



CHEMISTRY 3.5

An assessment for AS91391

Demonstrate understanding of the properties of organic compounds

Credits: Five

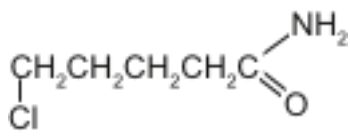
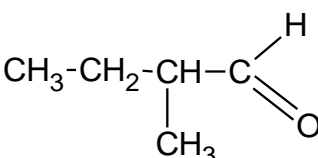
INSTRUCTIONS

Answer **ALL** questions.

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Question 1

- (a) Complete the table below by giving the IUPAC systematic name or the structural formula for each compound.

Compound	Structural Formula	IUPAC systematic name
A	 $\begin{array}{c} \text{NH}_2 \\ \\ \text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C} \\ \quad \parallel \\ \text{Cl} \quad \text{O} \end{array}$	
B		propanoyl chloride
C	 $\begin{array}{c} \text{H} \\ \\ \text{CH}_3-\text{CH}_2-\text{CH}-\text{C} \\ \quad \parallel \\ \text{CH}_3 \quad \text{O} \end{array}$	

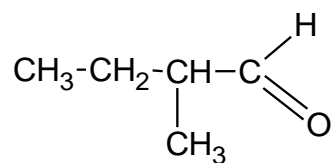
- (b) Compound C has enantiomers (optical isomers).

- (i) Draw three dimensional structures of the two enantiomers.

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- (ii) Describe how the structures are different and explain why compound C is the only one in the table above able to form enantiomers

(c) Compound C, drawn again below, has three branched chain isomers – Compounds D, E and F.



- None of compounds D, E or F can form enantiomers.
- Compound D has a quaternary carbon – a carbon attached to four other carbons.
- Compounds D and E will react with ammoniacal silver nitrate to give a silver mirror and the organic products compounds G and H respectively. Compound F does not react in this way.
- Compounds I, J and K have the molecular formula $\text{C}_5\text{H}_{12}\text{O}$. They can be oxidised to Compounds D, E and F respectively.

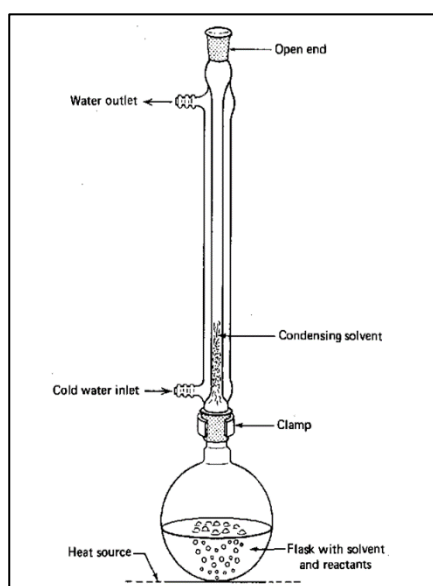
Complete the table below by writing structural formulae for Compounds D to K.

Compound D	Compound E	Compound F
Compound G	Compound H	
Compound I	Compound J	Compound K

Question 2

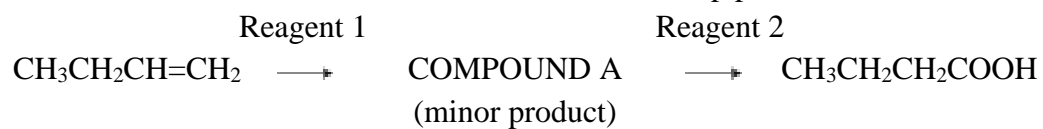
- (a) Ethyl butanoate has a pineapple-like odour and can be synthesised from butanoic acid.
- (i) Write an equation, using structural formulae, for the conversion of butanoic acid into ethyl butanoate including the alcohol and the conditions needed for the reaction to occur.

- (ii) The apparatus shown below can be used to increase the yield of ethyl butanoate.



Relate this apparatus to the production of ethyl butanoate by discussing how it operates to increase the yield of the reaction products.

