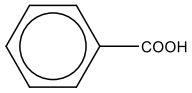
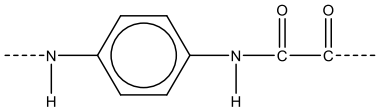
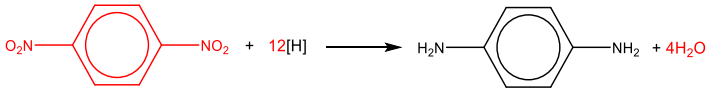
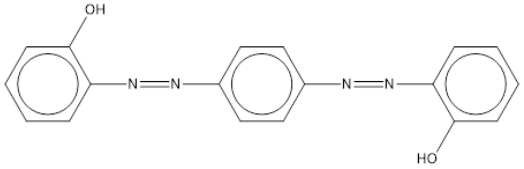
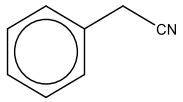
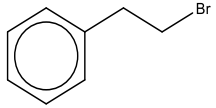
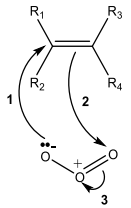
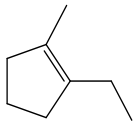
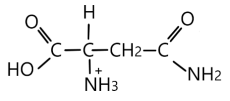
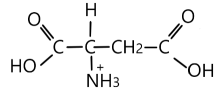
7(a)	**M1:** C*l*CH_2COOH $BrCH_2COOH$ CH_3COOH CH_3CH_2OH most acidic least acidic **M2:** electron withdrawing groups / electronegative groups / negative inductive effect **AND** weakens O–H bond / more stable anion **OR** electron donating groups / positive inductive effect **AND** strengthens O-H bond / less stable anion **M3 M4:** • chlorine is more electron-withdrawing / electronegative than bromine (related to XCH_2COOH) • electron withdrawing of C=O / negative inductive effect of C=O (related to COOH) • positive inductive effect / electron donating of alkyl / ethyl / R group (related to ROH) any two [1], all three [2]
7(b)	**M1:**  **M2:** CO_2
7(c)(i)	 **M1**: correct displayed amide bond with C=O, (C_6H_5)–N and (C–)C=O **M2**: rest of the structure correct with continuation bonds
7(c)(ii)	
7(d)(i)	**M1:**  **M2:** 

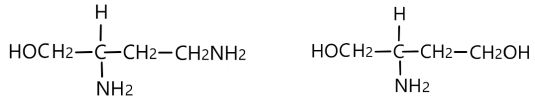
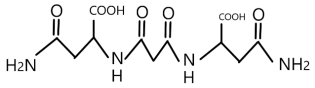
7(d)(ii)	HNO_2 (and HCl) **AND** ⩽10 °C **OR** $NaNO_2$ **AND** HCl **AND** ⩽10 °C

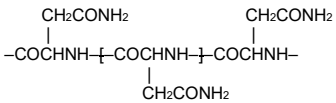
9(a)	**M1:** (basicity linked to) ability of lone pair / p-orbital to **AND** accept / coordinate with a proton / H^+ **M2:** (lone pair of) electrons on N is delocalised into C=O group (and make amides neutral)

9(b)(i)	**M1: M**  **M2: N** 
9(b)(ii)	Li*A*lH_4
9(c)	ketone / carbonyl **AND** secondary / 2°
9(d)(i)	 curly arrow 1: from O lone pair to C atom (in C=C) curly arrow 2: from C=C bond to the right-hand O atom in O=O curly arrow 3: from O=O bond to O^+

9(d)(ii)	

8(a)	the pH at which an amino acid exists as a zwitterion
8(b)	**M1:** $[HOOCCH(NH_3)CH_2CONH_2]^+$ **M2:** $[HOOCCH(NH_3)CH_2COOH]^+$  

8(c)	**M1:** $HOCH_2CH(NH_2)CH_2CH_2NH_2$ **M2:** $HOCH_2CH(NH_2)CH_2CH_2OH$ 
8(d)(i)	$HOOCCH_2COOH + 2SOCl_2 \rightarrow ClOCCH_2COCl + 2SO_2 + 2HCl$ [1]
8(d)(ii)	$HOOCCH(CH_2CONH_2)NHCOCH_2CONHCH(CH_2CONH_2)COOH$ **M1:** three molecules joined, with four correct amide groups only **M2:** whole structure correct as above, displayed formula accepted, skeletal formula as below accepted 
8(e)	**M1:** hydrolysis of amide to carboxylate ion **M2:** hydrolysis of –COOH to carboxylate ion and rest of molecule $^-OOCCH(NH_2)CH_2COO^-$

8(f)	• three monomer residues • all linkages correct • correct trailing bonds • repeat unit marked contains correct atoms Any two [1], any three [2], all four [3] 
8(g)(i)	• rotate the plane of the plane polarised light • by the same angle • in opposite directions Any two [1], all three [2]
8(g)(ii)	racemic mixture