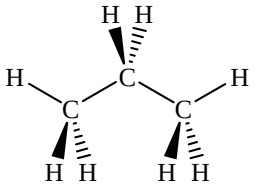
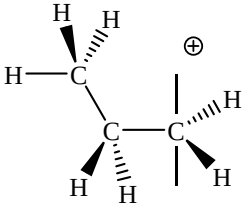
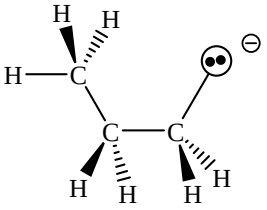
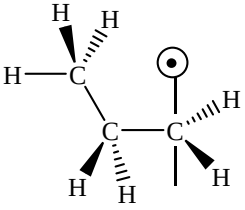
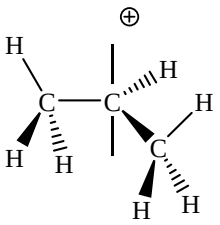
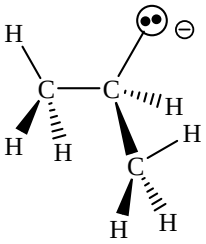
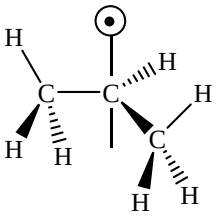
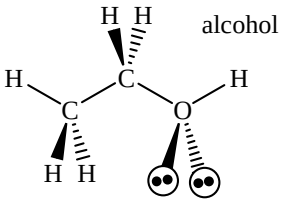
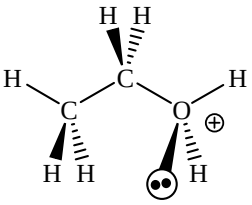
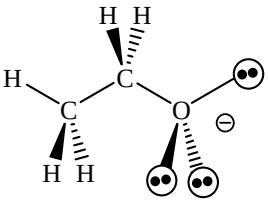
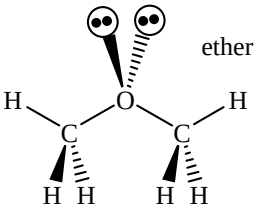
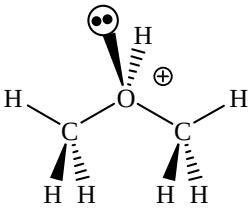
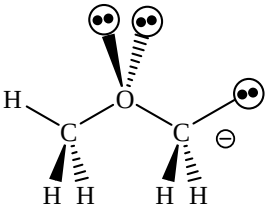
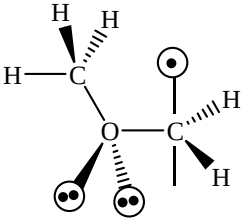
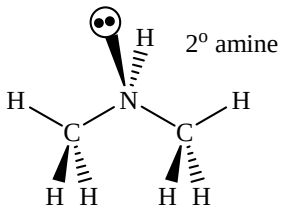
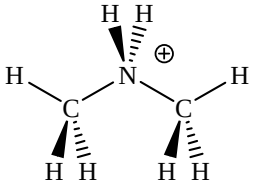
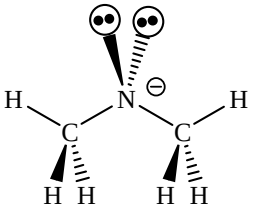
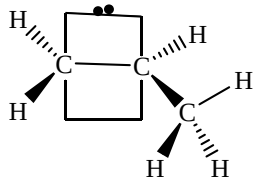
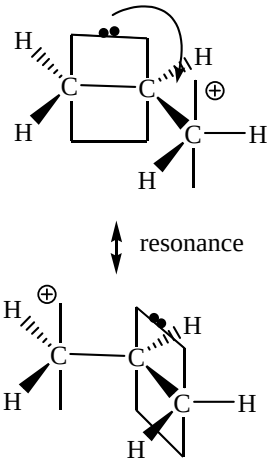
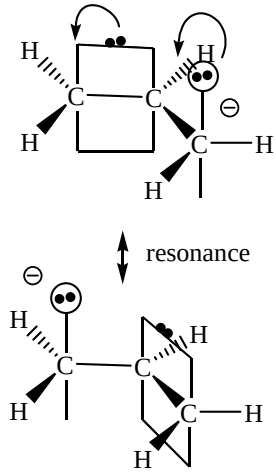
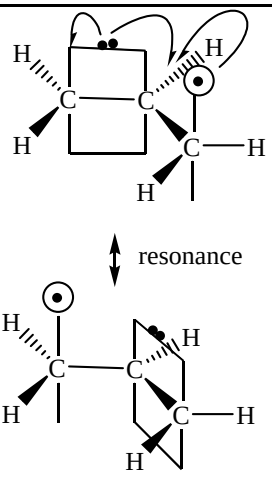
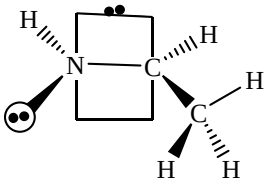
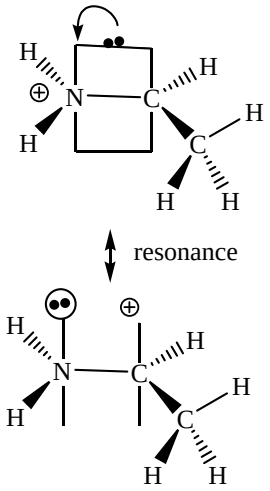
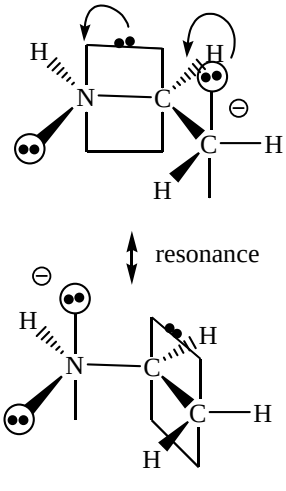
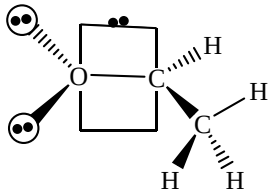
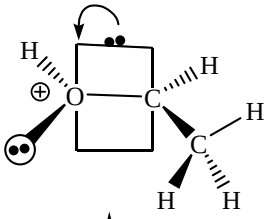
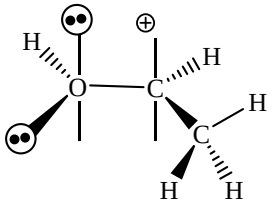
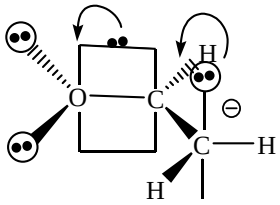
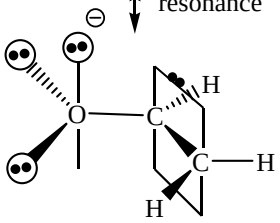
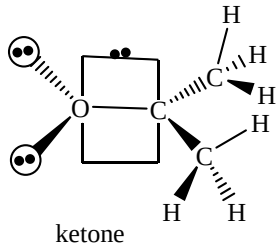
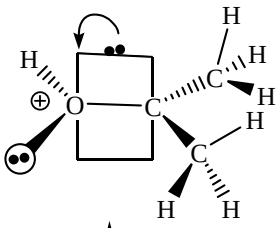
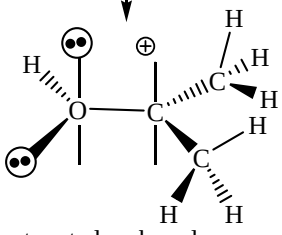
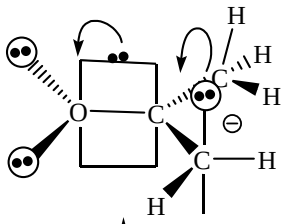
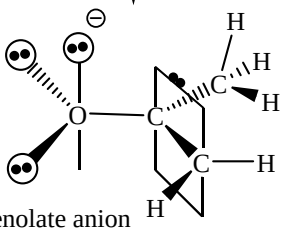
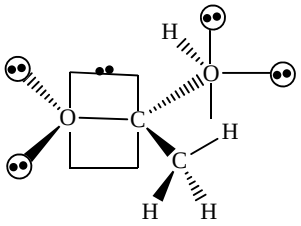
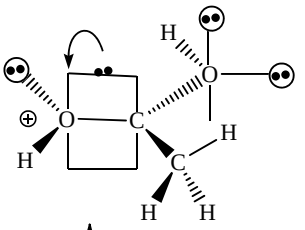
