

Name: _____ Date: _____

Per: _____

Parent Signature: _____

Stoichiometry Conversion Packet – NO CALCULATORS!

As a result of your performance on the Stoichiometry Unit, you have earned more practice! Please use the following examples to help you complete the packet over Vacation. It will be collected in your class on Tuesday, January 8, 2013.

Conversion of Moles to Grams:

Example 1 – How many grams of Lithium are in 3.50 moles Lithium?

$$\frac{3.50 \cancel{\text{ mol Li}}}{1} \times \frac{6.94 \text{ g Li}}{1 \cancel{\text{ mol Li}}} = 24.3 \text{ g Li}$$

The 6.94 g Li comes from the Periodic Table. The math of this now is multiplying $3.50 \times 6.94 = 24.29$. Rounding the numbers makes it easier so it is $3.5 \times 7 = 24.5$.

***Your Turn! Convert the following without the use of a calculator and round the atomic masses.

1. 5.0 moles C into grams
2. 12.5 moles O₂ into grams
3. 1/2 moles Carbon Dioxide into grams
4. 7.5 moles NaCl into grams
5. 93 moles H₂O into grams
6. 18 moles Iron(III) Chloride into grams
7. 3 moles HF into grams

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$$\begin{array}{r} 73.51 \\ \times 26.62 \\ \hline \end{array}$$

$$\begin{array}{r} 68.96 \\ \times 52.88 \\ \hline \end{array}$$

$$\begin{array}{r} 67.87 \\ \times 47.39 \\ \hline \end{array}$$

$$\begin{array}{r} 53.47 \\ \times 19.14 \\ \hline \end{array}$$

$$\begin{array}{r} 42.55 \\ \times 53.41 \\ \hline \end{array}$$

$$\begin{array}{r} 41.27 \\ \times 14.43 \\ \hline \end{array}$$

$$\begin{array}{r} 73.89 \\ \times 55.93 \\ \hline \end{array}$$

$$\begin{array}{r} 96.34 \\ \times 87.23 \\ \hline \end{array}$$

$$\begin{array}{r} 68.85 \\ \times 30.72 \\ \hline \end{array}$$

$$\begin{array}{r} 82.85 \\ \times 26.36 \\ \hline \end{array}$$

$$\begin{array}{r} 62.37 \\ \times 26.41 \\ \hline \end{array}$$

$$\begin{array}{r} 13.34 \\ \times 15.67 \\ \hline \end{array}$$

$$\begin{array}{r} 36.82 \\ \times 52.22 \\ \hline \end{array}$$

$$\begin{array}{r} 67.26 \\ \times 88.68 \\ \hline \end{array}$$

$$\begin{array}{r} 27.94 \\ \times 68.72 \\ \hline \end{array}$$

$$\begin{array}{r} 47.62 \\ \times 50.18 \\ \hline \end{array}$$

$$\begin{array}{r} 52.51 \\ \times 87.82 \\ \hline \end{array}$$

$$\begin{array}{r} 77.25 \\ \times 80.47 \\ \hline \end{array}$$

$$\begin{array}{r} 30.32 \\ \times 50.67 \\ \hline \end{array}$$

$$\begin{array}{r} 91.91 \\ \times 76.18 \\ \hline \end{array}$$

$$\begin{array}{r} 76.43 \\ \times 21.62 \\ \hline \end{array}$$

$$\begin{array}{r} 49.71 \\ \times 89.57 \\ \hline \end{array}$$

$$\begin{array}{r} 63.15 \\ \times 34.37 \\ \hline \end{array}$$

$$\begin{array}{r} 90.29 \\ \times 94.51 \\ \hline \end{array}$$

$$\begin{array}{r} 95.92 \\ \times 76.72 \\ \hline \end{array}$$



CHEMISTRY

COMPUTING FORMULA MASS WORKSHEET

Directions:

Find the formula mass of the following compounds. Round atomic masses to the nearest whole number. Place your final answer in the FORMULA MASS COLUMN.

