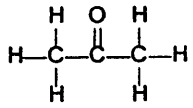
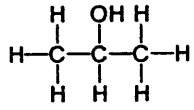
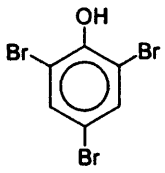
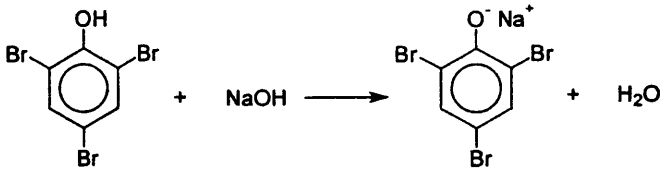
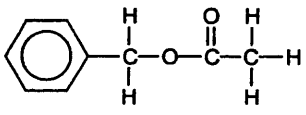
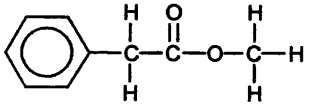
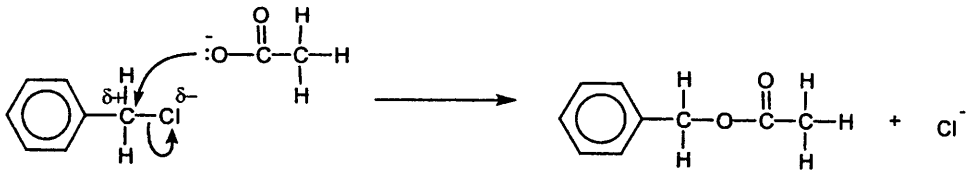
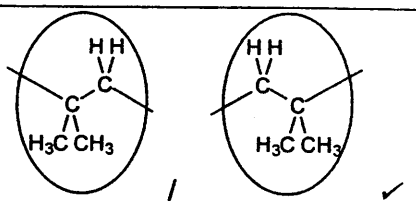
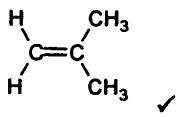
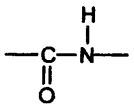
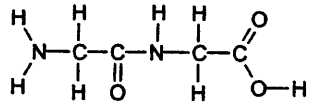
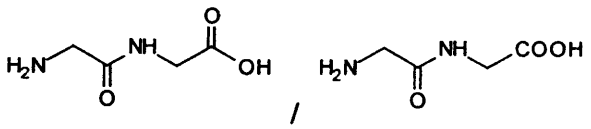
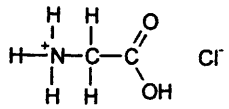
Qu.	Expected answers:	Marks
1 (a)	propanone ✓  ✓	[2]
(b) (i)	propan-2-ol ✓  ✓	[2]
(ii)	$NaBH_4$ ✓	[1]
(iii)	$C_3H_6O + 2[H] \longrightarrow C_3H_8O / C_3H_7OH$ ✓	[1]
(c)	2,4-dinitrophenylhydrazine ✓ yellow / orange/red … crystals /solid / ppt. etc ✓ (re)crystallise / purify ✓ measure melting point/m.p. (of product) ✓ compare with known compounds ✓ **ANY 4** out of **5**	max [4]
		[Total: 10]

Qu.	Expected answers:	Marks
2 (a) (i)	$C_6H_6 + Br_2 \longrightarrow C_6H_5Br + HBr$ organic product ✓ rest of the equation also correct ✓	[2]
(ii)	$FeBr_3$ / $AlBr_3$ / iron(III)bromide / aluminium bromide	[1]
(b) (i)	 ✓✓	[2]
(ii)	 organic product ✓(allow ecf from (i) but must be a ring with OH) rest of the equation also correct ✓	[2]
(iii)	(benzene) ring is activated ✓ lone pair on oxygen is delocalised / interacts with the π electrons ✓ more (π) electron density (around ring) ✓ attracts bromine / electrophiles more / polarises Br_2 molecule more ✓ ***ANY* 3** marks from **4**	max [3]
(iv)	antiseptics / disinfectants	[1]
		[Total: 11]

