

1. A compound has the molecular formula $C_4H_{10}O_2$. Which functional groups could be present? Provide one example for each positive answer. Briefly explain the negative answers.

amide:

ether:

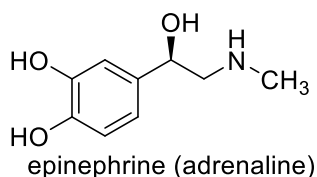
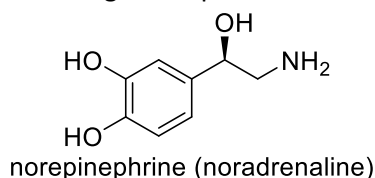
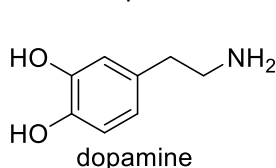
carboxylic acid:

alcohol:

carboxylic ester:

benzene:

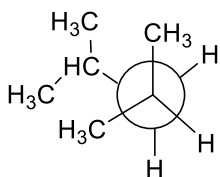
2. Catecholamines are an important class of neuroactive molecules. Three members of the group are shown below. Propose four different intermolecular forces that might allow catecholamines to interact with their protein neuroreceptor and elicit their biological response. Please be as precise as possible.



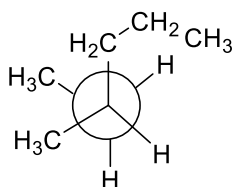
3. Draw the Newman projection for the highest and lowest energy conformation of the C-2/C-3 bond of 2-methylbutane. Name these conformations using the conventions we discussed in class.

4. Convert the following Newman projections into condensed or skeletal structures and name them.

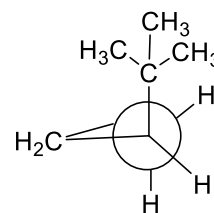
a)



b)



c)



5. Another stereoelectronic effect (i.e. an effect involving electrons and their orientation in space) that is related to hyperconjugation in alkanes is called the gauche effect. The following question explores the gauche effect.

a) Draw the anti staggered Newman projection for the structure, $\text{CH}_3\text{OCH}_2\text{Cl}$, as viewed down the $\text{O}-\text{CH}_2$ bond. Put the O atom in the front of the Newman projection. Incorporate lone pairs where necessary.

b) In actuality, the favored conformation is gauche staggered. Draw a gauche conformation of $\text{CH}_3\text{OCH}_2\text{Cl}$, as viewed down the $\text{O}-\text{CH}_2$ bond.

c) Hyperconjugation is advanced as a reason for the lower energy gauche conformation. Suggest a hyperconjugation effect that could lead to stabilization of the gauche conformation. (*Caution: SCARY problem!!*)