

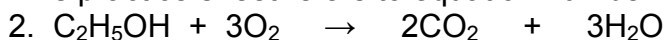
More Stoichiometry Practice using Excel

Download and open the Excel spreadsheet stoichiometry2004.xls from the Honors Chemistry page at www.dfeebeck.com

Make sure you are on the Stoichiometry tab.

Mole-Mass Ratios:

This practice sheet refers to equation number 2 on the spreadsheet:



Use the following molar masses for conversions:

$\text{C}_2\text{H}_5\text{OH} = 46.068\text{g/mol}$ $\text{O}_2 = 32.0\text{g/mol}$ $\text{CO}_2 = 44.01\text{g/mol}$ $\text{H}_2\text{O} = 18.016\text{g/mol}$

Sample Question 1:

- Determine the number of grams of oxygen required to react with 25.0g of ethanol ($\text{C}_2\text{H}_5\text{OH}$).
- How many grams of carbon dioxide can be produced?

Answer using Spreadsheet method:

- Type 25.0 into the grams cell for ethanol. How many moles of ethanol is this? _____ mol
- Experiment by placing various masses in the oxygen cell until the excess mass for both reactants is zero. What mass of oxygen was required? _____ g

Follow up:

- How many moles of oxygen is this? _____ mol (look at the value in the mol cell)
- What is the ratio of the coefficients for oxygen to ethanol? _____: _____
- What is the ratio of the moles of oxygen to ethanol (in lowest terms)? _____: _____
Should your answers to 4 and 5 be the same? _____.
- Is the ratio of the mass of oxygen to ethanol the same as in 5? _____. Why or why not? _____
- Look at the cell related to grams of CO_2 that can be produced. What is the value? _____ g CO_2 .

Answer using Computational method:

- Convert 25.0g of ethanol into moles: _____ mol $\text{C}_2\text{H}_5\text{OH}$.
- Determine the moles of oxygen required using the moles of $\text{C}_2\text{H}_5\text{OH}$ just calculated (i.e. set up a mole ratio using the coefficients of the balanced equation).
_____ mol O_2
- Convert back to grams of O_2 by multiplying the moles by the molar mass of O_2 .
_____ g O_2
- Is your answer to 3 above the same as that of 2 in the previous section? _____? If not, look over your above steps and recalculate the result. Watch your labels.
- Calculate the grams of carbon dioxide, CO_2 that can be produced by:
 - Using the moles of $\text{C}_2\text{H}_5\text{OH}$ in step 1, set up a mole ratio between the CO_2 and the $\text{C}_2\text{H}_5\text{OH}$ to calculate moles of CO_2 that can be produced.

_____ mol CO₂
 b. Convert from moles of CO₂ to grams by multiplying moles of CO₂ by the molar mass of CO₂.

_____ g CO₂
 c. Does your answer in step b above agree with your answer to step 7 in the previous section? _____. If not, go back over steps a and b above and recalculate your answer.

Sample Question 2- Limiting Reagents:

- Calculate the grams of H₂O that can be produced from 100.00g each of ethanol (C₂H₅OH) and oxygen (O₂).
- What is the excess reagent and how much is leftover?

Answer using Spreadsheet method:

1. Type 100.00g into the mass boxes for ethanol and oxygen (the two reactants). Fill in the data table below for the results that are produced when you do this.

C₂H₅OH	+	3O₂	→	2CO₂	+	3H₂O	
100.00	grams	100.00	grams		grams		grams
	mol		mol		mol		mol
	g excess		g excess				

- What is the number of grams of H₂O that can be produced? _____ g H₂O
- Which of the two reactants has leftover mass? _____ How much is in excess? _____ g
- Why is there some mass leftover? _____
- Calculate the mass of the substance that should have been used by subtracting the amount in excess from the original 100.00g. What is this mass? _____ g
- Plug your answer from 5 into the mass cell where the 100.00g originally was. What happens to the excess reagent cells when you enter this value?

What happens to the amount of H₂O produced? Why? _____

7. Are the moles of C₂H₅OH to O₂ being used in a 1:3 ratio that is consistent with the coefficients in the balanced equation now? _____.

Answer using Computational method:

Answers to sample question 1:

0.5427mol

52.10g

1.6281mol

3:1

3:1, Yes

No. Coefficients only work for quantities, not mass.

47.77g CO₂

25.0g C₂H₅OH (1mol C₂H₅OH / 46.068g C₂H₅OH) = **.5427 mol C₂H₅OH**

.5427mol C₂H₅OH (3mol O₂ / 1mol C₂H₅OH) = **1.6281 mol O₂**

1.6281mol O₂ (32.0g O₂ / 1mol O₂) = **52.10g O₂**

Yes, they should agree

.5427 mol C₂H₅OH (2mol CO₂ / 1mol C₂H₅OH) = **1.0854mol CO₂**

1.0854mol CO₂ (44.01g CO₂ / 1mol CO₂) = **47.77g CO₂**

Yes, they should agree

Sample Question 2 – Limiting Reagent Answers:

C₂H₅OH	+	3O₂	→	2CO₂	+	3H₂O	
100.00	grams	100.00	grams	91.69	grams	56.30	grams
2.1707	mol	3.1250	mol	2.0833	mol	3.1250	mol
52.01	g excess	0.00	g excess				

56.30g

C₂H₅OH, 52.01g

There was more than the mass of ethanol required to react with all 100.00g of the O₂ used.

47.99g

Both the excess reagent boxes are now zero, indicating that exactly the correct mass or reactants are being used with none leftover; Nothing, because the amount of H₂O produced was not dependant upon the amount of excess C₂H₅OH, only on the amount that was used.