Problem Set-up example:	
Find the formula mass of $\text{Ca}(\text{NO}_3)_2$	
Ca:	$1 \times 40.1 = 40.1$
N:	$2 \times 14.0 = 28.0$
O:	$6 \times 16.0 = 96.0$
Formula Mass	= $\frac{\quad}{\quad}$
	164

COMPOUND	FORMULA MASS
AgNO_2	
NiSO_3	
$\text{Ca}_3(\text{PO}_4)_2$	
HgSO_4	
$\text{Fe}(\text{NO}_3)_3$	
KBr	
BeCr_2O_7	
$\text{Co}(\text{ClO}_3)_2$	
$\text{Cu}_2\text{C}_4\text{H}_4\text{O}_6$	
$\text{CuSO}_4 \cdot 7 \text{H}_2\text{O}$	

COMPOUND	FORMULA MASS
ZnCl_2	
K_3PO_4	
$\text{Al}_2(\text{SO}_4)_3$	
MgCrO_4	
$\text{CaC}_4\text{H}_4\text{O}_6$	
NaCl	
$\text{K}_2\text{Cr}_2\text{O}_7$	
H_2SO_4	
$\text{Cu}(\text{OH})_2$	
$\text{MgSO}_4 \cdot 5 \text{H}_2\text{O}$	

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Reducing Fractions

1) $\frac{3}{6} =$ _____

11) $\frac{6}{12} =$ _____

21) $\frac{56}{80} =$ _____

2) $\frac{42}{49} =$ _____

12) $\frac{49}{70} =$ _____

22) $\frac{32}{48} =$ _____

3) $\frac{12}{15} =$ _____

13) $\frac{8}{12} =$ _____

23) $\frac{8}{32} =$ _____

4) $\frac{15}{27} =$ _____

14) $\frac{30}{70} =$ _____

24) $\frac{9}{36} =$ _____

5) $\frac{16}{24} =$ _____

15) $\frac{3}{6} =$ _____

25) $\frac{36}{48} =$ _____

6) $\frac{6}{10} =$ _____

16) $\frac{18}{90} =$ _____

26) $\frac{4}{14} =$ _____

7) $\frac{5}{15} =$ _____

17) $\frac{6}{12} =$ _____

27) $\frac{45}{81} =$ _____

8) $\frac{6}{9} =$ _____

18) $\frac{35}{45} =$ _____

28) $\frac{2}{8} =$ _____

9) $\frac{4}{12} =$ _____

19) $\frac{24}{40} =$ _____

29) $\frac{40}{72} =$ _____

10) $\frac{6}{12} =$ _____

20) $\frac{5}{10} =$ _____

30) $\frac{4}{16} =$ _____



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Multiplying Fractions and Whole Numbers

1) $\frac{2}{3} \times 8 =$

2) $\frac{2}{3} \times 21 =$

3) $\frac{5}{12} \times 10 =$

4) $\frac{3}{7} \times 6 =$

5) $\frac{1}{5} \times 27 =$

6) $\frac{9}{14} \times 29 =$

7) $\frac{1}{4} \times 20 =$

8) $\frac{1}{2} \times 11 =$

9) $\frac{2}{14} \times 20 =$

10) $\frac{1}{8} \times 6 =$

11) $\frac{3}{9} \times 21 =$

12) $\frac{6}{10} \times 9 =$

13) $\frac{1}{4} \times 18 =$

14) $\frac{8}{16} \times 17 =$

15) $\frac{4}{12} \times 26 =$



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Convert Grams to Moles:

Example 2 - How many moles of Carbon are in 3.0 grams Carbon?

$$\frac{3.0 \text{ g } \cancel{C}}{12 \text{ g } \cancel{C}} \times \frac{1 \text{ mol } C}{1} = .25 \text{ mol } C$$

Remember, the 12 grams C comes from the Periodic Table. The math now is $3.0 \div 12$ or $3/12$. This simplifies to $1/4$ or 0.25. **It is not 4!!**

***Your Turn! Convert the following grams to moles:

1. 7 grams of N_2 gas to moles of N_2
2. 180 grams water into moles water
3. 18 grams glucose ($C_6H_{12}O_6$) into moles glucose
4. 29 grams sodium chloride into moles sodium chloride
5. 19.5 grams CaF_2 into moles
6. 47 grams K_2O into moles
7. How many moles of $FeBr_3$ are in 74 grams $FeBr_3$?
8. How many moles of Carbon Dioxide gas are in 11 grams Carbon Dioxide gas?
9. How many moles of water are in 99 grams of water?

