

# KEY

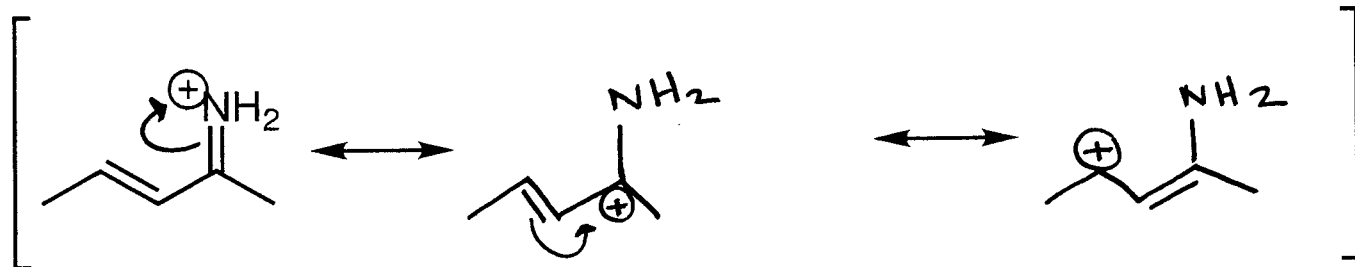
## Problem Set II

## Resonance & Orbitals

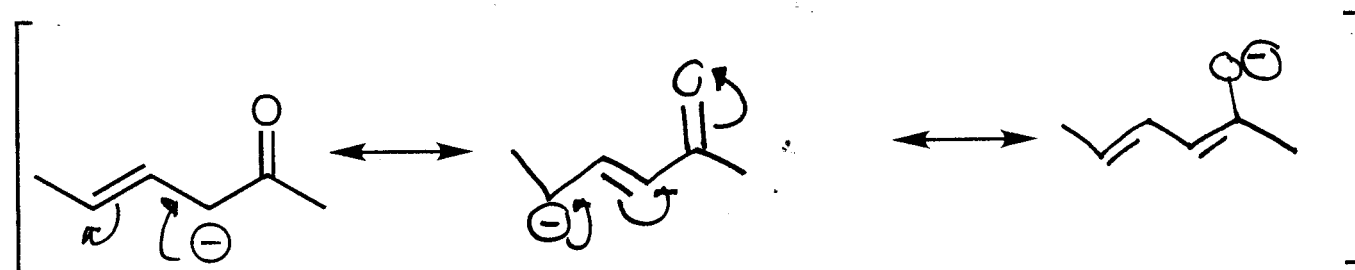
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1. Draw two more REASONABLE resonance structures.

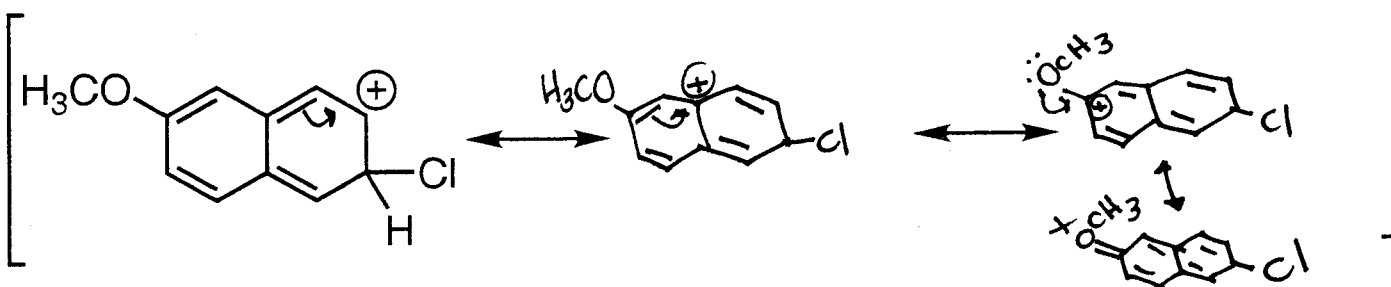
(a)



