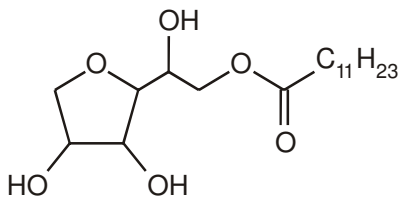


F324 Module 1: HW3

1. The demand for 'natural' shampoos and detergents has led to the development of more biodegradable detergents such as sorbitan monolaurate, which is made from plants.



sorbitan monolaurate

- (i) Suggest a type of reaction that could break down sorbitan monolaurate when it is washed into drains and rivers.

Explain your answer and state the type of organic products formed.

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.....
.....

[3]

- (ii) Suggest **one other** reason why detergents such as sorbitan monolaurate are regarded as 'environmentally friendly'.

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[1]

[Total 4 marks]

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2. An ester **D** with the formula, $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}(\text{CH}_3)_2$, is used in rum flavouring.

(a) Draw a displayed formula of ester **D**.

[2]

(b) Outline how you could obtain a sample of ester **D**, starting with a named carboxylic acid and a named alcohol.

Include any essential reaction conditions and write an equation for the reaction. You do not need to include any details of the separation or purification of the ester.

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[6]

- (c) State a spectroscopic method that could be used to confirm that a sample of ester **D** has a molecular mass of 130.

Explain how you would obtain the molecular mass of **D** from the spectrum.

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[2]

[Total 10 marks]

3. Linoleic acid, $C_{17}H_{31}COOH$, is an unsaturated fatty acid found in triglycerides from sunflower oil.

- (i) Draw the structure of the triglyceride made from linoleic acid, $C_{17}H_{31}COOH$, and propane-1,2,3-triol. Show clearly all the bonds in the ester groups.

[2]

- (ii) Deduce the number of carbon to carbon double bonds in a molecule of the triglyceride.

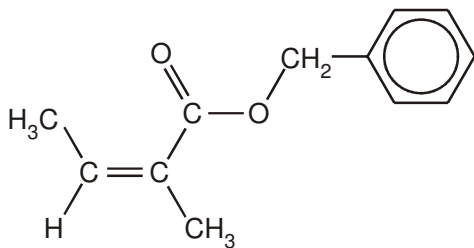
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[1]

[Total 3 marks]

F324 Module 1: HW3

4. Compound **A** is used to add the flavour of mushrooms to foods.



compound **A**

- (a) (i) Apart from the benzene ring, name the two functional groups in compound **A**.

.....

[2]

- (ii) Draw the skeletal formula of compound **A**.

[1]

- (iii) Deduce the molecular formula of compound **A**.

.....

[1]

- (b) Compound **B** is a stereoisomer of compound **A**.

Explain what is meant by the term *stereoisomerism*. Use compounds **A** and **B** to illustrate your answer.

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[2]

- (c) If the food is cooked for a long time, naturally occurring acids catalyse the hydrolysis of compound **A**.

Draw structures to show the **two** organic compounds formed by the acid hydrolysis of compound **A**.

[2]

- (d) The hydrolysis of compound **A** can be monitored by sampling the mixture at regular intervals, separating the components, and recording their infra-red spectra.

- (i) State **two** absorptions that would be expected in the infra-red spectrum of compound **A**, and identify the parts of the molecule responsible for each.

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.....

[2]

- (ii) Suggest a wavenumber range within the spectrum that could be used to clearly distinguish compound **A** from the products formed by the hydrolysis reaction.

Explain your answer.

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[2]

[Total 12 marks]