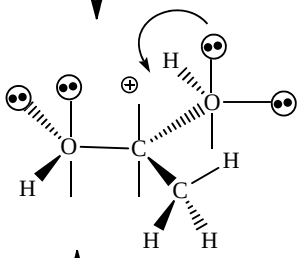
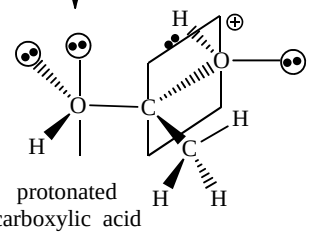
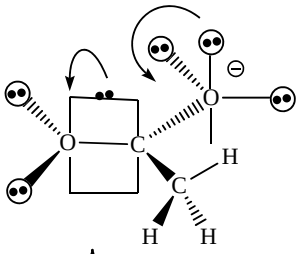
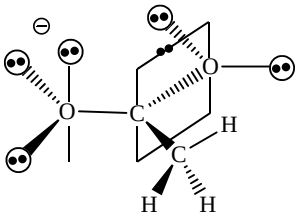
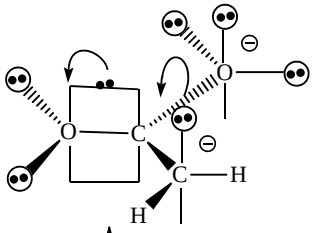
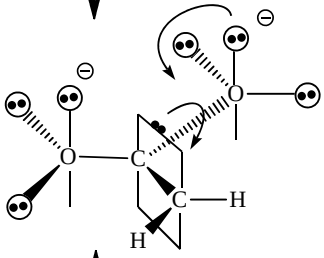
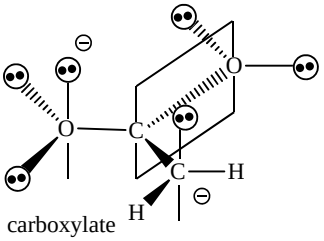
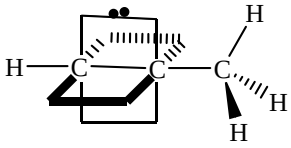
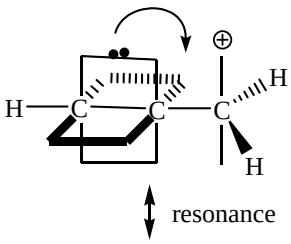
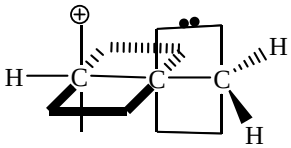
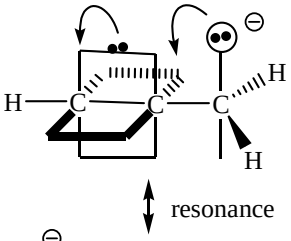
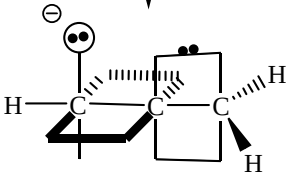
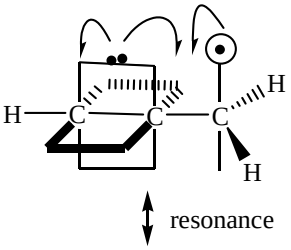
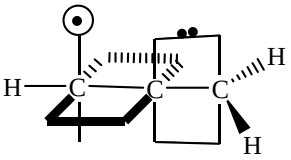
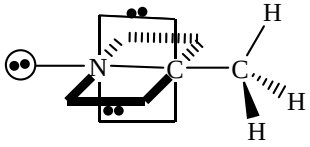
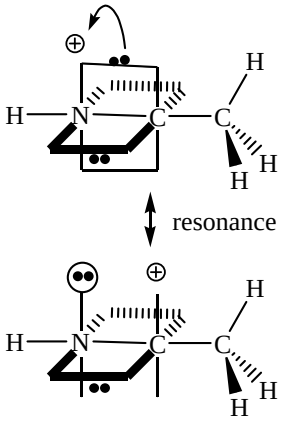
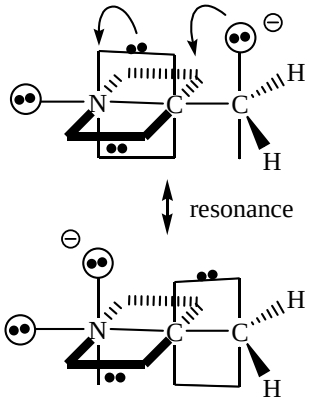
$CH_3CH_2CH_3$ (neutral)	$CH_3CH_2CH_2^{\oplus}$ (cation)	$CH_3CH_2\ddot{C}H_2^{\ominus}$ (anion)	$CH_3CH_2\dot{C}H_2$ (free radical)
 use zig-zag drawing for sp^3 chains	 1^o carbocation	 1^o carbanion	 1^o free radical
	$CH_3\overset{\oplus}{C}HCH_3$ (cation)	$CH_3\ddot{C}HCH_3^{\ominus}$ (anion)	$CH_3\dot{C}HCH_3$ (free radical)
	 2^o carbocation	 2^o carbanion	 2^o free radical
CH_3CH_2OH (neutral)	$CH_3CH_2OH_2^{\oplus}$ (cation)	$CH_3CH_2O^{\ominus}$ (anion)	
 alcohol use zig-zag drawing for sp^3 chains	 protonated alcohol	 alkoxide	
CH_3CH_2OH (neutral)	$CH_3CH_2OH_2^{\oplus}$ (cation)	$CH_3CH_2O^{\ominus}$ (anion)	$CH_3O\dot{C}H_2$ (free radical)
 ether use zig-zag drawing for sp^3 chains	 protonated ether	 carbanion	 free radical