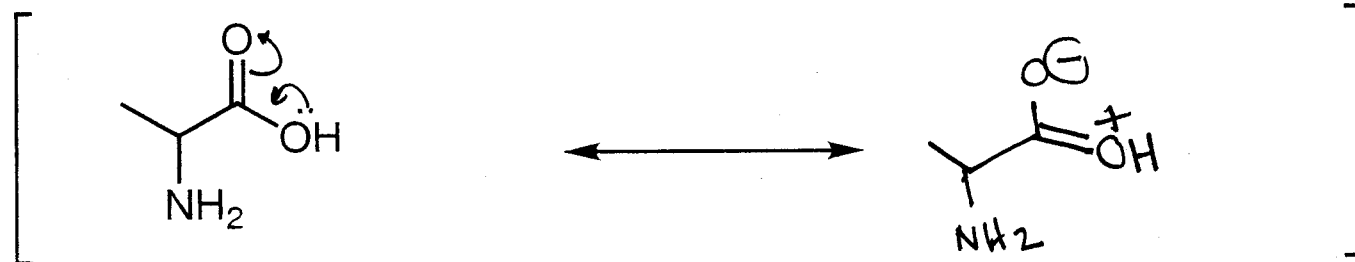
(b)



(c)

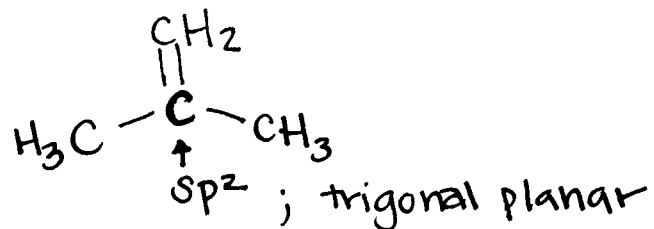


(d)

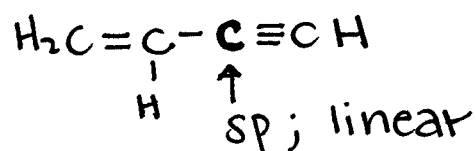


2. Describe the hybridization and the geometry of each bold atom in the following molecules:

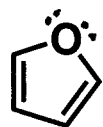
(a) 2-methyl propene,  $(\text{CH}_3)_2\text{C}=\text{CH}_2$



(b) 1-buten-3-yne,  $\text{H}_2\text{C}=\text{C}-\text{C}\equiv\text{CH}$

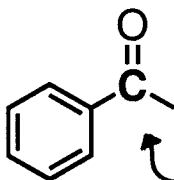


(c) furan,



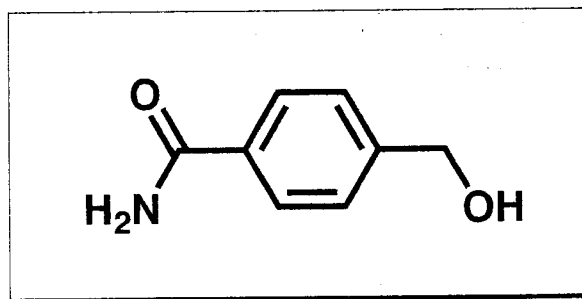
$sp^3$ ; trigonal center, (geometry)  
bent shape

(f) acetophenone,

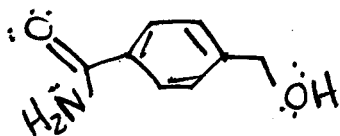


$sp^2$ ; trigonal planar

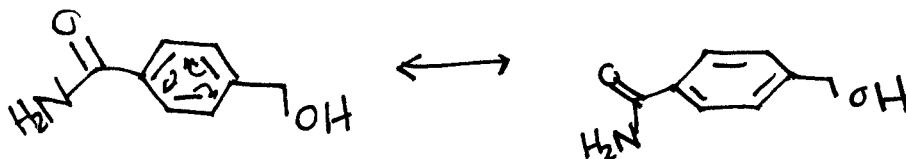
### 3. A combined problem



(a) Complete the structure by adding all lone pairs and formal charges.



(b) Draw THE MOST IMPORTANT resonance contributor.



(c) The hybridization of the carbonyl carbon is  $sp^2$ .

(d) The hybridization of the carbonyl oxygen is  $sp^2$ .

(e) The hybridization of the alcohol oxygen is  $sp^3$ .

(f) How many  $sp^2$  hybridized atoms are in the above molecule (as drawn)? 8

(g) How many lone pairs? 5

(h) The O-C-C(hydroxy group) bond angle is (circle one):  
 $109.5^\circ$  ,  $< 109.5^\circ$  ,  $> 109.5^\circ$

(i) How many pi bonds are present? 4

(j) Sketch a diagram of the orbitals that overlap to form the carbonyl group.

