InkChemistry

QUESTION WORKBOOK

Carboxylic acids, esters and biodiesel

Carbonyls and carboxylic acids · Unit C20

AQA 3.3.9.1 · OCR A 6.1.3, 6.2.2, 6.2.4

20 questions · 62 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 CAE-Q5

Explain why a 0.10 mol dm^{-3} solution of ethanoic acid has a higher pH than a 0.10 mol dm^{-3} solution of hydrochloric acid. [2]

A2 CAE-Q7

Explain what the following result shows about esterification: when ethanol labelled with oxygen-18 in its OH group is esterified with ethanoic acid, all of the oxygen-18 is found in the ester. [2]

A3 CAE-Q14

Suggest why the glycerol formed in biodiesel production can be separated from the methyl esters with a separating funnel. [2]

A4 CAE-Q21

Suggest why methanoic acid gives a silver mirror with Tollens' reagent while ethanoic acid does not. [2]

SECTION B · Standard, 3 to 5 marks

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B1 CAE-Q1 Describe a chemical test that shows an unknown liquid is ethanoic acid rather than ethanol, giving the observations, an equation for the reaction and the name of the salt formed. [4]

B2 CAE-Q15 Compare the hydrolysis of methyl ethanoate by dilute sulfuric acid with its hydrolysis by aqueous sodium hydroxide. [4]

B3 CAE-Q16 Outline how a pure sample of ethyl ethanoate is obtained from the mixture left after heating ethanoic acid and ethanol under reflux. [4]

B4 CAE-Q3 Name the esters $CH_3CH_2COOCH_2CH_3$, $HCOOCH_3$ and $CH_3CH_2CH_2COOCH_3$. [3]

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B5 CAE-Q4 Give the reagent and condition needed to make propyl ethanoate from ethanoic acid, and give the equation for the reaction. [3]

B6 CAE-Q6 Explain why the hydrolysis of an ester by aqueous sodium hydroxide goes to completion, whereas hydrolysis by dilute acid does not. [3]

B7 CAE-Q8 Explain how adding an ester plasticiser makes PVC flexible. [3]

B8 CAE-Q10 Calculate the maximum mass of methyl hexadecanoate, Mr 270.0, formed by the transesterification of 403 g of the triglyceride $(C_{15}H_{31}COO)_3C_3H_5$, Mr 806.0, with excess methanol. [3]

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B9 CAE-Q11 Describe how soap is made from a fat, naming the products. [3]

B10 CAE-Q12 Give three uses of esters, and for each give the property of esters that suits them to it. [3]

B11 CAE-Q13 Suggest two ways of increasing the yield of ethyl ethanoate made from ethanoic acid and ethanol, and explain one of them. [3]

B12 CAE-Q18 Explain why ethanoic acid is a stronger acid than ethanol. [3]

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B13 CAE-Q19 Suggest the order of acid strength of ethanoic acid, chloroethanoic acid and trichloroethanoic acid, strongest first, and explain the order. [3]

B14 CAE-Q20 Give the reagent and condition for converting propanenitrile into propanoic acid, and give the equation for the reaction. [3]

B15 CAE-Q22 Show that a saturated ester of relative molecular mass 102.0, which gives ethanol as the only alcohol when it is hydrolysed, must be ethyl propanoate. [3]

SECTION C · Long, 6 marks or more

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C1 CAE-Q17 Evaluate biodiesel made from rapeseed oil as a replacement for diesel from crude oil, including the claim that it is carbon-neutral. [6]

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