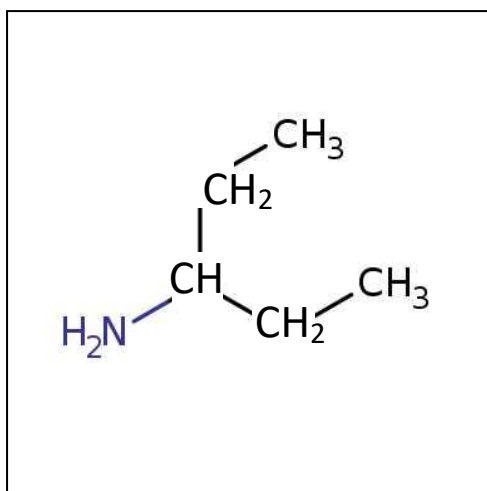Revision organic

1. Below is the structure of compound A

a. The ^{1}H-NMR signal produced by compound A shows four signals. Complete the table below.

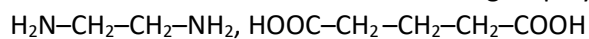| Hydrogen	ppm	Peak area	Splitting pattern
1	2.5		
2	1.7		
3	1.5		
4	1.0		

2. The structure of isopropyl acetate is shown on the right. It has an ^{1}H-NMR spectrum with three signals at 5.0 ppm, 2.0 ppm and 1.2 ppm.
Give the splitting pattern and peak area of each signal in the table below.
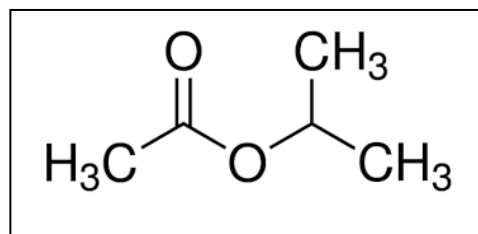
Signal ppm	Peak area	Splitting pattern
5.0		
2.0		
1.2		

3. The two monomers shown below undergo a polymerisation reaction.
$H_2N–CH_2–CH_2–NH_2$, $HOOC–CH_2–CH_2–CH_2–COOH$
a. Name the two monomers
$H_2N–CH_2–CH_2–NH_2$ _____
$HOOC–CH_2–CH_2–CH_2–COOH$ _____
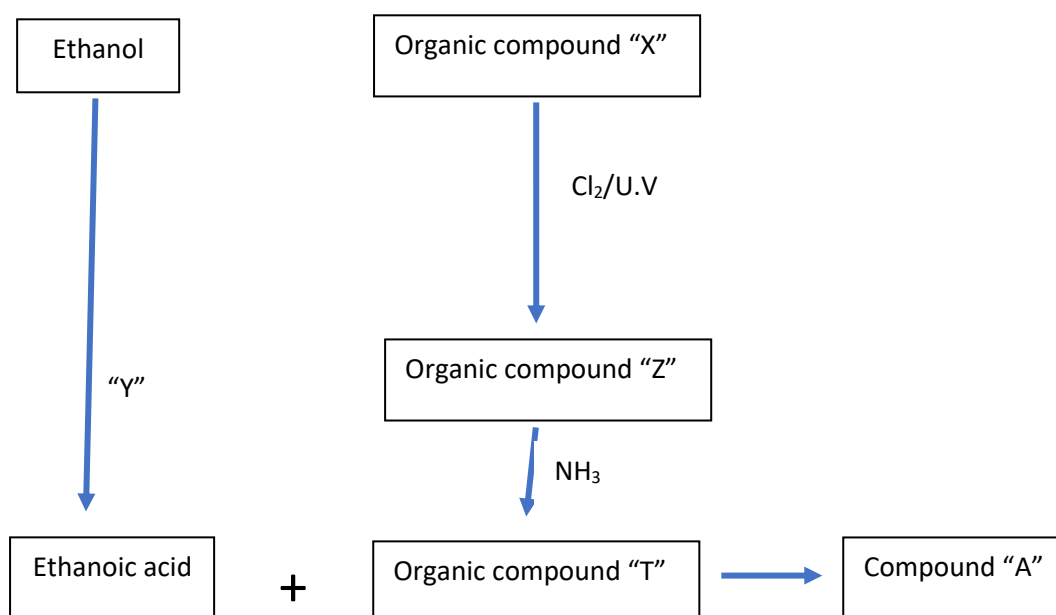b. What type of polymerisation reaction takes place between the two monomers? Justify your answer.

c. What is the molecular mass of a polymer formed from 4 monomers.?

d. In the box below, draw the repeating unit of the polymer formed between the two monomers above.

i. Circle the functional groups linking the monomers together.