Convert Moles gas to Volume gas:*Example 3 – How many liters of gas are in 3 moles of Oxygen gas?*

$$\frac{3 \cancel{\text{ mol}} \text{ O}_2}{1 \cancel{\text{ mol}}} \times \frac{22.4 \text{ L}}{1} = 67.2 \text{ L O}_2$$

Remember, 1 mole of any gas at standard conditions will always occupy 22.4 Liters! So multiply 3 x 22.4.

***Your Turn! Please convert the following moles into liters:

1. 6 mol Oxygen gas to Liters
2. 1/2 mol N₂ to Liters
3. 2 mol Carbon Monoxide

Convert Volume gas to Moles gas:*Example 4 – How many moles of Hydrogen gas is in 100 Liters Hydrogen gas?*

$$\frac{100 \cancel{\text{ L}} \text{ H}_2}{22.4 \cancel{\text{ L}}} \times \frac{1 \text{ mol}}{1} = 4.64 \text{ mol H}_2$$

So the math is 100 ÷ 22.4 or 100 / 22.4 = 4.64. It is not 100 x 22.4!!

***Your Turn – Convert the following Liters to Moles:

1. 44.8 Liters of oxygen gas to moles oxygen gas
2. 11.2 Liters of nitrogen gas to moles nitrogen gas
3. 67.2 Liters of water vapor to moles water vapor

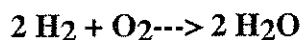
CHEMISTRY

MOLAR RATIOS WORKSHEET

Molar Ratios

The molar ratio is an important concept in solving stoichiometry problems. The sources for these ratios are the coefficients of a balanced equation.

Example 1:



What is the molar ratio between H_2 and O_2 ?

Answer:

two to one. So this ratio is written as a fraction is

$$\frac{2 \text{ mol H}_2}{1 \text{ mol O}_2}$$

What is the molar ratio between O_2 and H_2O ?

Answer:

one to two. As a fraction, it is:

$$\frac{1 \text{ mol O}_2}{2 \text{ mol H}_2\text{O}}$$

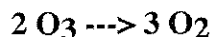
What is the molar ratio between H_2 and H_2O ?

Answer: two to two or:

$$\frac{2 \text{ mol H}_2}{2 \text{ mol H}_2\text{O}}$$

This reduces to one to one, but leave it written as 2 to 2.

Example 2:



The exact molar ratio you would use depends on how the problem is worded.

What is the molar ratio between O_3 and O_2 ?

$$\frac{2 \text{ mol O}_3}{3 \text{ mol O}_2}$$

What is the molar ratio between O_2 and O_3 ?

$$\frac{3 \text{ mol O}_2}{2 \text{ mol O}_3}$$

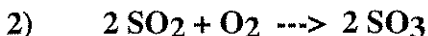
Practice Problems

Following each equation are two requests for molar ratios from the equation.



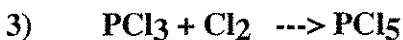
Write the molar ratios for:

N_2 to H_2 and NH_3 to H_2



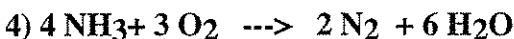
Write the molar ratios for:

O_2 to SO_3 and O_2 to SO_2



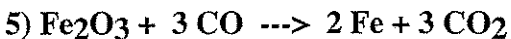
Write the molar ratios for

PCl_3 to Cl_2 and PCl_3 to PCl_5



Write the molar ratios for

NH_3 to N_2 and H_2O to O_2



Write the molar ratios for

CO to CO_2 and Fe to CO

Stoichiometry Conversions: Moles Given to Moles Find

Using the notes from Stoichiometry on ChemLeal.com, write the 4 steps for Calculating Moles of Reactants and Products:

1. _____
2. _____
3. _____
4. _____

Example 5 – How many moles of Iron(III) Oxide are formed when 6.50 moles of Iron reacts with excess Oxygen?



$$\frac{6.50 \cancel{\text{ mole Fe}}}{4 \cancel{\text{ mol Fe}}} \times \frac{2 \text{ mol Fe}_2\text{O}_3}{1} = ? \text{ mole Fe}_2\text{O}_3$$

$$= 3.25 \text{ mole Fe}_2\text{O}_3$$

First, start off with the balanced equation. Then write the given amount on the top right. The given is 6.50 moles Fe. The next step is to write the units and formula of what you are asked to find on the far right. This is moles of Fe₂O₃. The next step is to look at the units given and units to find. They are both moles so the next step is to look at the formulas given and formulas to find. These are different. How do we change formulas? Use the Mole Ratio *from the balanced equation*. This is where the 2 mole Fe₂O₃ / 4 mol Fe comes from. The math now is 6.50 x 2 ÷ 4 = 3.25.