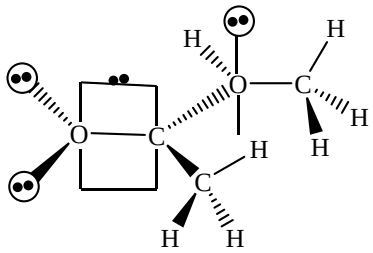
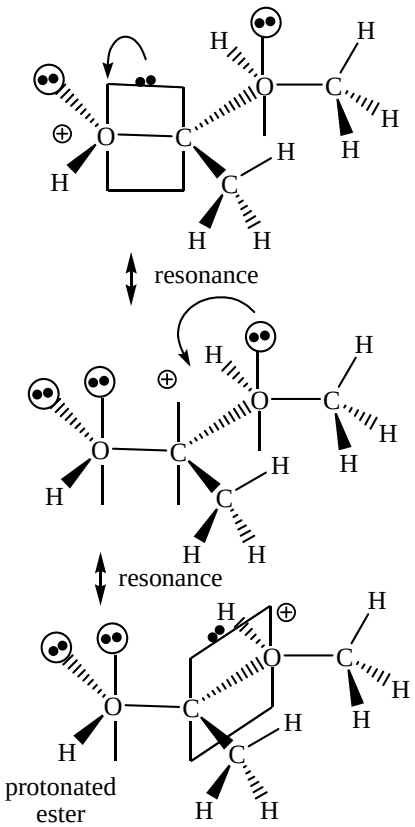
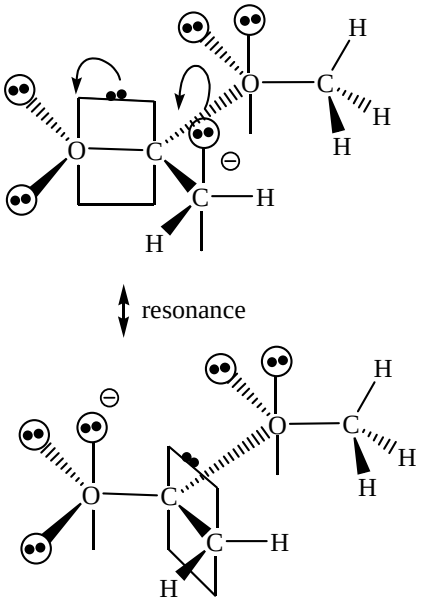
CH_3NHCH_3 (neutral)	$CH_3NH_2CH_3^{\oplus}$ (cation)	$CH_3NCH_3^{\ominus}$ (anion)	
 2° amine use zig-zag drawing for sp^3 chains	 dialkylammonium ion	 2° amide anion	
CH_2CHCH_3 (neutral)	$CH_2CHCH_2^{\oplus}$ (cation)	$CH_2\dot{C}H\dot{C}H_2^{\ominus}$ (anion)	$CH_2\dot{C}HCH_2$ (free radical)
 monosubstituted alkene	 1° allylic carbocation	 1° allylic carbanion	 1° allylic free radical
CH_3CHNH (neutral)	$CH_3CHNH_2^{\oplus}$ (cation)	$\overset{\ominus}{C}H_2CHNH$ (anion)	
 imine			

