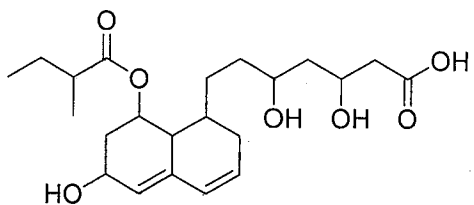


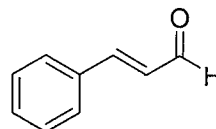
1) Indicate which functional groups are present in each of these molecules by writing the appropriate letters in the box below each molecule. (14 pts)

|   |         |   |                 |   |               |
|---|---------|---|-----------------|---|---------------|
| A | Alkene  | F | Aldehyde        | L | Anhydride     |
| B | Alkyne  | G | Ketone          | M | Acid halide   |
| C | Alcohol | H | Carboxylic acid | N | Amine         |
| D | Ether   | J | Ester           | O | Nitrile       |
| E | Epoxide | K | Amide           | P | Aromatic ring |



**Pravastatin**  
Cholesterol-lowering drug

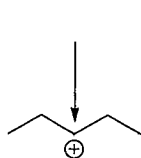
A C H J



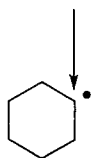
**3-Phenylprop-2-enal**  
Flavoring compound isolated from  
cinnamon tree bark

A F P

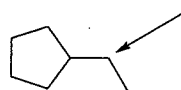
2) How many hydrogen atoms are attached to each of the indicated carbons? Write your answer in the box under each structure. All charges are shown. (8 pts)



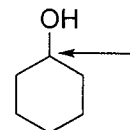
1



1

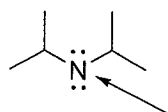


2

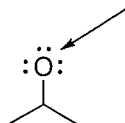


1

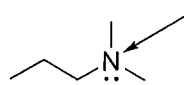
3) Calculate the formal charge for each of the indicated atoms. All lone pairs are shown. Write your answer in the box under each structure. (3 pts)



-1

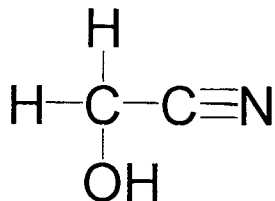


-1

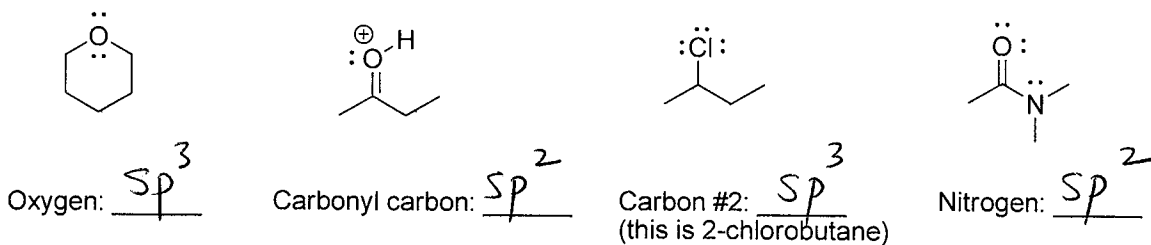


0

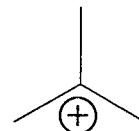
- 4) Identify the two orbitals that overlap to form each of the indicated bonds in the structure shown. All atoms in the structure are neutral, but lone pairs are not shown (you will have to draw them in). (16 pts)



- C-N  $\sigma$       Sp on C and Sp on N  
 C-O  $\sigma$       Sp<sup>3</sup> on C and Sp<sup>3</sup> on O  
 C-C  $\sigma$       Sp<sup>3</sup> on left C and Sp on right C  
 C-N  $\pi$  (either)      p on C and p on N
- 5) Choose the best description of the hybridization of each of the indicated atoms. Choices are  $sp$ ,  $sp^2$ ,  $sp^3$ . (4 pts)

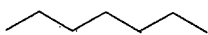


- 6) The carbon with the positive charge has four valence shell orbitals (just like all carbons). Complete the table by writing how many of each type of valence orbital there are on this carbon. If there are no orbitals of a particular type on that carbon, write "0" (zero). (5 pts)

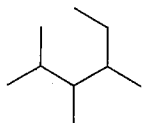


| Orbital type | s | p | sp | sp <sup>2</sup> | sp <sup>3</sup> |
|--------------|---|---|----|-----------------|-----------------|
| How many?    | 0 | 1 | 0  | 3               | 0               |

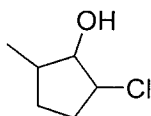
- 7) Provide acceptable IUPAC (systematic) names for each of the following molecules (15 pts).



heptane



2,3,4-trimethylhexane



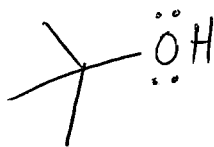
2-chloro-5-methylcyclopentanol

- 8) Draw the requested molecules in the boxes provided and circle the correct choice underneath each name to classify the compound. (10 pts)

**Tert-butyl alcohol**

Classify this alcohol  
(circle one):

1°    2°    3°



**Isopropyl chloride**

Classify this alkyl halide  
(circle one):

1°    2°    3°