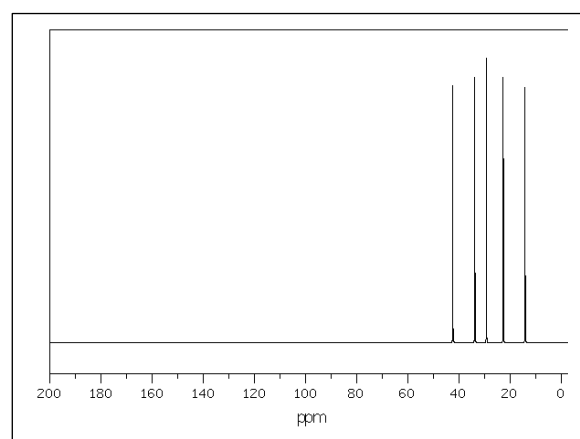ii. Name the functional groups linking the monomers together.

4. Consider the organic reaction pathway below.

| Ethanol |

| Organic compound "X" |

Cl_2/U.V

| Organic compound "Z" |

"Y"

NH_3

| Ethanoic acid | **+** | Organic compound "T" | ⟶ | Compound "A" |

a. Given the ^{13}C-NMR of the straight chain, primary amine "T", shown on the right, name:
i.   Compound "X"
ii.   Compound "Z"
iii.   Compound "T"
iv.   Reagent "Y"

b. Draw the structural formula of compound "A" in the box below.

200 180 160 140 120 100 80 60 40 20 0
ppm

c. What class of reaction forms compound "A".

d. Calculate the molar mass of compound "A".

5. Consider the chromatogram, shown on the right, produced with reversed-phase HPLC. The area under each peak is shown.
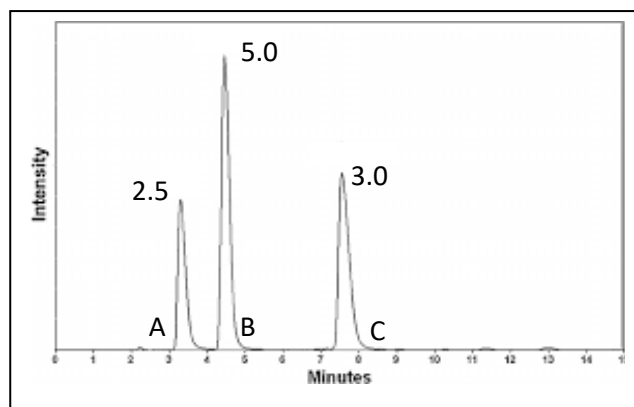
a. A mixture of hexane, propane and butane is placed in the column to produce the chromatogram shown on the right.

   i. Identify the peak belonging to:
      - Propane
   - Butane
      - Hexane

b. The area under each peak can be used to determine the concentration of each component in the mixture. Explain how this is done.

c. Another unknown mixture of hydrocarbons was analysed using the same column and exact same conditions as the mixture in question a. above. The table below reveals the data derived from the chromatogram of the unknown mixture.