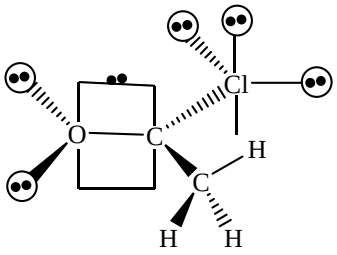
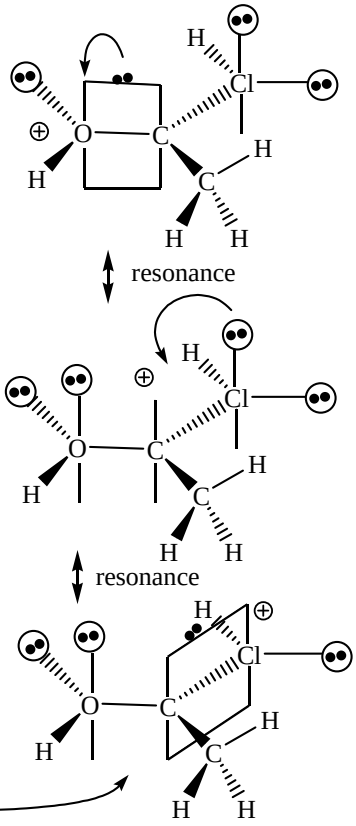
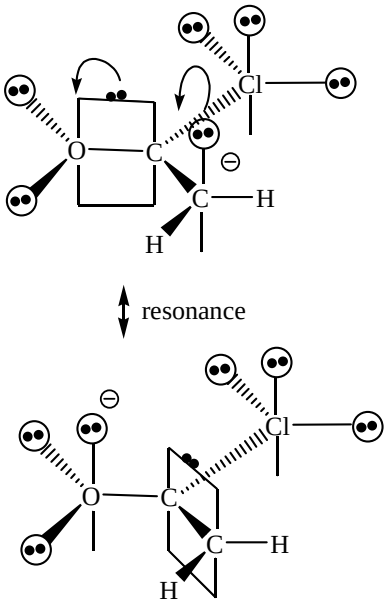
CH_3CHO (neutral)	$CH_3CHOH^{\oplus}$ (cation)	$CH_2CHO^{\ominus}$ (anion)	
 aldehyde	 resonance  protonated carbonyl	 resonance  enolate anion	
CH_3COCH_3 (neutral)	$CH_3COHCH_3^{\oplus}$ (cation)	$CH_3C\ddot{O}CH_2^{\ominus}$ (anion)	
 ketone	 resonance  protonated carbonyl	 resonance  enolate anion	

