

QUESTION ONE:

(a) Draw the structural formula of each of the organic compounds below.

(i)	(ii)
Name: propylpentanoate	Name: 2-chlorohexanal

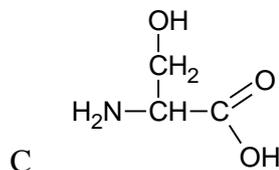
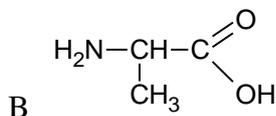
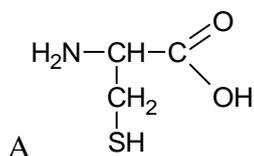
(iii)	(iv)
Name: 3-aminobutanoic acid	Name: propanoylchloride

(b) Give the systematic IUPAC names for the following molecules.

(i)	(ii)
$\begin{array}{c} \text{H}_3\text{C}-\text{C}=\text{O} \\ \quad \quad \quad \diagdown \\ \quad \quad \quad \text{O}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \end{array}$	$\begin{array}{c} \text{O} \\ \quad \quad \quad \diagdown \\ \text{H}_2\text{N}-\text{C}-\text{CH}_2-\text{CH}_3 \end{array}$
Name:	Name:

(iii)	(iv)
$\begin{array}{c} \text{H}_3\text{C}-\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\ \quad \quad \quad \parallel \\ \quad \quad \quad \text{O} \end{array}$	$\begin{array}{c} \text{H}_3\text{C}-\text{CH}-\text{CH}=\text{CH}_2 \\ \quad \quad \quad \\ \quad \quad \quad \text{Cl} \end{array}$
Name:	Name:

- (b) Proteins are also condensation polymers formed by the joining of amino acids. Draw the tripeptide formed when the following amino acids are joined in the order A-B-C.

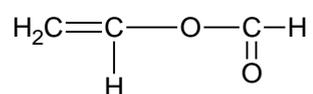


- (c) Amino acids can exist as enantiomers (optical isomers). Draw 3-dimensional structures of amino acid B in (b) that clearly shows the relationship between the two enantiomers.

- (d) Describe similarities and differences in the chemical and physical properties of the enantiomers in part (c).

- (e) PVA is an **addition** polymer used in the adhesive industry as wood or paper glue.

The monomer from which it is synthesised is



Draw a piece of the polymer showing two repeating units.

- (f) Explain why the polymer in (e) is considered an **addition polymer**.

QUESTION FOUR:

(a) Use the following information to identify and write structural formulae for compounds A-F:

- Compound A is a colourless liquid with the molecular formula, C_3H_7Cl .
- A sample of A was refluxed with aqueous KOH and a compound B formed with the molecular formula C_3H_8O .
- A sample of B was heated with concentrated sulfuric acid and a compound C formed which rapidly decolourised bromine water.
- A sample of B was heated with acidified potassium dichromate and compound D formed and was isolated from the reaction mixture. D did not react with Tollens reagent but turned blue litmus red.
- Samples of compound B and D were refluxed together with a few drops of sulfuric acid and compound E formed.
- Compound E reacted with concentrated ammonia solution to form compound F, with molecular formula C_3H_7NO .

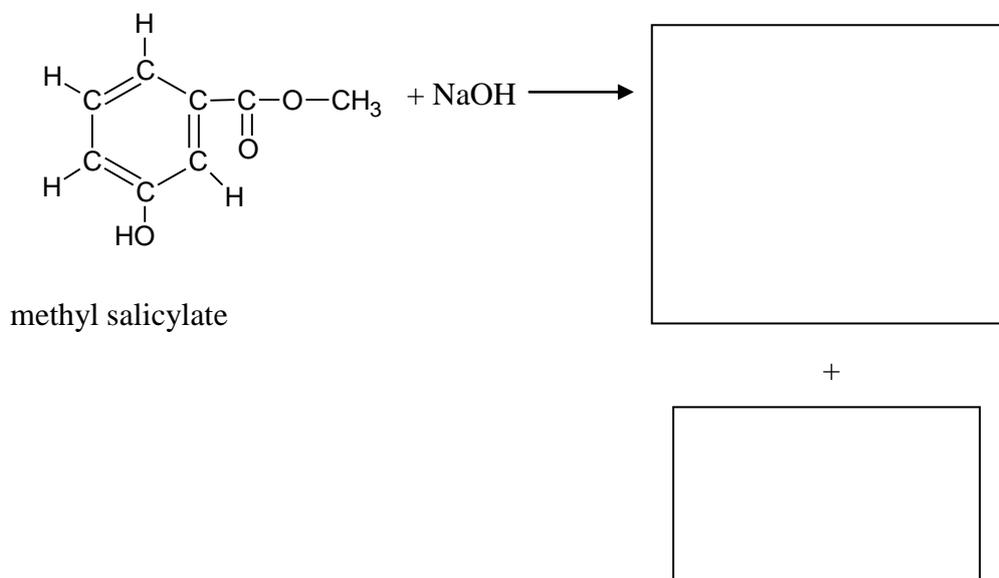
Compound	Structural formula
A	
B	
C	
D	
E	
F	

QUESTION FIVE:

Methyl salicylate (oil of wintergreen) is an ester with a characteristic odour and a component of liniment. Salicylic acid (used to manufacture aspirin) can be prepared from methyl salicylate in the following way:

1. Methyl salicylate is **refluxed** with sodium hydroxide for 30 minutes during which two organic products form.
2. The mixture is **distilled** slowly and an alcohol is collected in the distillate.
3. Concentrated hydrochloric acid is added to the cooled residual solution and the salicylic acid crystals formed are washed and filtered off.

(a) Complete the following equation for the reaction occurring in **step 1**.



(b) What type of reaction is occurring in step 1? _____

(c) Write an equation for the reaction occurring in step 3.

