OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

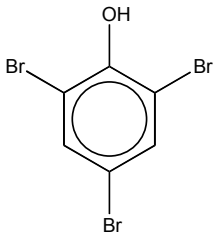
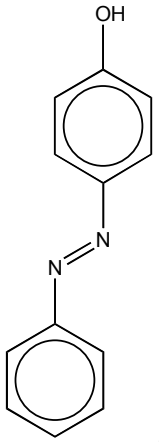
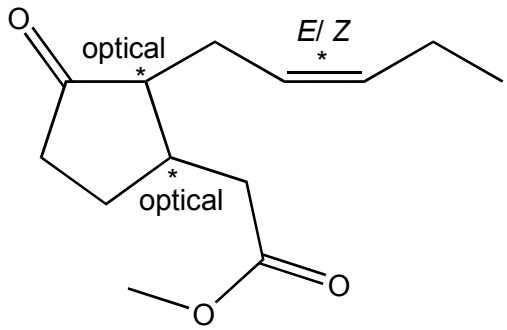
CHEMISTRY F324 MS

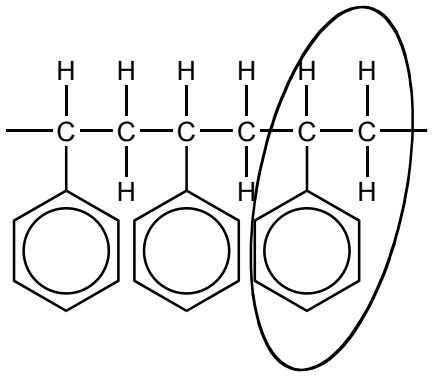
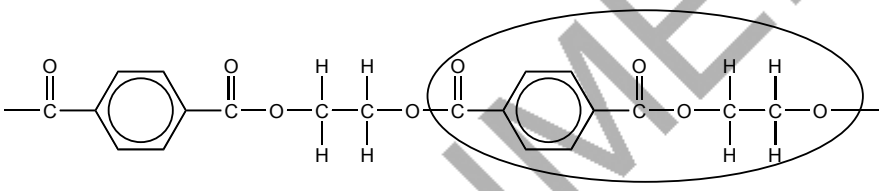
Unit F324: Rings, Polymers and Analysis

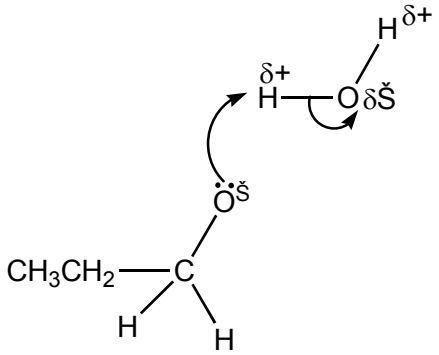
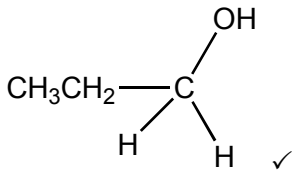
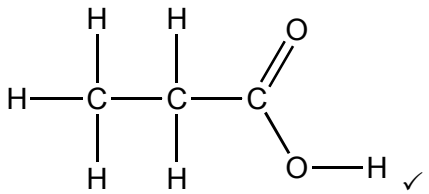
Specimen Mark Scheme

The maximum mark for this paper is **60**.

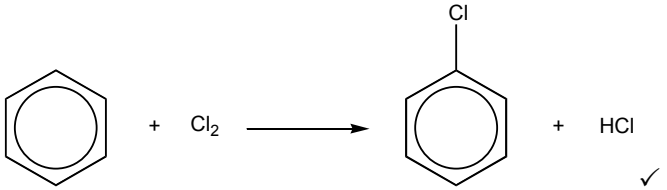
This document consists of **6** printed pages and **2** blank pages.