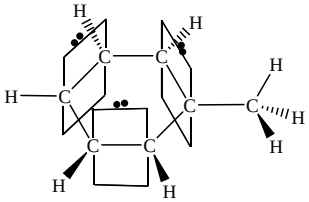
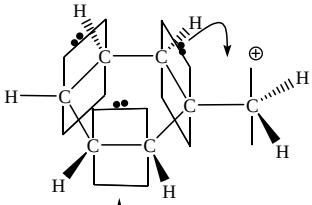
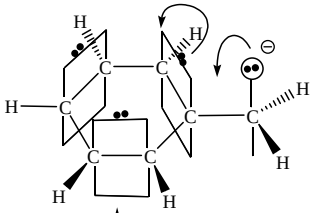
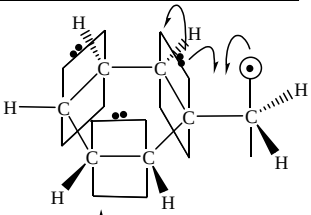
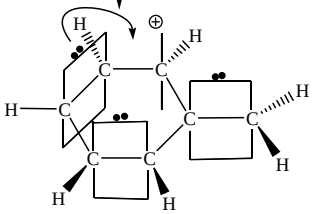
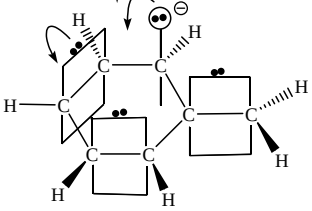
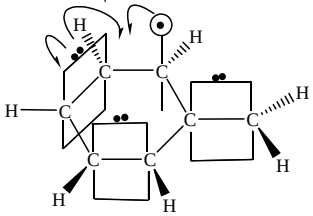
CH_3CO_2H (neutral)	$CH_3C(OH)_2^{\oplus}$ (cation)	$CH_3CO_2^{\ominus}$ (anion)	$\ddot{C}H_2CO_2^{-2}$ (dianion)
 carboxylic acid	 resonance  resonance  protonated carboxylic acid	 resonance  carboxylate anion	 resonance  resonance  carboxylate dianion

