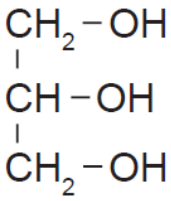
91391 Demonstrate understanding of the properties of organic compounds

Collated Triglyceride (fat/oil) Questions

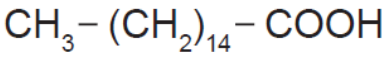
(2021) No question asked

(2020:3)

(c) (i) Draw the structural formula of the triglyceride that would be formed from glycerol and the fatty acid, palmitic acid, provided below.



glycerol



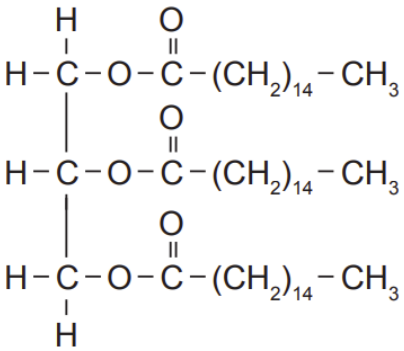
palmitic acid

(ii) Explain why this is a condensation reaction.

(iii) The triglyceride formed in (c)(i) can be hydrolysed by heating under reflux in either acidic or basic conditions. Outline the advantages of heating under reflux when hydrolysing a triglyceride.

(2019:3)

(b) Triglycerides are found in fats and oils. Below is an example of a triglyceride.



(i) Put a circle around ONE of the ester groups in the triglyceride molecule shown above.

(ii) Compare and contrast the acidic and basic hydrolysis of the triglyceride molecule shown.

In your answer, you should include:

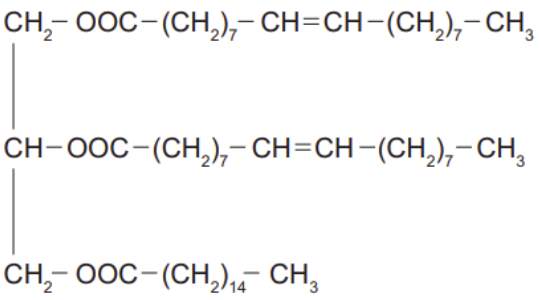
- an explanation of the hydrolysis reaction
- structural formulae of the products formed from both acidic and basic hydrolysis
- reagents and conditions required.

(2018) No question asked

(2017) No question asked

(2016:3)

(c) A triglyceride found in olive oil has the following structure:

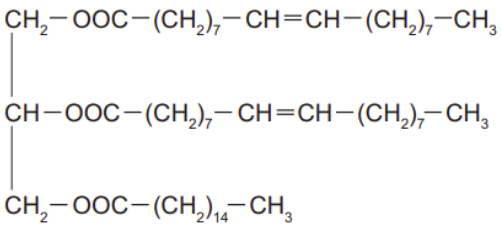


(i) Put a circle around one of the ester groups in the triglyceride molecule shown above.

(ii) Draw the structural formulae of the products produced by the hydrolysis of this triglyceride in basic conditions, using aqueous sodium hydroxide, NaOH.

(2015:3)

(a) A triglyceride has the following structure:



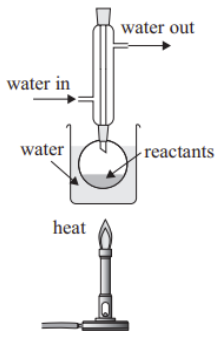
(i) Circle one of the alkene groups in the triglyceride molecule.

This triglyceride is described as unsaturated.

(ii) Describe a chemical test that can be used to show that the molecule is unsaturated. Give any observations, and state the type of reaction occurring.

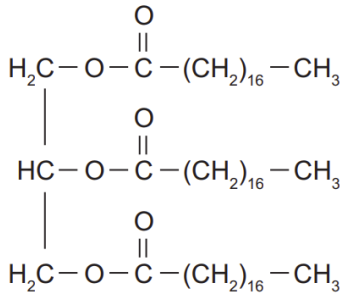
(iii) Draw the structural formulae of the organic products formed by hydrolysis of this triglyceride using aqueous sodium hydroxide.

(iv) Explain why the equipment opposite is used for hydrolysis of the triglyceride.



(2014:1)

(c) The triglyceride below is shown in condensed form.



(i) Circle a functional group on the diagram above and give its name. Functional group name:

(ii) Compare and contrast the reaction of the above triglyceride when it undergoes both acidic and basic hydrolysis.

