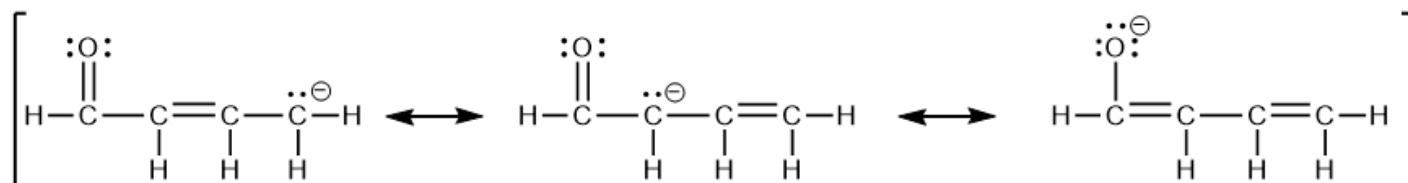
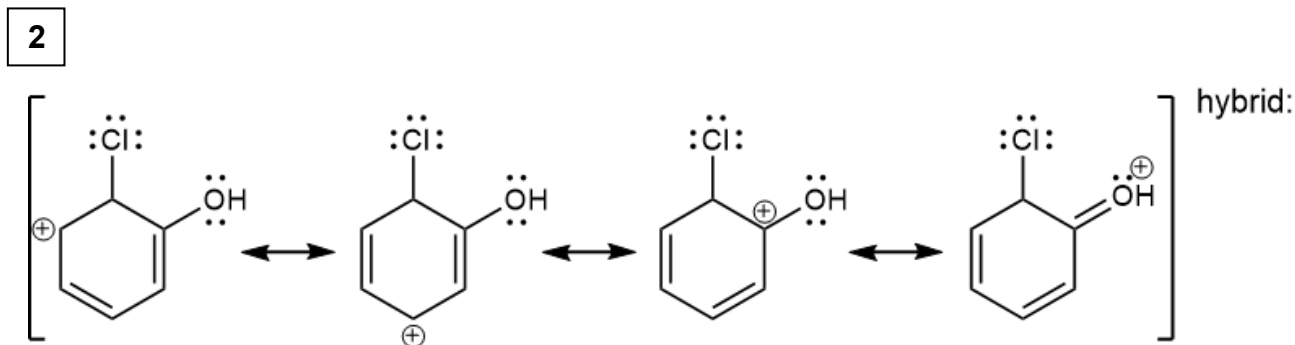




- 1 **Group work:** provide **curved arrows** to convert one resonance structure to the next, **rank** the given resonance forms (e.g., most important, least important, equal contributors, etc.), briefly **explain** the ranking, and draw the **resonance hybrid**.

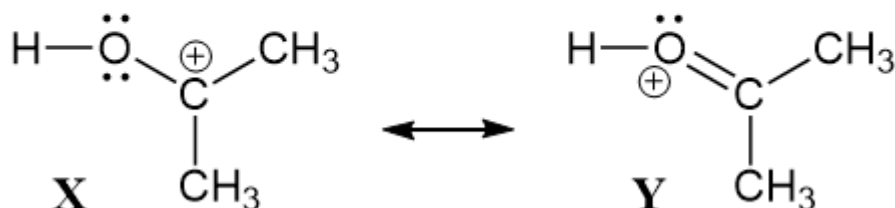


hybrid:

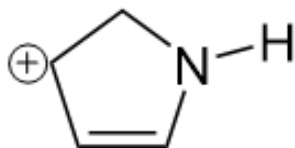


Try SkillBuilders 2.5, 2.6

- 3 Which resonance structure contributes more to the resonance hybrid? Explain briefly.



