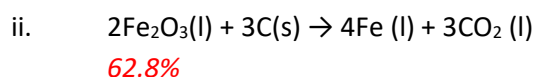
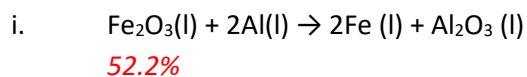


Revision-of alcohols, percentage yield, *atom* economy, chromatography and spectroscopy

1) Consider the two reactions shown below. They represent reactions that form iron.

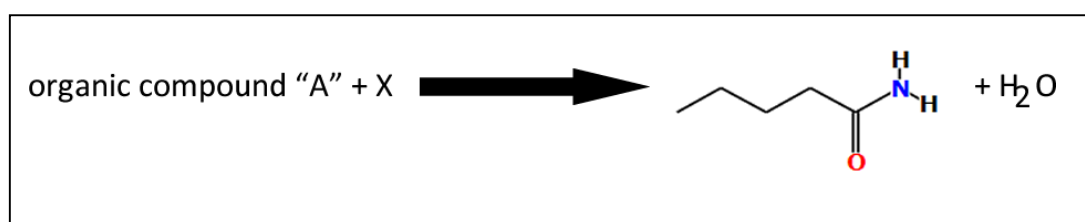
a) Calculate the percentage atom economy of each reaction.



b) Iron was produced using equation i. above. Calculate the percentage yield if 15.9 tons of Fe_2O_3 reacted with excess aluminium to produce 9.82 tons of iron.

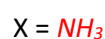
88.2%

2) Consider the reaction pathways shown below.



a) Identify the type of reaction. *Condensation*

b) Name compound X and A and draw their structural formulae.



A = *Pentanoic acid*

3) A mixture of propanol, pentan-1-amine and propanoic acid is separated into its components

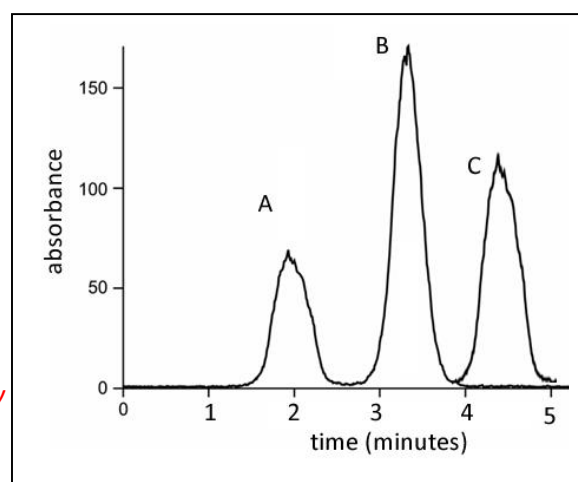
using **reversed phase** HPLC. This technique uses a polar solvent with a non-polar stationary phase. The mixture is dissolved in acetone (CH_3COCH_3) before being placed in the column packed with beads covered with non-polar side chains. The chromatogram shown on the right is produced.

a) Which molecule represents A, B and C? Explain
 R_t depends on the compound's polarity, the more polar a molecule the more it will interact with the mobile phase and less with the non-polar stationary phase. This will result in lower retention times.

A = propanoic acid

B = propanol

C = pentan-1-amine



b) What is the retention time of "C".

4.4 minutes

c) Which compound is present in the mixture in the highest concentration? Explain

B it has the highest area under the peak.

4) A compound with the molecular formula C_xH_8O was analysed using 1H NMR, IR and mass spectrometry. The spectra are shown on the right.

a) What is the value of x in C_xH_8O

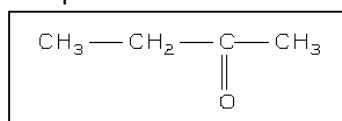
4 this is determined from the parent ion mass in the MS.

b) What can be deduced from the IR spectrum.

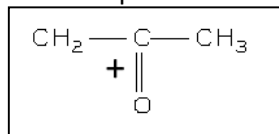
C=O bond.

c) How many non-equivalent hydrogens are present in the molecule. *3*

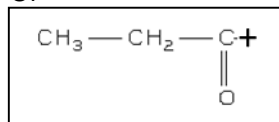
d) Draw the structural formula of the compound.



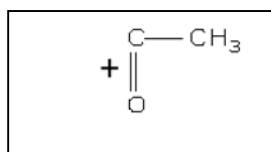
e) What fragment is responsible for the base peak in the MS?



Or



f) What fragment is responsible for the peak at 42 m/z and 43 m/z?



or