(iii) In your answer you should include:

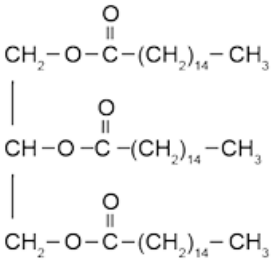
- drawings of condensed structures of the organic products
- any reagents and conditions required for the reaction to proceed.

(2013) No question asked

ANSWERS

(2020:3)

(c) (i)



(ii) This is a condensation reaction because smaller organic molecules (glycerol and fatty acids) join together to make a larger organic molecule (triglyceride). In the process, water is eliminated. (One water molecule is eliminated for each ester linkage).

(iii) Heating under reflux is an advantage as it condenses volatile organic molecules that have turned into gases back into liquids. This allows the reaction to go to completion and ensures none of the reactants / products escape, thus increasing the yield of the product. This also means the reaction can be heated without the risk of losing reactant / product, so the rate of the reaction increases.

(2019:3)

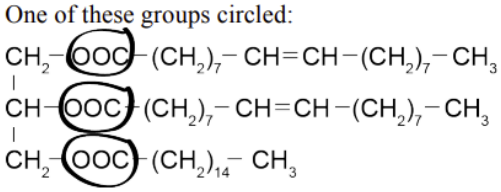
(b) (i) Circle around –COO–

(ii) A hydrolysis reaction uses water to split a large organic molecule into smaller organic molecules. Hydrolysis occurs in both acidic and basic conditions (using dilute acid or base). Both acidic and basic hydrolysis require heat under reflux. Both hydrolysis reactions produce the alcohol, glycerol. However, basic hydrolysis will produce the salt of the carboxylic acid, whereas acidic hydrolysis will produce the carboxylic acid.
Products from acidic hydrolysis: $CH_2(OH)–CH(OH)–CH_2(OH)$ $3CH_3–(CH_2)_{14}–COOH$
Products from basic hydrolysis: $CH_2(OH)–CH(OH)–CH_2(OH)$ $3CH_3–(CH_2)_{14}–COO^-$

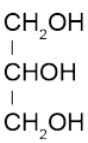
(2016:3)

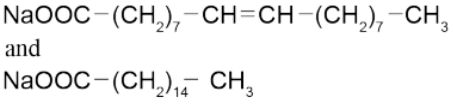
(c) (i)

One of these groups circled:



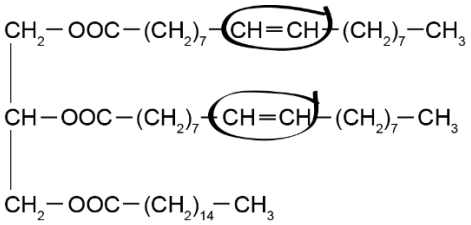
(ii)





(2015:3)

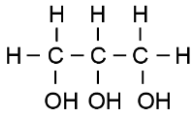
(a) (i) Any one of these groups circled:



(ii) Bromine water rapidly decolourised from red or orange to colourless in an addition reaction.

OR Acidified permanganate rapidly decolourised from purple to colourless in a redox or oxidation or reduction reaction.

(iii)



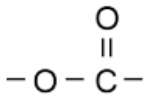
$NaOOC(CH_2)_7CH=CH(CH_2)_7CH_3$ $NaOOC(CH_2)_{14}CH_3$

(iv) Increases the rate of reaction; (Condensing) prevents volatile chemicals from being lost to the environment (The mixture refluxed to increase reaction rate without loss of product through evaporation).

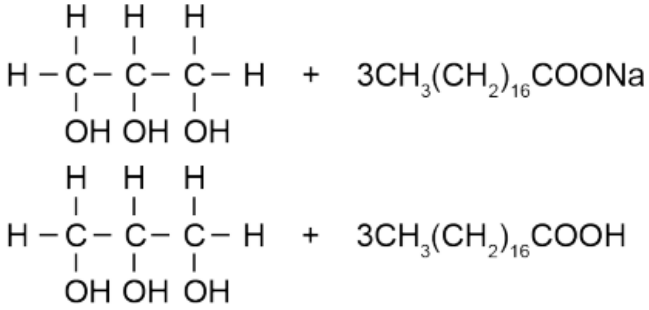
(2014:1)

(c) (i)

Ester group:



(ii)



Both acidic and basic hydrolysis produce the same alcohol propan-1,2,3-triol. In addition, they both require heat / reflux In contrast, acidic hydrolysis requires H_2O/ H^+ or HCl(aq) and produces the carboxylic acid, whereas basic hydrolysis requires H_2O / OH^- or NaOH(aq) and produces the carboxylate ion/salt.