Peak	Retention time(min)	Area under the peak.
1	2.5	5.0
2	7.7	6.0
3	10.2	10.0
4	6.0	3.2

   Are any of the three compounds, propane, butane or hexane present in the unknown mixture? Justify you answer.
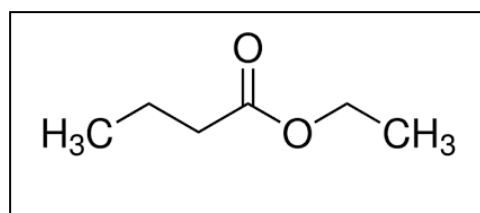
d. The same mixture, as in question a. above was run through the same column, with a change in one of the conditions, to develop the chromatogram shown on the right. What one change to the conditions could have produced the chromatogram on the right? Justify your answer.
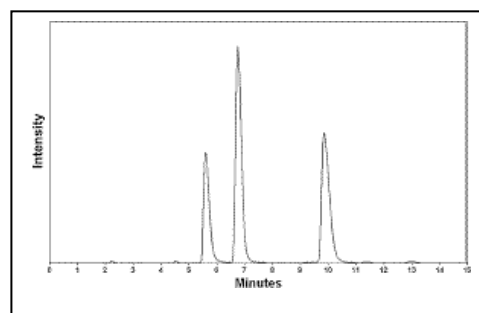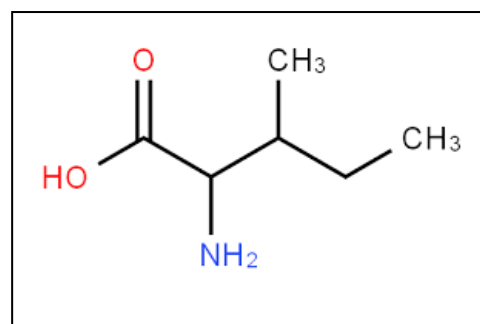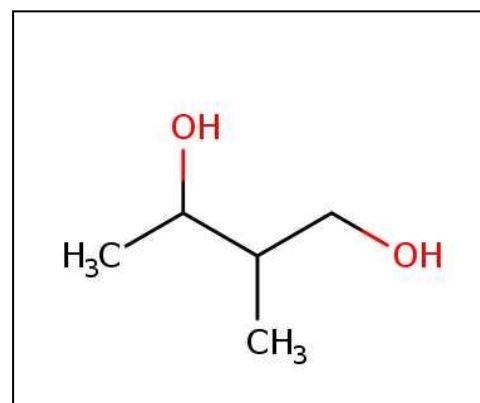
e. A Panadol tablet was crushed and a 0.200 gram sample taken to be dissolved in an appropriate solvent and made up to 5.0 mL before being injected into a HPLC column. The chromatogram that was produced is shown on the right. Paracetamol (acetaminophen) has a retention time of 12 minutes. Its peak area was 0.25 units. A calibration curve was constructed of concentration of paracetamol versus peak area as shown on the right.

Calculate the percentage, by mass, of the paracetamol present in each tablet.

0.25

Calibration curve
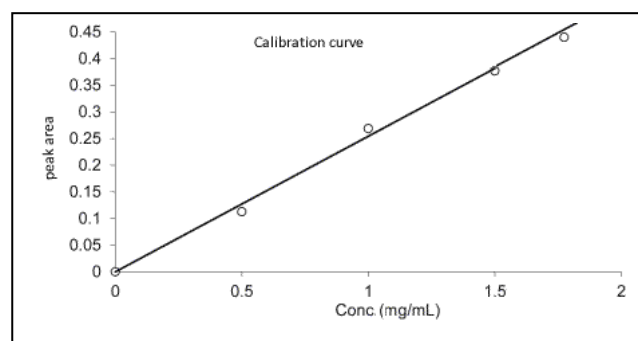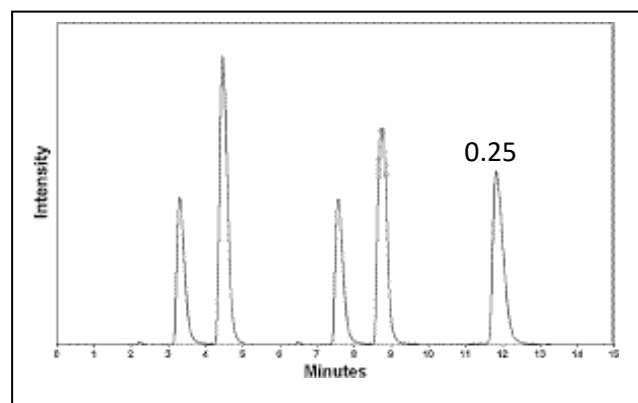
6. Give the systematic name of each of the following molecules.