{\text{molar mass}} \times \frac{\text{molar ratio}}{\text{ratio}} \times \frac{\text{molar mass}}{22.4 \text{ L}} \times \frac{\text{needed}}{1 \text{ mol needed}}$$

molar ratio uses coefficients of the balanced equation  
 $\frac{\# \text{ mol needed}}{\# \text{ mol given}}$

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2}$$

$$PV = nRT$$

$$PV_m = gRT$$

$$P_{\text{TOT}} = P_1 + P_2 + P_3$$