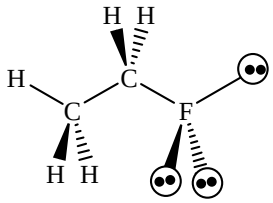
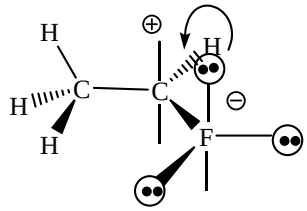
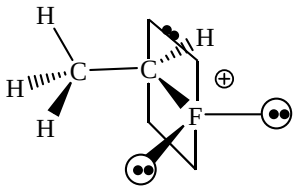
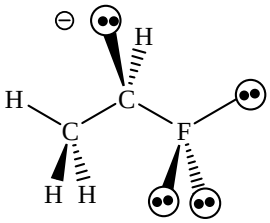
$HCCCH_3$ (neutral)	$HCCCH_2^{\oplus}$ (cation)	$HCC\ddot{C}H_2^{\ominus}$ (anion)	$HCC\dot{C}H_2$ (free radical)
 alkyne	 resonance  propargyl carbocation	 resonance  propargyl carbanion	 resonance  propargyl free radical

CH_3CN (neutral)	$CH_3CNH^{\oplus}$ (cation)	$\ddot{C}H_2CN^{\ominus}$ (anion)
 nitrile	 protonated nitrile	 nitrile enolate

$CH_3CO_2CH_3$ (neutral)	$CH_3C(OH)OCH_3^{\oplus}$ (cation)	$\ddot{C}H_2CO_2CH_3^{\ominus}$ (anion)
 ester	 protonated ester	 ester enolate

CH_3COCl (neutral)	$CH_3COHCl^{\oplus}$ (cation)	$\ddot{C}H_2COCl^{\ominus}$ (anion)
		
acid chloride	resonance	resonance
	resonance	
		acid chloride enolate (unstable to elimination, forms ketene)
poor resonance due to inefficient overlap of 3p chlorine orbital with 2p carbon orbital		

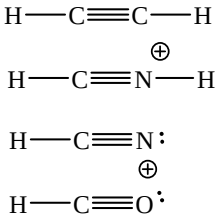
$C_6H_5CH_3$ (neutral)	$C_6H_5CH_2^{\oplus}$ (cation)	$C_6H_5\ddot{C}H_2^{\ominus}$ (anion)	$C_6H_5\dot{C}H_2$ (free radical)
			
	resonance	resonance	resonance
			
	resonance 2 more times (in the ring)	resonance 2 more times (in the ring)	resonance 2 more times (in the ring)

CH_3CH_2F (neutral)	$CH_3CHF^{\oplus}$ (cation)	$CH_3\ddot{C}HF^{\ominus}$ (anion)
 use zig-zag drawing for sp^3 chains fluoroalkane	 resonance 	

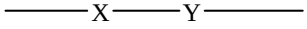
$C_6H_5CH_3$	$C_6H_5CH_2^{\oplus}$	$C_6H_5CH_2^{\ominus}$	$C_6H_5CH_2$
$C_6H_5NH_2$	$C_6H_5NH_3^{\oplus}$	$C_6H_5NH^{\ominus}$	
C_6H_5OH	$C_6H_5OH_2^{\oplus}$	$C_6H_5O^{\ominus}$	
CH_3CH_2F	$CH_3CHF^{\oplus}$	$CH_3CHF^{\ominus}$	HCCF
CH_3NO_2	$CH_3NO_2H^{\oplus}$	$CH_2NO_2^{\ominus}$	
CH_3NO	$CH_3NOH^{\oplus}$	$CH_2NO^{\ominus}$	
OCO	$ONO^{\oplus}$	$NNN^{\ominus}$	

$NO_3^{\ominus}$	$NO_2^{\ominus}$	HNO_3	HNO_2	CH_2CCH_2	CH_2CNH	$CH_2CNH_2^{\oplus}$	CH_2CO	$CHCO^{\ominus}$	$CH_2COH^{\oplus}$
$NNN^{\ominus}$	CH_2NN	CH_3NNN							

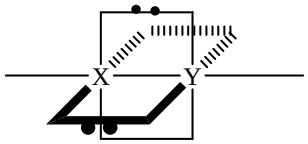
2D and 3D structures with carbon and heteroatoms – acid and base reactions – neutral and formal charge