(ii) The conversion of but-1-ene to butanoic acid is a 2-step process.



Identify compound A and the reagents needed for each of the 2 steps.

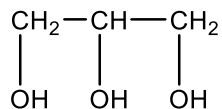
Compound A _____

Reagent 1 _____ Reagent 2 _____

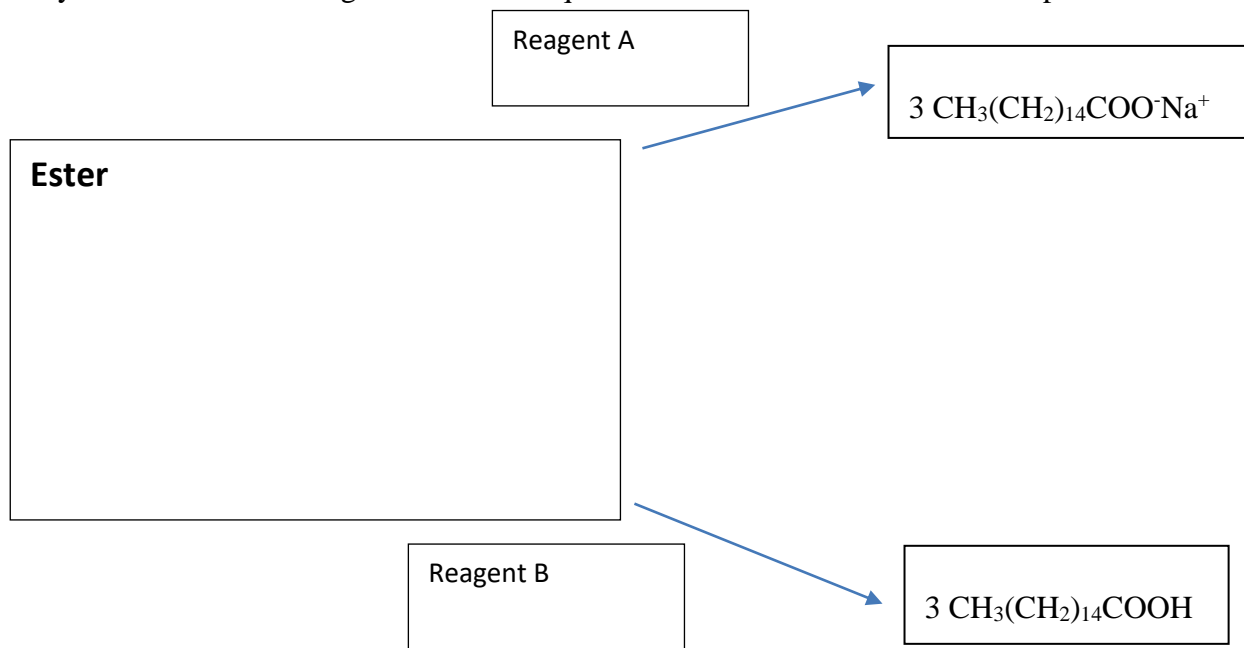
Question 3

Palm oil is a triester which can be hydrolysed, under different conditions, to palmitic acid or to sodium palmitate, a common ingredient in laundry and toilet soaps.

In each case the by-product is glycerol:



- (a) Complete the flow chart below by identifying the triester from which the two compounds are synthesised and the reagents A and B required to obtain the different reaction products.



- (b) Aminoethanoic acid (glycine) and 2-aminopropanoic acid (alanine) are two amino acids used in the synthesis of proteins.

- (i) Draw the structure of each of these molecules.

Aminoethanoic acid	2-aminopropanoic acid

- (ii) Draw the structure of a dipeptide formed when these two amino acids combine. (There are a two of possible dipeptides, you only need to draw one of these.)

(iii) Circle the **peptide** link in the structure in (ii) above.

(c) Complete the following reaction scheme by drawing structural formulae for each of the compounds A-E and identifying the reagents 1 to 4.