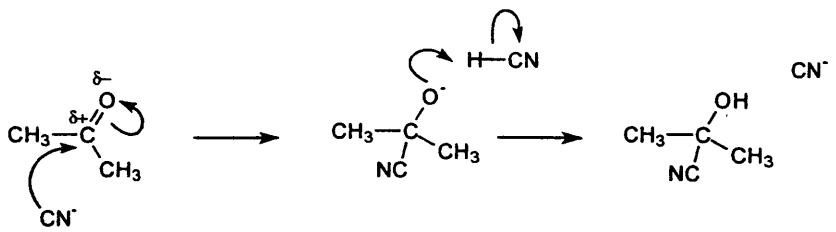
Qu.	Expected answers:	Marks
3 (a) (i)	$NaOH / KOH / OH^- / H_2O$ ✓	[1]
(ii)	nucleophilic ✓ substitution ✓	[2]
(iii)	$C_6H_5CH_2Cl + NaOH \longrightarrow C_6H_5CH_2OH + NaCl$ ✓ $/ OH^- \longrightarrow Cl^-$ if water in (i), then: $H_2O \longrightarrow HCl$	[1]
(b) (i)	allow either  or  ✓	[1]
(ii)	$C_6H_5CH_2OH + CH_3COOH \longrightarrow CH_3COOCH_2C_6H_5 + H_2O$ ✓ allow $C_6H_5CH_2COOCH_3$ as the ester	[1]
(iii)	perfumes / flavourings / solvents ✓	[1]
(iv)	suggested mechanisms could be S_N1 or S_N2 type (such as the example shown below)  look for diagram or words describing: nucleophilic ✓ substitution / ester + Cl^- as products ✓ dipole on C-Cl bond ✓ curly arrow from COO^- to C ✓ curly arrow from bond to Cl ✓ **ANY 3 out of 5** (allow anything reasonable producing $C_6H_5CH_2COOCH_3$)	max [3]
		[Total: 10]

Qu.	Expected answers:	Marks
4	(at a temperature) < 10° ✓	[1]
	(reagent is) nitrous acid / HNO_2 ✓ (made by) sodium nitrite / $NaNO_2$ ... ✓ ... (with) hydrochloric acid / HCl ✓ ... (to give diazonium salt with formula) eg $C_6H_5N_2^+$ / $C_6H_5N_2Cl$ / $C_6H_5N^+{\equiv}N\ Cl$ ✓	
	balanced equation - e.g. $C_6H_5NH_2 + HNO_2 + H^+ \longrightarrow C_6H_5N_2^+ + 2H_2O$ ✓	
	(any of the other marks above may be awarded if they appear in an equation)	max [4]
	MAX 4 from these 5	
	(used to form) dyes / colourings / coloured compounds ✓	[1]
		[Total: 6]

Qu.	Expected answers:	Marks
5 (a) (i)	 / ✓	[1]
(ii)	CH_2 ✓	[1]
(iii)	 ✓	[1]
(b) (i)	peptide / amide ✓	[1]
	 ✓	[1]
(ii)	condensation ✓	[1]
(iii)	 ✓	[1]
	 ✓	[1]
5 (b) (iv)	M_r glycine, $C_2H_5NO_2$ = **75**.(0) ✓ M_r $C_4H_8N_2O_3$ = **132**.(0) ✓	[2]
	use of 2:1 ratio to give **0.009333**mol of dipeptide ***H*** expected / ecf ✓ (or use of 2:1 ratio to give mass ratio of **150:132** / ecf)	[1]
	answer in the range **89.2 - 89.4** with 3 sf / ecf ✓(correct answer gets all **4** marks) (answer in the range **44.6 - 44.7** (no 2:1) with 3 sf gets **3** marks overall)	[1]
(v)	 $H_3N^+CH_2COOH$ Cl^-/ NH_3^+ group ✓ rest of the molecule and Cl^- ✓	[2]
		[Total: 14]