*****Your Turn! Calculate Moles**

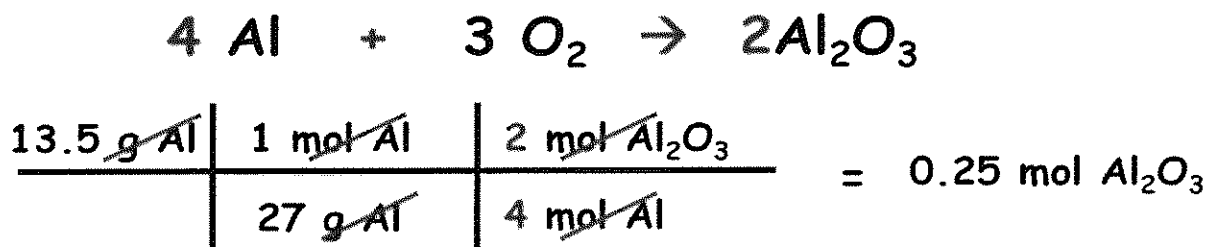
1. Using the above equation, if you have 2.5 moles Fe, how many moles of Fe₂O₃ do you get?
2. Using the above equation, how many moles of Oxygen gas do you need if you have 2.5 moles Fe?
3. How many moles of water can be produced when 5 moles of Oxygen gas reacts with Hydrogen gas?
4. How many moles of Oxygen gas is needed to completely react with 5 moles of Hydrogen Gas

Stoichiometry Conversions: Grams Given to Moles Find

Using the notes from Stoichiometry on ChemLeal.com, write the 4 steps for Calculating Moles of Reactants and Products:

1. _____
2. _____
3. _____
4. _____

Example 6 – How many moles of Aluminum Oxide are formed when 13.5 grams of Aluminum reacts with excess Oxygen?



First, start off with the balanced equation. Then write the given amount on the top right. The given is 13.5 grams Al. The next step is to write the units and formula of what you are asked to find on the far right. This is moles of Al_2O_3 . The next step is to look at the units given and units to find. They are grams and moles so the next step is to look at the formulas given and formulas to find. These are different too. We need to first convert grams to moles. Then, how do we change formulas? Use the Mole Ratio *from the balanced equation*. This is where the 2 mole Al_2O_3 / 4 mol Al comes from. The math now is $13.50 \div 27 \times 2 \div 4 = 0.25$.

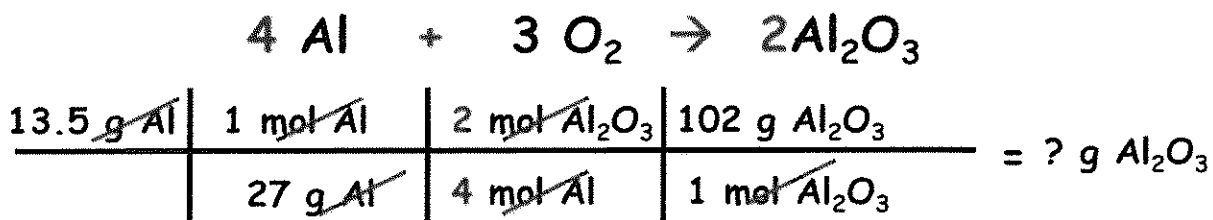
***Your Turn! Calculate Moles

5. Using the above equation, if you have 54 grams Al, how many moles of Al_2O_3 do you get?
6. Using the above equation, how many moles of Oxygen gas do you need if you have 81 grams Al?
7. How many moles of water can be made when 32 grams of Oxygen gas reacts with Hydrogen gas?
8. How many moles of Oxygen gas is needed to completely react with 6 grams of Hydrogen Gas?

