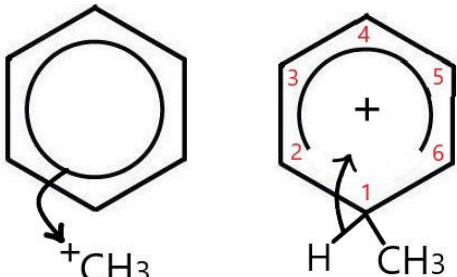
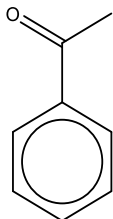
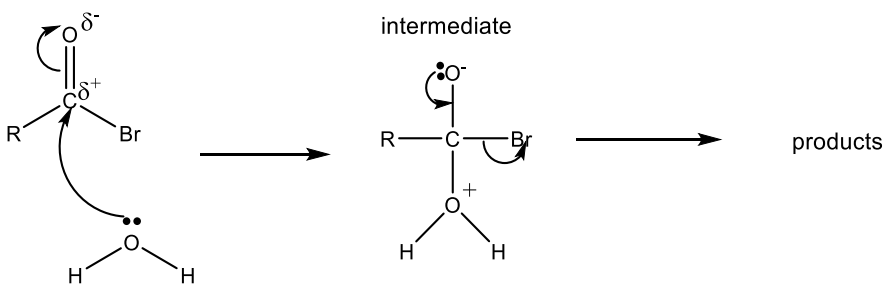
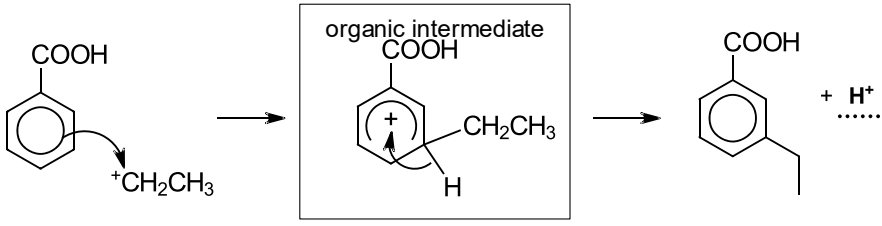


9(a)	- all C atoms are sp^2 hybridised - bonds between C atoms are σ and π - C–C σ bonds are formed by overlap of sp^2 hybrid orbitals - C–C π bonds are formed by overlap of p orbitals - bonds between C and H atoms are σ - C–H bonds are formed by overlap of sp^2 hybrid orbitals and s orbitals Any two [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 $25^\circ C \leq T \leq 60^\circ C$
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

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 H₂O) 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

5(a)	M1 and M2: any two [1], all three [2] • (hexagonal ring) planar / (trigonal) planar • 120° • sp² hybridised M3: p orbitals overlap sideways / laterally (with each other above and below the ring) forming π bonds M4: σ bonds form when sp² / hybridised orbitals overlap end-on-end / head on
5(b)(i)	M1: (reaction 5) Pt / Ni + H₂ (+ heat) M2: (reaction 6) (CH₃)₂CHCOCl + AlCl₃ (+ heat)
5(b)(ii)	reduction / hydrogenation
5(c)(i)	(CH ₂ CH ₃ group) directs to 2-, 4- (and 6-) positions AND due to being an electron donating group
5(c)(ii)	CH ₃ CH ₂ Br + FeBr ₃ → CH ₃ CH ₂ ⁺ + FeBr ₄ ⁻
5(c)(iii)	 M1: curly arrow from inside / touching the hexagon to (CH₂) 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 ⁻ → HBr + FeBr ₃