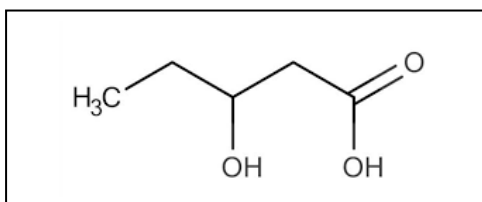


Revision – organic, analytical and green chemistry.

1. Give the IUPAC names of the following organic molecules.



5,5

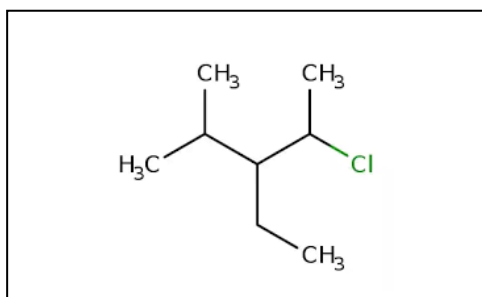
4-fluoro-2,4-dimethylpentan-2-ol

The amino acid isoleucine

2-amino-3-methylpentanoic acid

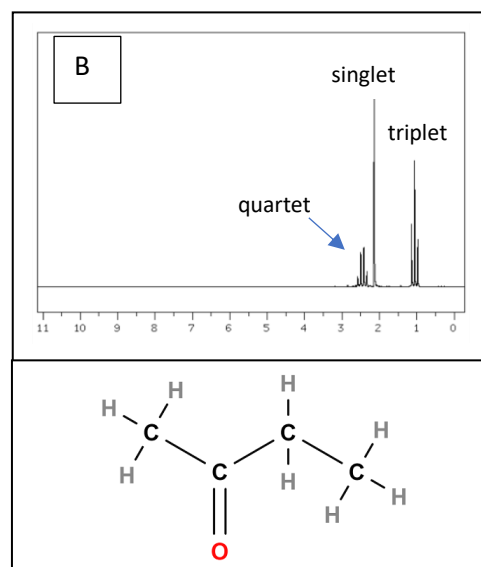
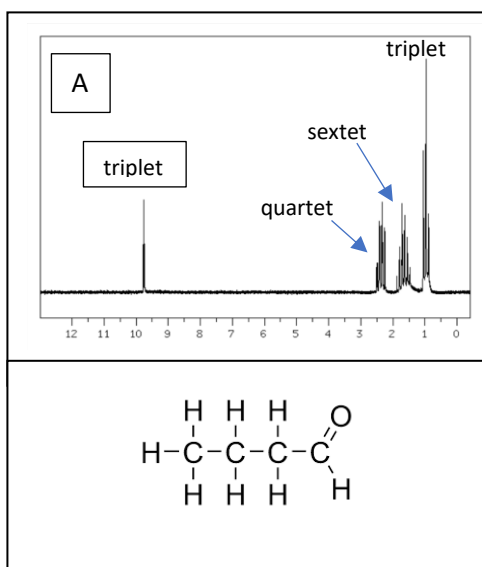
$(\text{CH}_3)_3\text{C}(\text{CH}_2)_3\text{CH}_2\text{NH}_2$

5,5-dimethyl-1-hexanamine

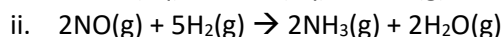
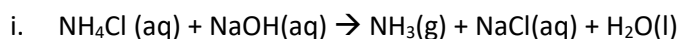


2-chloro-3-ethyl-4-methylpentane

2. Draw the structural formula for the two compounds A and B with the molecular formula $\text{C}_4\text{H}_8\text{O}$ and the ^1H NMR shown below



3. Below are two possible chemical reactions for the formation of ammonia.



a. Using atom economy, select the reaction producing less waste? Show all working out.

i. $(17/93.5) \times 100 = 18.2\%$

ii $(34/70) \times 100 = 48.6\%$

b. Calculate the %yield of reaction ii. above, if 4.00 grams of H_2 gas reacted completely with excess NO to produces 4.50 grams of NH_3 .

Theoretical yield

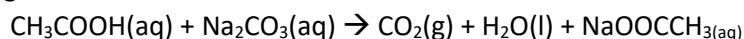
\Rightarrow mol of 4.00 g of $\text{H}_2 = 2 \text{ mol}$

\Rightarrow mol of NH_3 formed is $(2/5) \times 2 = 0.400 \text{ mol}$

\Rightarrow mass of $\text{NH}_3 = 0.400 \times 17.0 = 6.80 \text{ g}$

$\% \text{yield} = (4.50 / 6.80) / \times 100 = 66.2\%$

4. A sample of commercial vinegar is analysed using volumetric analysis to calculate its acetic acid concentration in mol/litre. An aliquot of 20.00 mL was taken from the original bottle and placed into a 200 mL volumetric flask and made to the mark with distilled water. A 25.00 mL aliquot was taken from the volumetric flask and titrated against a standardised 0.100 M Na_2CO_3 . An average titre of 27.89 mL was obtained using phenolphthalein as an indicator. Calculate the concentration, in mol/litre, of the acetic acid present in the vinegar. The reaction is given below.



Step 1 – find the mol of titrant delivered in an average titre.

$\Rightarrow n = C \times V = 0.100 \times 0.02789 = 0.002789$

Step 2 – Using the balanced equation calculate the mol of vinegar present

$\Rightarrow 1 : 1 \text{ ratio} \Rightarrow n_{\text{vinegar}} = 0.002789$

Step 3 – calculate the mol of vinegar in the volumetric flask

$\Rightarrow (200/25) \times 0.002789 = 0.0223 \text{ mol}$

Step 4 – calculate the concentration of vinegar

$\Rightarrow 0.0223 / 0.0200 = 1.12 \text{ M}$

5. Ethyl propanoate is a food additive in candy that gives the confectionary a fruity flavour and aroma. Give a set of valid reaction pathways for the formation of ethyl propanoate given the organic starting compounds propane and ethene. Clearly show all reagents and their state in the reaction pathway.

