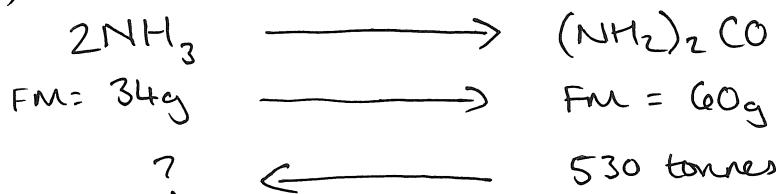


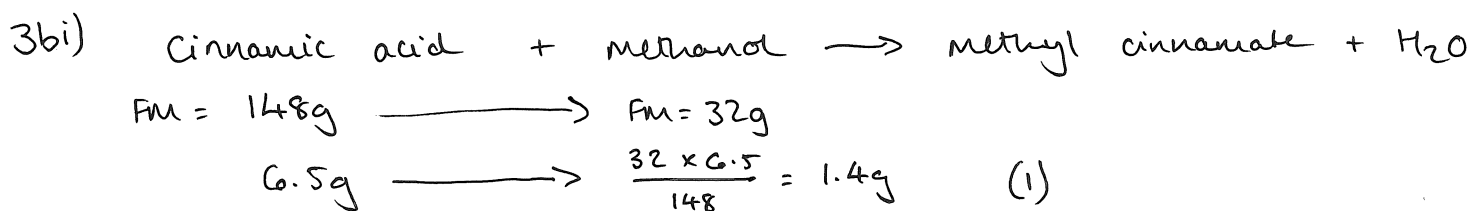
Specimen paper

10ai)

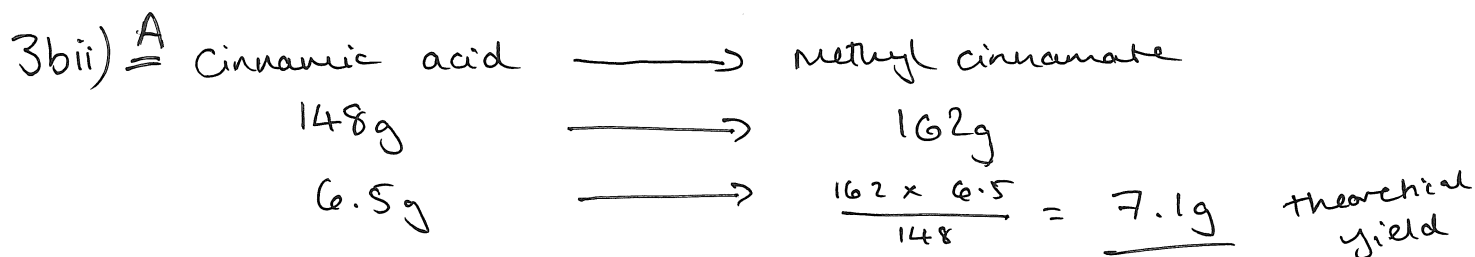


$$? = \frac{34 \times 530}{60} = \underline{\underline{300.3 \text{ tonnes}}}$$

2015 paper



The calculation shows that 6.5g of cinnamic acid would fully react with 1.4g of methanol, however the question states that 2g of methanol is being used so cinnamic acid is limiting the reaction. (1)



$$\frac{\text{Actual yield}}{\text{Theoretical yield}} \times 100$$

$$\frac{3.7}{7.1} \times 100 = 52.1\%$$

B

3.7g of methyl cinnamate requires 6.5g of cinnamic acid. 100g of methyl cinnamate requires $\frac{100}{3.7} \times 6.5\text{g}$ of cinnamic acid (175.7g).

$$\begin{array}{ccc}
 250\text{g} & \longrightarrow & \text{£35} \\
 175.7\text{g} & \longrightarrow & \frac{\text{£35} \times 175.7\text{g}}{250\text{g}} = \text{£24.57}
 \end{array}$$



$$n = \frac{m}{M} = \frac{118}{32} = 3.6875 \quad ; \quad n = 3.6875$$

$$V = n \times MV = 3.6875 \times 24$$

$$V = \underline{\underline{88.5 \text{ L}}}$$

7c ii) Bonds Broken

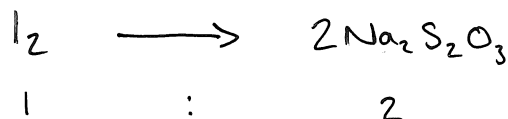
$$\begin{array}{l} \text{C-H} \times 3 \quad (+1236) \\ \text{C-O} \times 1 \quad (+360) \\ \text{O-H} \times 3 \quad (+1389) \\ \hline +2985 \end{array}$$

Bonds Formed

$$\begin{array}{l} \text{H-H} \times 3 \quad (-1308) \\ \text{C=O} \times 2 \quad (-1486) \\ \hline -2794 \end{array}$$

$$\text{Enthalpy change} = 2985 + (-2794) = +191 \text{ kJ mol}^{-1}$$

12a iii) From Step 2 we can work out the number of moles of iodine from the given information about $\text{Na}_2\text{S}_2\text{O}_3$.



$$\begin{aligned} n &= V \times C \\ &= 0.0124 \times 0.00100 \\ &= 0.0000124 \text{ moles} \end{aligned}$$

$$0.0000062 \text{ moles} \quad :$$

Now we can use the number of moles of iodine in the first step to compare I_2 with NaOCl .



$$0.0000062 \quad : \quad 0.0000062$$

$$C = \frac{n}{V}$$

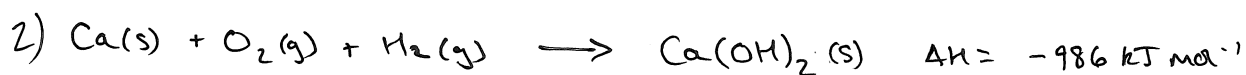
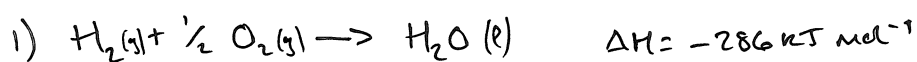
$$= \frac{0.0000062}{0.1 \text{ (from } 100 \text{ cm}^3 \text{ of water sample)}}$$

$$= \underline{\underline{0.000062 \text{ mol L}^{-1}}}$$

2016 Paper



Combustion equations and required action to match the reaction equation:



For equation 1) - • Flip the value because H_2 needs to be on the right hand side. $+286 \text{ kJ mol}^{-1}$
• $\times 2$ to make sure $\text{H}_2\text{O} \rightarrow 2\text{H}_2\text{O}$. $+572 \text{ kJ mol}^{-1}$

For equation 2) - No action required, Ca(s) is on the correct side. -986 kJ mol^{-1}

$$\begin{aligned}\text{Enthalpy change} &= 1) + 2) \\ &= (+572) + (-986) \\ &= -414 \text{ kJ mol}^{-1}\end{aligned}$$