Stoichiometry Conversions: Grams Given to Grams Find

Please write the 5 steps for Calculating Grams of Reactants and Products:

1. _____
2. _____
3. _____
4. _____
5. _____

Example 7 – How many moles of Al_2O_3 are formed when 13.5 grams of Al reacts with excess O_2 ?

$$13.5 \div 27 \times 2 \div 4 \times 102 = 25.5 \text{ g } Al_2O_3$$

First, start off with the balanced equation. Then write the given amount on the top right. The given is 13.5 g Al. The next step is to write the units and formula of what you are asked to find on the far right. This is grams of Al_2O_3 . The next step is to look at the units given and units to find. They are grams and grams so the next step is to look at the formulas given and formulas to find. These are different again. We need to first convert grams to moles. Then, how do we change formulas? Use the Mole Ratio *from the balanced equation*. This is where the 2 mole Al_2O_3 / 4 mol Al comes from. Finally, convert back to grams.

***Your Turn! Calculate grams

9. Using the above equation, if you have 54 grams Al, how many grams of Al_2O_3 do you get?
10. Using the above equation, how many grams of Oxygen gas do you need if you have 81 grams Al?
11. How many grams of water can be made when 32 grams of Oxygen gas reacts with Hydrogen gas?
12. How many moles of Oxygen gas is needed to completely react with 6 grams of Hydrogen Gas?

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Conversion / Stoichiometry Problem Mix:

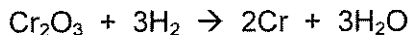
1. Convert 5 moles HCl into grams
2. Convert 10 moles Oxygen gas to Liters
3. If you have 12.5 Liters of Hydrogen gas, how many moles do you have?
4. If 8 grams of oxygen gas reacts with hydrogen gas, how many grams of water will be made?
5. If 8 grams of hydrogen gas reacts with oxygen gas, how many liters of water will be made?
6. How many atoms are in one mole of Carbon?
7. How many moles of Aluminum are needed to react with 64 grams of Oxygen to make Aluminum Oxide?
8. How many grams of Carbon Dioxide are made when 32 grams of CH₄ combusts?
9. Convert 4 grams of Calcium into moles.
10. How many grams of Iron(III) Oxide are made when 28 grams of Iron reacts with excess Oxygen gas?
11. How many Liters of water are made when 4.5 Liters of Oxygen gas reacts with Hydrogen gas?
12. How many grams of Copper are made when 7 grams of Copper(II) Sulfate reacts with Iron to make Copper and Iron(II) Sulfate?

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Chemistry Unit 4 Practice – Stoichiometry

Each question is just like the Quiz. You must show all of your work.
Put your answer in the space provided! No Work = No Credit!

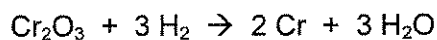
1. A chemist uses hot hydrogen gas to convert chromium(III) oxide to pure chromium. How many moles of hydrogen are needed to convert 5 moles of chromium(III) oxide, Cr₂O₃ to Cr?



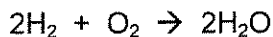
2. How many liters of oxygen, O₂, are required for the complete combustion of ½ mole of pentane, C₅H₁₂ at standard conditions according to the following unbalanced equation?



3. A chemist uses hot hydrogen gas to convert chromium(III) oxide to pure chromium. How many moles of hydrogen are needed to convert 76 grams of chromium(III) oxide, Cr₂O₃?



4. Hydrogen can react explosively with oxygen to form water. How many liters of hydrogen are required to combine with 16 grams of oxygen at standard conditions?



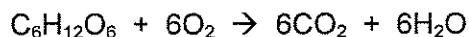
5. How many grams of calcium are required to make 4 moles of hydrogen gas from hydrochloric acid, HCl according to the unbalanced equation?



6. Butane, C_4H_{10} burns in oxygen. How many liters of water vapor, H_2O , are produced by the combustion of 20 moles of butane at standard conditions?



7. How many liters of oxygen, at standard conditions, are needed to react with 90 grams of glucose, ($\text{C}_6\text{H}_{12}\text{O}_6$)?



8. How many grams of oxygen are required to produce 9 grams of water at standard conditions?

