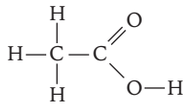
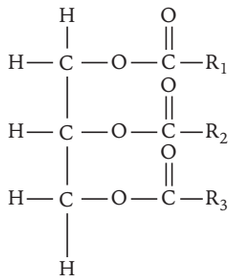
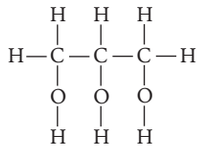
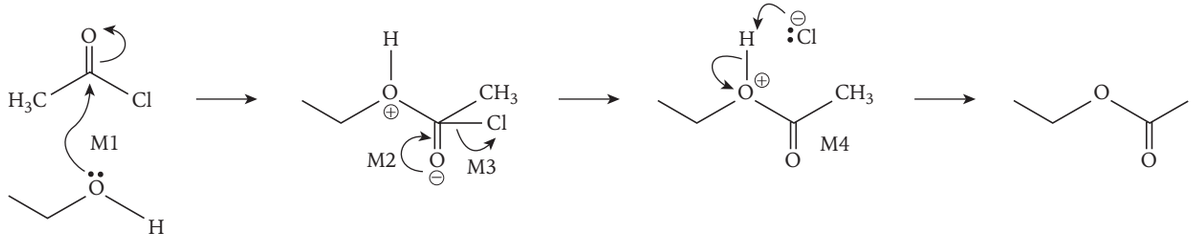
A Level OCR Chemistry

Chapter 22 – answers

Question	Answers	Extra information	Mark	AO Spec reference
1(a)(i)	Acidified potassium dichromate (VI) AND reflux OR $K_2Cr_2O_7/H_2SO_4$ AND reflux	Must state acidified, or have acid as reagent too for the mark, and must have reflux, not distillation	1	4.2.1
1(a)(ii)	Pentanoic acid		1	4.1.1
1(b)			1	6.3.1, M4.2
1(c)	M_r pentan-1-ol = 88 (g mol^{-1}) Moles pentan-1-ol = 0.151 g/88 g mol^{-1} = 0.00172 (mol) Ratio alcohol : ester = 1 : 1 Theoretical moles ester = 0.00172 (mol) M_r ester = 130 (g mol^{-1}) Theoretical mass ester = 0.00172 × 130 = 0.2236 g % yield = actual/theoretical = 0.161 g / 0.2236 g × 100 = 72%		1 1 1 1	2.1.3, M0.0, M0.1, M0.2
2(a)(i)	It is a renewable fuel		1	HSW12
2(a)(ii)			1	6.1.3
2(b)(i)	Dilute acid, heat	Need both reagent and condition for mark	1	6.1.3

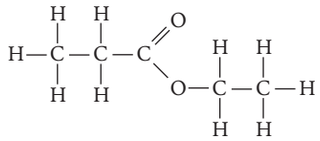
A Level OCR Chemistry

Chapter 22 – answers

Question	Answers	Extra information	Mark	AO Spec reference
2(b)(ii)		Need to show all bonds for the mark.	1	6.1.3, M4.2
2(b)(iii)	A straight-chain molecule will have a higher boiling point Molecules will be able to get closer together so can form stronger dipoles Meaning more energy is needed to overcome intermolecular attractions upon melting		1 1 1	2.2.2
3(a)(i)	$SOCl_2$		1	6.1.3
3(a)(ii)			1 1 1	6.1.3
3(b)	M_r compound F = 78.5 (g mol^{-1}) Moles compound F = 1.727 g / 78.5 g mol^{-1} = 0.022 mol Ratio compound F : ester = 1 : 1 Moles ester G = 0.022 mol M_r ester G = 88 (g mol^{-1}) Theoretical mass ester G = 1.936 g Percentage yield = 1.540 / 1.936 × 100 = 80% (79.5%)		1 1 1 1	2.1.3, M0.0, M0.1, M0.2, M1.1, M2.2
4(a)	Add deionised water to product, aspirin will precipitate Filter off precipitate Wash residue with deionised water Leave to dry		1 1 1 1	PAG6