4 Draw resonance structures for the following cation.

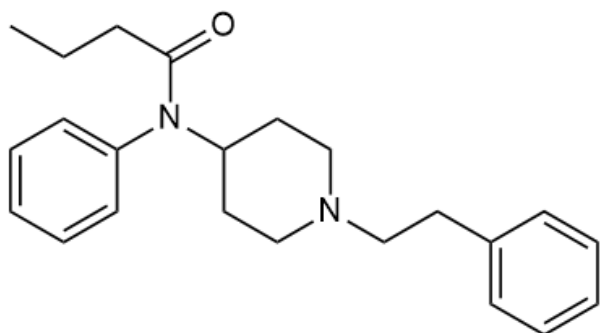


Hybridization and Resonance: Localized and Delocalized Lone Pairs (Klein 2.13)

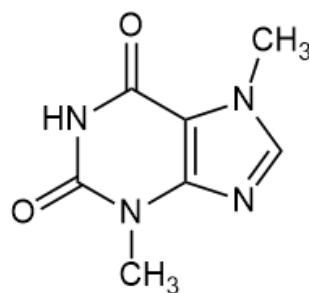
A lone pair that is involved in resonance is described as being _____ because it is spread out over multiple atoms.

A _____ lone pair is at a single location (not involved in resonance).

Group work: Add all missing lone pairs, and identify each as *localized (L)* or *delocalized (D)*.



Fentanyl - an addictive painkiller. This synthetic opioid is a leading cause of overdose deaths in U.S.



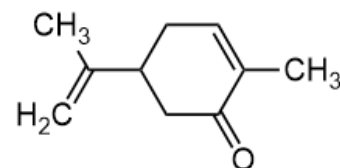
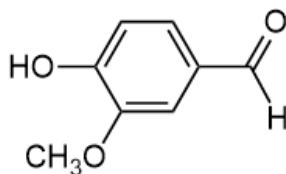
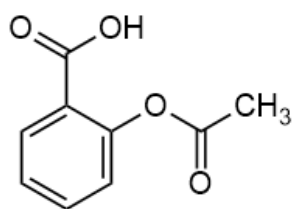
Theobromine - makes chocolate toxic to dogs

5

6

Group work: Use page 2-7 to identify the Functional Groups in fentanyl, aspirin, vanillin & carvone.

7



Aspirin - pain-reliever and fever reducer, a nonsteroidal anti-inflammatory drug (NSAID) that has been on the market since 1899

Vanillin - primary component of extracts of vanilla bean, used as artificial flavoring

Carvone - smells and tastes like either spearmint or caraway!

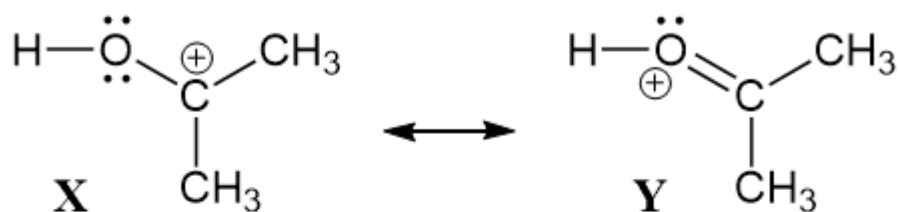
Try SkillBuilder 2.9

Note: "R" represents any carbon group.

