

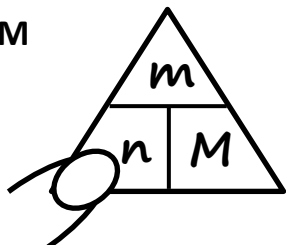
Achievement Standard Chemistry 91161

Carry out quantitative analysis

Calculations from equations – **mnm!!**

Reminder ☺

$$n = m / M \quad \& \quad m = n M$$



m is mass (g)
n is amount (mol)
M is molar mass / mass of one mole (g mol^{-1})

Now study the examples below and try some questions for yourself!

Example!

If 32.0 g of ethanol $\text{C}_2\text{H}_5\text{OH}$ is burnt in oxygen, what mass of water will be produced? $M(\text{C}) = 12.0 \text{ g mol}^{-1}$, $M(\text{H}) = 1.00 \text{ g mol}^{-1}$, $M(\text{O}) = 16.0 \text{ g mol}^{-1}$

1 *m* (you were given in the Q.)

$$\text{C}_2\text{H}_5\text{OH} + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 3\text{H}_2\text{O}$$

1 mol	3 mol	2 mol	3 mol
32.0 g	-	-	? g

$n = m/M$

$n = 32.0/46.0$

$n = 0.696 \text{ mol}$

2 *n*

$m = n M$

$m = 2.09 \times 18.0 = 37.6 \text{ g}$

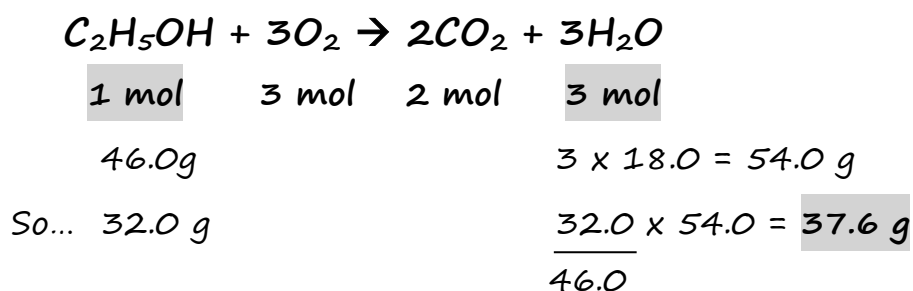
$n = 3 \times 0.696 = 2.09 \text{ mol}$

3 *n* (by mol ratio)

4 *m* (you were asked to find)

Another way... by straight proportion

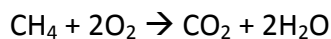
Work amount masses for the mole ratio you have been given in the equation.... Then work out - by proportion - for the quantity you are given... it's quick, easy and it works!!!



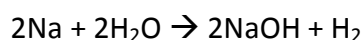
Calculations from equations

Easy ones!

1. What mass of carbon dioxide would be formed if 20.0 g of methane gas was burnt?

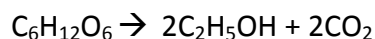


2. Sodium reacts with water to form sodium hydroxide and hydrogen gas. What mass of sodium would be needed to make 100 g of sodium hydroxide?

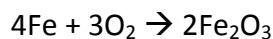


A bit harder!

3. Calculate the mass of ethanol $\text{C}_2\text{H}_5\text{OH}$ that could be formed from 45.0 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$

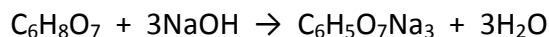


4. What mass of iron would be needed to produce 34.5 g of iron(III) oxide Fe_2O_3 ?



Hardest!

5. Citric acid reacts with sodium hydroxide. The equation for the reaction is:



Calculate the mass of sodium citrate, $\text{C}_6\text{H}_5\text{O}_7\text{Na}_3$, which is formed when 10.0 g of sodium hydroxide reacts with citric acid.

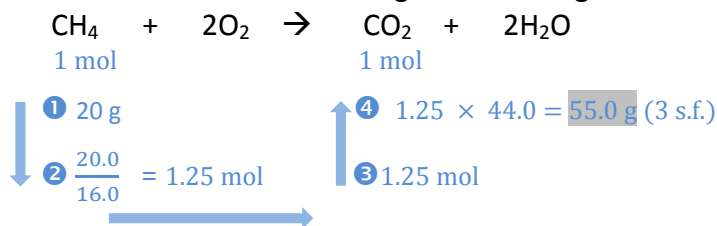
6. Malic acid reacts with sodium hydroxide. The equation for the reaction is:



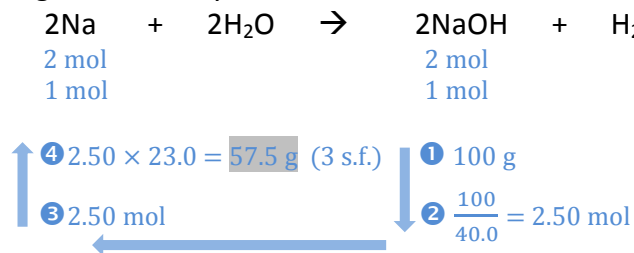
Calculate the (maximum) mass of sodium malate, $\text{C}_4\text{H}_4\text{O}_5\text{Na}_2$, which could be made from 15.0 g of sodium hydroxide.

Answers – final answers given to 3 s.f.

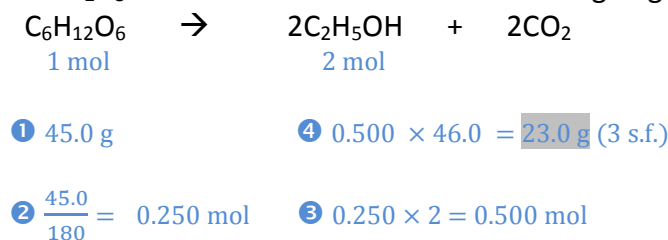
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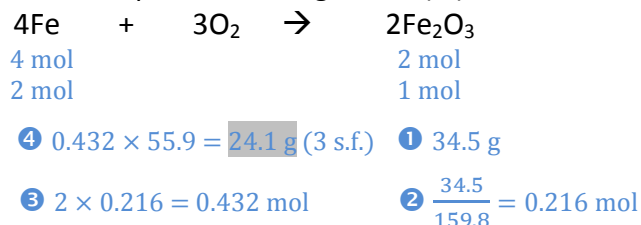
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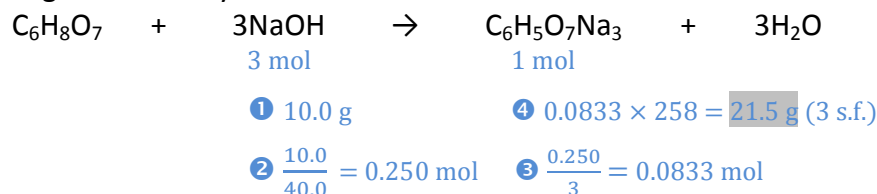
3. Calculate the mass of ethanol $\text{C}_2\text{H}_5\text{OH}$ that could be formed from 45.0 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$



4. What mass of iron would be needed to produce 34.5 g of iron(III) oxide Fe_2O_3 ?



5. Citric acid reacts with sodium hydroxide. Calculate the mass of sodium citrate, $\text{C}_6\text{H}_5\text{O}_7\text{Na}_3$, which is formed when 10.0 g of sodium hydroxide reacts with citric acid.



6. Malic acid reacts with sodium hydroxide. Calculate the (maximum) mass of sodium malate, $\text{C}_4\text{H}_4\text{O}_5\text{Na}_2$, which could be made from 15.0 g of sodium hydroxide.