A Level OCR Chemistry

Chapter 22 – answers

Question	Answers	Extra information	Mark	AO Spec reference
4(b)	M_r of aspirin = 168 g mol^{-1} M_r ethanoic acid = 60 g mol^{-1} Total mass = 168 + 60 = 228 Atom economy = 168/228 = 0.74 OR 74%		1 1	2.1.3, M0.1, M0.2, M1.1
4(c)	Any **one** of: Less corrosive Not as readily hydrolysed Doesn't produce corrosive fumes of hydrogen chloride		1	PAG 6
5(a)(i)		Must show all bonds	1 1	4.1.1, M4.2,
5(a)(ii)	C═O peak 1630-1820 cm^{-1} C—O peak at 1000 – 1300 cm^{-1}		1	4.2.4
5(b)(i)	$CH_3COOCH_2CH_3 + NaOH \rightarrow CH_3COONa + CH_3CH_2OH$	Can be written or displayed formula, functional groups must be clear	1	6.1.3
5(b)(ii)	$CH_3COOCH_2CH_3 + H_2O \rightarrow CH_3COOH + CH_3CH_2OH$	Can be written or displayed formula, functional groups must be clear	1	6.1.3
5(b)(iii)	Carboxylic acids are able to form hydrogen bonds with the water molecules more readily Because of the presence of the polar carboxyl group / O—H bonds	Polar group carboxyl group, and/ or hydrogen bonds to water molecules can be shown in a diagram for the two marks.	1 1	6.1.3

A Level OCR Chemistry

Chapter 22 – answers

Question	Answers	Extra information	Mark	AO Spec reference
6(a)(i)	Recrystallisation: Dissolve impure solid in a minimum volume of hot water/solvent Cool solvent and filter solid Wash with cold water/solvent and dry	Lose **1** mark for every point missed.	1 1 1	PAG 6
6(a)(ii)	M_r $CH_3COOH = 60$ M_r $(CH_3COO)_2Mg.4H_2O = 214.3$ Moles $CH_3COOH = 2.16 / 60 = 0.036$ mol 2:1 ratio So theoretical moles $(CH_3COO)_2Mg.4H_2O = 0.036 / 2 = 0.018$ mol Actual moles $(CH_3COO)_2Mg.4H_2O = 2.85 / 214.3 = 0.013299$ mol Percentage yield = actual/theoretical $\times$ 100 = $0.01329 / 0.018 \times 100 = 73.884$ % yield = 74 (.0)%	Lose ratio mark and answer mark if incorrect ratio of CH_3COOH to $(CH_3COO)_2Mg.4H_2O$	1 1 1 1 1	2.1.3, M0.2, M1.1
6(a)(iii)	Melting point: Obtain melting point, Compare to known values Pure sample will have a (sharp) melting point close to known value Spectroscopy: Run/collect NMR/IR spectrum, Compare to database/known spectra Spectrum of pure sample will contain same peaks as known, and not others TLC: Run a TLC Compare (R_f value) to known data Pure sample will have a very similar R_f	Must describe steps of ONE process for **2** marks, lose **1** mark for each step missed.	2	PAG 6
6(b)(i)	An acid which only partially dissociates into its ions (in water/solution)		1	2.1.4
6(b)(ii)	$K_a = [CH_3CH_2COO^-][H^+]/[CH_3CH_2COOH]$		1	5.1.3
6(b)(iii)	$2CH_3CH_2COOH + CaO \rightarrow (CH_3CH_2COO)_2Ca + H_2O$	**1** mark for correct species **1** mark for balancing, IGNORE state symbols	1 1	6.1.3

A Level OCR Chemistry

Chapter 22 – answers

Skills box answers:

a) (i) Cyclohexene. $C_6H_{10} + Br_2 \rightarrow C_6H_{10}Br_2$

(ii) cyclohexanecarboxylic acid $2C_6H_{11}COOH + Na_2CO_3 \rightarrow 2Na(C_6H_{11}COO) + H_2O + CO_2$

b) (i) Cyclohexanone and cyclohexanol are flammable and should be kept away from naked flames.

(ii) Fill a beaker with hot water / use a water bath. Place boiling tubes in water bath and leave to a few minutes.