	<u>Functional Group</u>	<u>Example</u>	<u>Abbreviation</u>	<u>Name</u>
CHM 3140	alkane	CH ₄	RH	methane
	alkyl halide	CH ₃ Cl	RX or RCl	chloromethane (methyl chloride)
	alkene	H ₂ C=CH ₂	R ₂ CCR ₂	ethene (ethylene)
	alkyne	HC≡CH	RCCR	ethyne (acetylene)
CHM 3150	alcohol	CH ₃ OH	ROH	methanol (methyl alcohol)
	ether	CH ₃ OCH ₃	ROR or R ₂ O	methoxymethane (dimethyl ether)
	amine	CH ₃ NH ₂	R ₃ N	methanamine (methyl amine)
	aldehyde	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-H	RCHO	ethanal (acetaldehyde)
	ketone	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-CH ₃	RCOR or R ₂ CO	2-propanone (acetone)
	carboxylic acid	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-OH	RCO ₂ H	ethanoic acid (acetic acid)
	acid chloride (acyl halide)	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-Cl	RCOCl	ethanoyl chloride (acetyl chloride)
	ester	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-OCH ₃	RCO ₂ R	methyl ethanoate (methyl acetate)
	amide	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-NH ₂	RCONR ₂	ethanamide (acetamide)
	anhydride	CH ₃ - $\overset{\text{O}}{\parallel}$ -C-O- $\overset{\text{O}}{\parallel}$ -C-CH ₃	RCO ₂ COR or (RCO) ₂ O	ethanoic anhydride (acetic anhydride)
	nitrile	CH ₃ CN	RCN	ethanenitrile (acetonitrile)
	aromatic		ArH	benzene

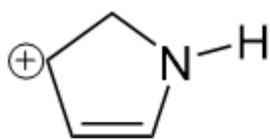
3

Which resonance structure contributes more to the resonance hybrid? Explain briefly.

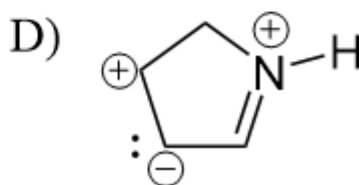
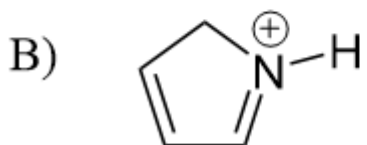
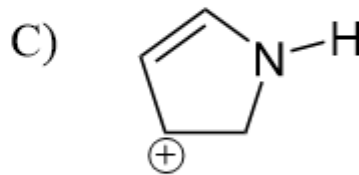
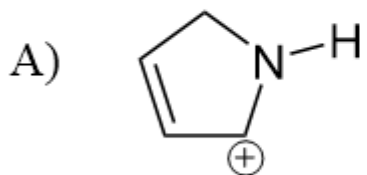


- A) **X** because carbon better handles positive charge (C less electronegative)
- B) **Y** because oxygen better handles positive charge (O more electronegative)
- C) **Y** because oxygen better handles positive charge (O is larger).
- D) **X** because **Y** is missing an octet.
- E) **Y** because **X** is missing an octet.

4

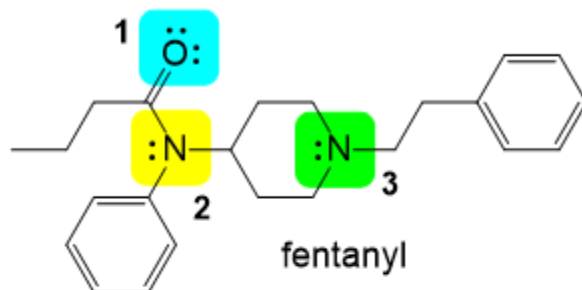


Which of the following is NOT a resonance form of the compound given above?



5

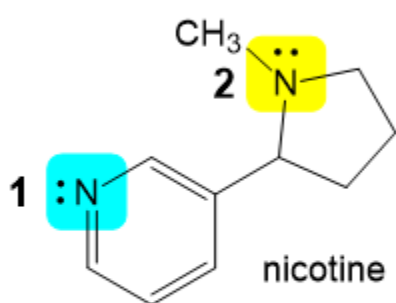
Identify each of the lone pairs in fentanyl as localized or delocalized.



	1	2	3
A)	localized	delocalized	localized
B)	delocalized	localized	localized
C)	localized	delocalized	delocalized
D)	delocalized	delocalized	localized
E)	delocalized	delocalized	delocalized

6

Identify the orbital occupied by the lone pair on each of the indicated nitrogen atoms in nicotine.



	1	2
A)	p	sp^2
B)	p	sp^3
C)	sp^2	sp^3
D)	sp^2	sp^2
E)	sp^2	p