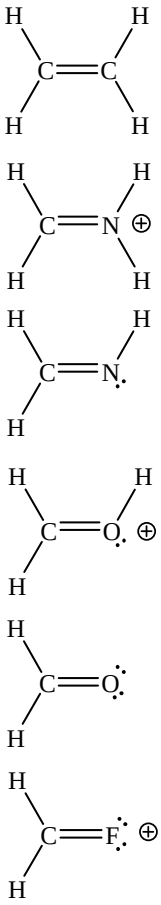


sigma skeleton

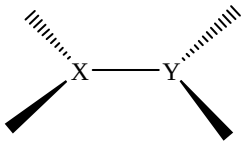


sigma + pi bonds

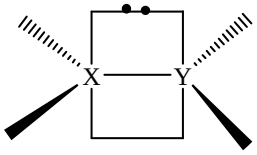




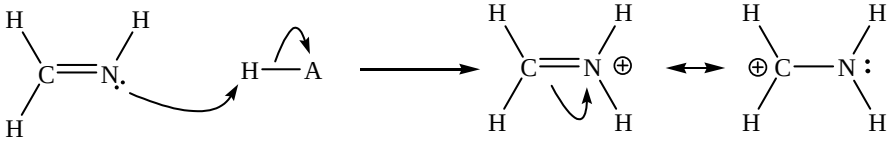
sigma skeleton

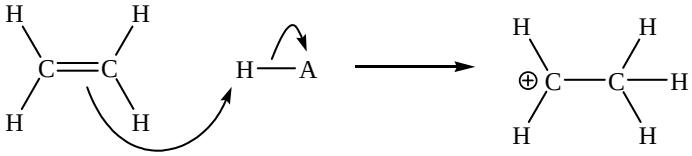


sigma + pi bonds

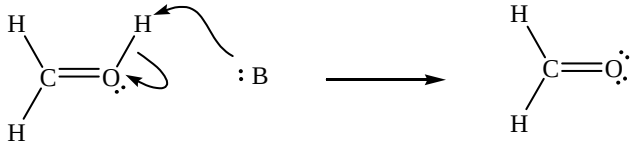


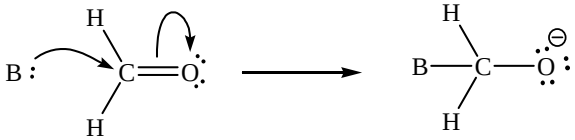
In acid (H-A) - Do not make +2.
1. react with lone pair electrons, "A" keeps electrons (as conjugate base)
2. react with pi bond electrons

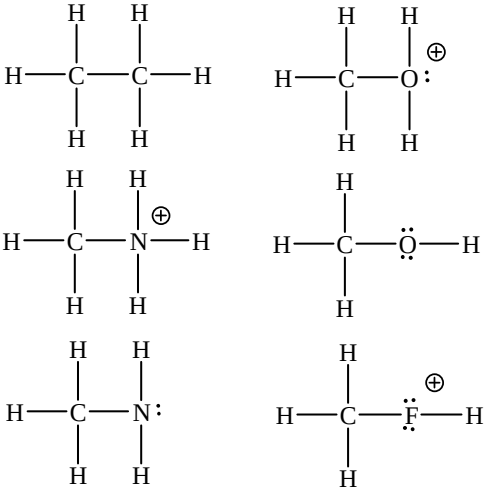




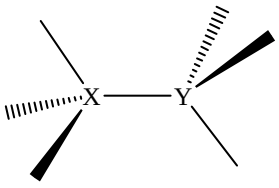
In base ($B:^{\ominus}$) - Quench "+" if possible.
1. remove proton (H+), leave electrons behind
2. attack carbon, push electrons away to heteroatom



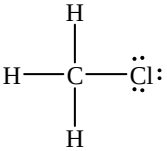




sigma skeleton



no pi bonds



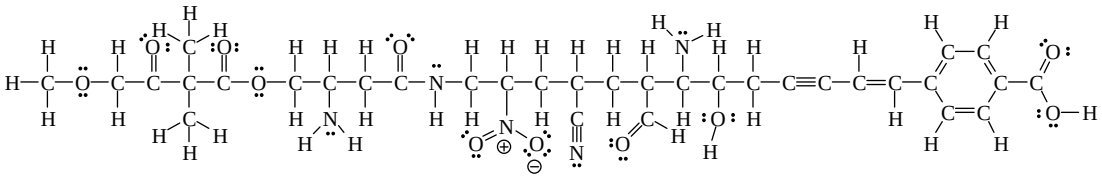
antidisestablishmenttarianism - opposition to disestablishment of a church or religoius body

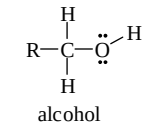
an - ti - dis - es - tab - lish - ment - ta - ri - an - ism

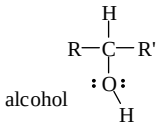
Break a complicated problem down into simpler parts.

