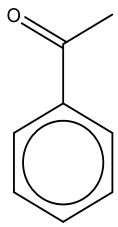
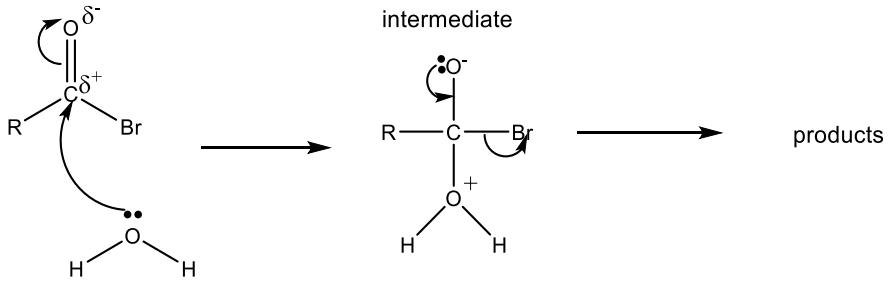
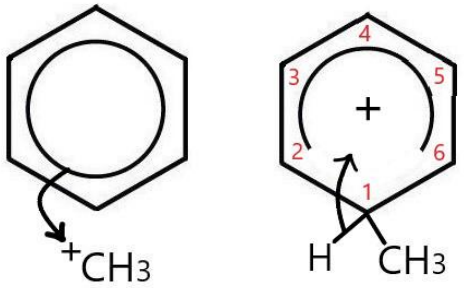
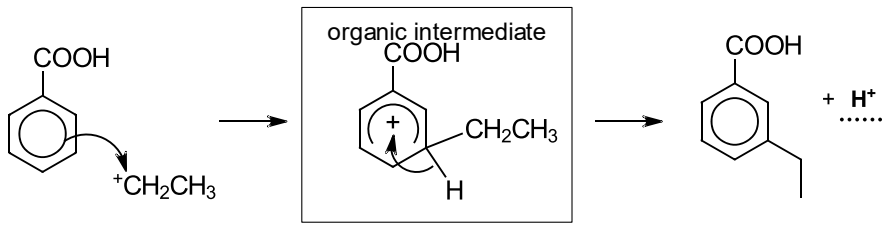
8(a)(i)	NO_2 group directs to 3 (and 5) / meta position **AND** due to being an electron-withdrawing / electronegative group
8(a)(ii)	$HNO_3 + H_2SO_4 \rightarrow NO_2^+ + HSO_4^- + H_2O$ **OR** $HNO_3 + 2H_2SO_4 \rightarrow NO_2^+ + 2HSO_4^- + H_3O^+$
8(b)(i)	
8(b)(ii)	**M1:** (reaction 1) ethanoyl chloride / CH_3COCl **AND** $AlCl_3$ **M2:** (reaction 2) 2-bromopropane / $(CH_3)_2CHBr$ **AND** $FeBr_3$
8(c)	**M1:** with C_6H_5Br no change / no precipitate **AND** with $C_6H_5CH_2Br$ cream precipitate in C_6H_5Br **M2:** lone pair / p-orbital on Br delocalised / overlaps with ring / π system **M3:** C–Br bond stronger / has partially double bond character
8(d)(i)	(nucleophilic) addition–elimination
8(d)(ii)	 **M1 M2:** • lone pair on O • curly arrow from (lone pair) O (in H_2O) to C (of C=O) • correct dipole on C=O • curly arrow from the C=O bond to O atom any two [1], all four [2] **M3:** correct intermediate **M4:** curly arrow from (lone pair on) $O^{(-)}$ to C–O bond **AND** curly arrow from C–Br to Br

9(a)	• all C atoms are sp^2 hybridised • bonds between C atoms are σ and π • C–C σ bonds are formed by overlap of sp^2 hybrid orbitals • C–C π bonds are formed by overlap of p orbitals • bonds between C and H atoms are σ • C–H bonds are formed by overlap of sp^2 hybrid orbitals and s orbitals Any two [1], any four [2], all six [3]

9(b)	CH_3Cl and $AlCl_3$
9(c)	 **M1:** curly arrow from within hexagon towards ^+C **M2:** intermediate, usual rules for horseshoe and + charge **M3:** curly arrow from C–H bond into ring **AND** H^+ product
9(d)	**M1:** HNO_3 **AND** H_2SO_4 **M2:** concentrated **AND** 25 °C ⩽ T ⩽ 60 °C
9(e)	alkaline $KMnO_4$
9(f)	4-nitrobenzoic acid
9(g)	(hot) concentrated HCl and Sn
9(h)	**M1:** perform step 3 before step 2 **OR** perform step 2 before step 1 **M2:** COOH is 3-directing **OR** NO_2 is 3-directing

5(a)	**M1** and **M2:** any two [1], all three [2] • (hexagonal ring) planar / (trigonal) planar • 120° • sp^2 hybridised **M3:** p orbitals overlap sideways / laterally (with each other above and below the ring) forming π bonds **M4:** σ bonds form when sp^2 / hybridised orbitals overlap end-on-end / head on
5(b)(i)	**M1:** (reaction 5) Pt / Ni + H_2 (+ heat) **M2:** (reaction 6) $(CH_3)_2CHCOCl$ + $AlCl_3$ (+ heat)
5(b)(ii)	reduction / hydrogenation
5(c)(i)	(CH_2CH_3 group) directs to 2-, 4- (and 6-) positions **AND** due to being an electron donating group
5(c)(ii)	$CH_3CH_2Br + FeBr_3 \rightarrow CH_3CH_2^+ + FeBr_4^-$
5(c)(iii)	 **M1:** curly arrow from inside / touching the hexagon to (CH_2) group / C^+ charge **M2:** structure of the intermediate **M3:** curly arrow from C-H bond into / onto the ring **AND** formation / loss of H^+
5(c)(iv)	$H^+ + FeBr_4^- \rightarrow HBr + FeBr_3$