Qu.	Expected answers:	Marks
6 (a) (i)	C_7H_8O ✓	[1]
(ii)	M_r = 108 so m/e of molecular ion = **108** / ecf from **(i)** ✓	[1]
(iii)	%C = (84.0)/(108) x 100% = **77.8%** ✓ %H = (8.0)/(108) x 100% = **7.4%** ✓ / ecf from **(i)** or **(ii)**	[2]
(b)	***K*** has OH group ✓ ***K*** has peak at 3230 - 3550 cm^{-1} ✓ (ignore reference to any other bonds) ***L*** does not have OH group / peak at 3230 - 3550 cm^{-1} ✓	[3]
(c) (i)	peak at δ = 7.3ppm / with area 5, is due to the benzene ring (protons) ✓ peak at δ = 4.5ppm / with area 2, is due to the $-CH_2-$ (protons) ✓ peak at δ = 3.2ppm / with area 1, is due to the OH (proton) ✓	[3]
(ii)	peak at δ = 3.2ppm / with area 1 disappears / ecf from ***(i)*** ✓	[1]
(iii)	expect peak at δ = 7.1-7.7 ppm ✓ 5 protons responsible / area = 5 ✓ expect peak at δ = 3.3-4.3ppm ✓ 3 protons responsible / area = 3 ✓	[4]
		[Total: 15]

Qu.	Expected answers:	Marks
7 (a)	CH_3CH_2COOH ✓	[1]
(b)	$C_6H_5NO_2$ ✓	[1]
(c)	CH_3Cl / CH_3Br ✓ $AlCl_3$ / $FeCl_3$ / $FeBr_3$ etc ✓	[2]
(d)	$C_6H_5NH_3^+$ / $C_6H_5NH_2$ ✓	[1]
(e)	$CH_3COOC_2H_5$ ✓	[1]
(f) (i)	$(CH_3)_2C(OH)CN$ etc ✓	[1]
(ii)	nucleophilic ✓ addition ✓	



Look for the following in a diagram as above or description: (dipoles **not** required)

CN^-/nucleophile attacks (δ)+ carbonyl C / curly arrow from CN^- to carbonyl C ✓
(curly arrow) breaking C=O ✓
correct structure of the intermediate ✓
curly arrow from O^- to HCN / H_2O ✓

***ANY* 5** out of the **6** marks above — **max [5]**

(curly arrows must be clearly from and to the correct bond / atom to gain the mark)

[Total: 12]

Qu.	Expected answers:	Marks
8	(**structural** isomerism is) same molecular formula, different structural formulae ✓	
	two correct structures of suitable example ✓	
	stereoisomerism (is same structural) formula /order of bonds, different spatial arrangements of the atoms ✓	
	(**cis-trans / geometric** isomerism is due to) non-rotation around a C=C double bond ✓	
	two correct structures of suitable example ✓	
	(**optical** isomerism is when) molecules are non-superimposable mirror images / asymmetric / contain a chiral centre ✓ (or polymers may be isotactic, atactic or syndiotactic)	
	carbon atom is attached to four distinguishable / different groups / atoms /(or shown in diagram) ✓ (or polymer side chain on the same, random or alternate sides)	
	two correct 3-d structures of suitable example ✓	
	8 points on isomerism (3 MAX for optical isomerism / polymers)	
	(synthesis of only one stereoisomer of a **pharmaceutical** is good because ...)	
	... only one of the two stereoisomers may be active /the two isomers may have different activity in the body ✓ ... a smaller dose needed /saves cost of materials/separation ✓ (ora) ... the other may have (harmful) side effects ✓	
	good example of stereospecific drug e.g. Thalidomide / Dopa / Ibuprofen ✓	
	4 points on chiral synthesis	**max [10]**
	Quality of Written Communication	
	the answer is coherent, and at least **two** of the specialist terms: **structural**, **cis-trans/geometric** and **optical isomerism** are assigned correctly ✓	
	the text contains at least two legible sentences with reasonably accurate spelling, punctuation and grammar ✓	
		[2]
		[Total: 12]