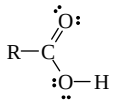
$CH_3OCH_2COC(CH_3)_2CO_2CH_2CHNH_2CH_2CONHCH_2CH(NO_2)CH_2CH(CN)CH_2CH(CHO)CHNH_2CHOHCH_2CCCHCHC_6H_4CO_2H$

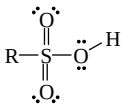
RCH_2OH	$RCH(OH)R'$	RCO_2H	RSO_3H
RCH_2SH	$RCH(SH)R'$	$RCOCl$	RSO_2Cl
RNH_2	$RCH(NH_2)R'$	$RCO_2C(CH_3)_3$	RSO_3CH_3
$ROCH(CH_3)_2$	$RCH(OCH_2CH_3)R'$	$RCONH_2$	RSO_2NH_2
$RSCH_3$	$RCH(SCH_2CH_3)R'$	$RCONHCH_3$	$RSO_2N(CH_3)_2$
$RCHCH_2$	$RCHCHCH_2CH_3$	RCN	$RCCCN$
$RCCH$	$RCCC(CH_3)_3$	$RCH(CN)CO_2CH_3$	$CH_3COC_6H_4CHCHCH(OH)CHO$
$RCHO$	$OHCCCC(CH_3)_3$	RNO_2	$RCH(NO_2)R'$
RC_6H_5	$RC_6H_4CHOHCHO$	RN_3	R_2CN_2
$RCOCH_3$	$RCOCHCHCH_3$	RNO	$RONO$

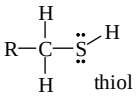


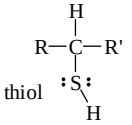

alcohol

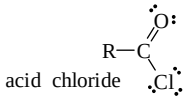

alcohol

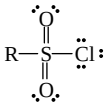

carboxylic acid

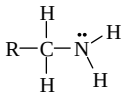

sulfonic acid

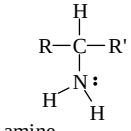

thiol

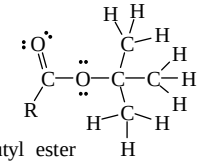

thiol

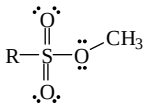

acid chloride

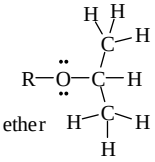

sulfonyl chloride

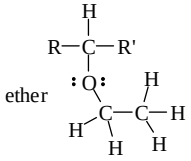

amine

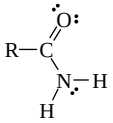

amine

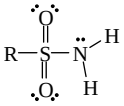

t-butyl ester

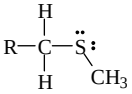

methyl sulfonate

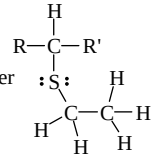

ether


ether


amide


sulfonamide


thio ether / sulfide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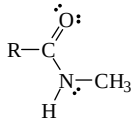
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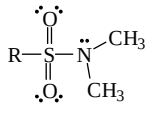
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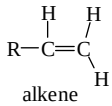
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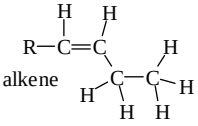
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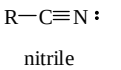
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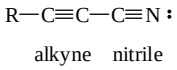
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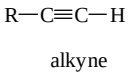
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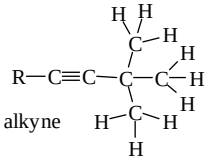
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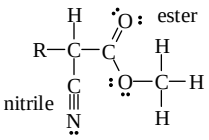
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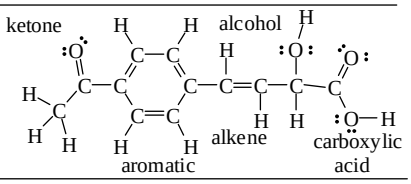
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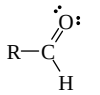
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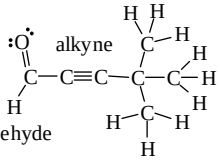
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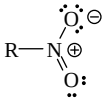
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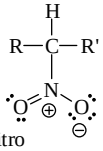
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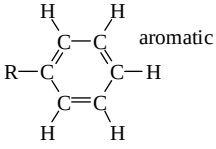
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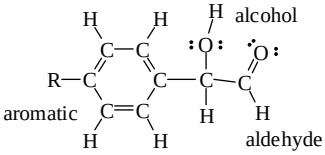
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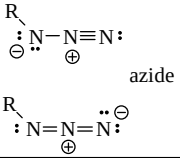
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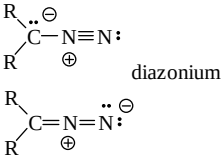
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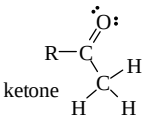
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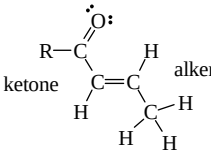
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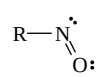
nitroso

nitrite