Question Number	Answer	Max Mark
1(a)(i)	CH_3COOH ✓	[1]
(ii)	$C_6H_5NO_2$ ✓	[1]
(iii)	$CH_3CH_2CH_2NH_2$ ✓	[1]
(iv)	CH_3COOH ✓ CH_3CH_2OH ✓	[2]
(v)		[1]
(vi)	 diazo link ✓; rest of structure ✓	[2]
(b)(i)	$C_{13}H_{20}O_3$ ✓	[1]
(ii)	ketone ✓ ester ✓ alkene ✓	[3]
(iii)	 both optical ✓ *E*/*Z* ✓	[2]

Question Number	Answer	Max Mark
(iv)	possible side effects of other chiral compound ✓ increased costs/difficulty of separating of isomers ✓ using bacteria within synthetic route ✓	**[2 max]**
2(a)(i)	  1 mark for each repeat unit ✓✓	**[2]**
(ii)	1 mark for each monomer ✓✓	**[2]**
(b)	C=O absorbs radiation/breaks ✓ ester linkage hydrolysed ✓	**[2]**
(c)(i)	one amide link shown correctly ✓ glycine and phenylalanine parts shown correctly ✓ proline linked correctly ✓	**[3]**
(ii)	6✓	**[1]**
(iii)	gas/liquid chromatograph separates the tripeptides ✓ mass spectrometer produces a distinctive fragmentation pattern ✓ identification by computer using a spectral database ✓	**[3]**

Question Number	Answer	Max Mark
3(a)(i)	 1 mark for each curly arrow ✓✓	[2]
(ii)	 ✓	[1]
(iii)	electron pair donor ✓	[1]
(iv)	electron pair on H^- attracted to $\delta+$ carbon forming a dative covalent bond ✓ the double/π electron pair breaks ✓ electron pair now on O^- ✓	[3]
(b)(i)	radio waves ✓	[1]
(ii)	chemical shift OCH_3 singlet from chemical shift at δ = 3.6 ✓ $CH_2C{=}O$ from chemical shift at δ = 2.4 ✓ ✎ *requires use of 'chemical shift' and δ for 1st mark in this category* splitting/coupling CH_3 adjacent to CH_2 from triplet splitting pattern ✓ $CH_2C{=}O$ adjacent to CH_3 from quartet splitting pattern ✓ ✎ *requires use of 'splitting/coupling' and triplet/quartet for 1st mark in this category* $CH_3CH_2COOCH_3$ ✓	[5]
(c)	 ✓	[1]

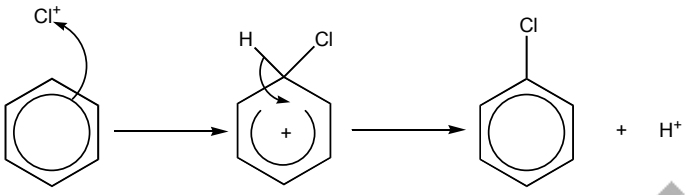
4(a)(i)



✓ **[1]**

(ii) Introduces a permanent dipole on Cl_2 / forms Cl^+/
$AlCl_3 + Cl_2 \rightarrow AlCl_4^- + Cl^+$/
$AlCl_3 + Cl_2 \rightarrow Cl^{\delta+} – AlCl_3^{\delta-}$ ✓ **[1]**

(iii)



correct dipole / Cl^+ ✓
curly arrow from benzene ring to Cl^+ / $Cl^{\delta+}$ ✓
intermediate ✓
curly arrow from H to regenerate benzene ring in intermediate ✓
H^+ as other product ✓ **[4]**

(iv) electrophilic substitution ✓ **[1]**
with electrophilic spelt correctly

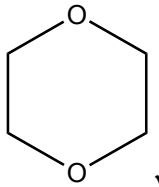
(b) In benzene, π electrons are delocalised/spread out ✓
In alkenes, π electrons are concentrated between 2 carbons ✓
Electrophiles attracted more to greater electron density in alkenes ✓ **[3]**

5 (a) **G**: CO ✓
$HCOOH/H_2CO_2 \longrightarrow CO + H_2O$ ✓

(b) **H**: C ✓
$C_{12}H_{22}O_{11} \longrightarrow 12C + 11H_2O$ ✓

(c) **I**: $C_4H_8O_2$ ✓
$2C_2H_6O_2 \longrightarrow C_4H_8O_2 + 2H_2O$ ✓

Structure:



✓ **[7]**

accept any sensible structure of $C_4H_8O_2$

Paper Total **[60]**