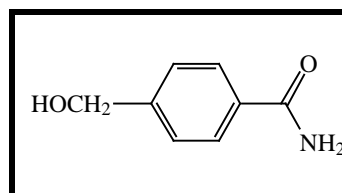
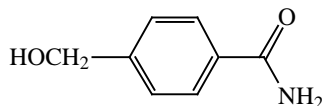


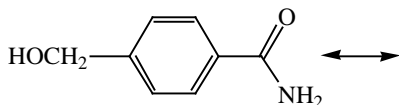
The questions on this page refer to this molecule:



1. (3 point) Circle and label three functional groups on the structure above.
2. (2 points) Complete the structure by adding all lone pairs and formal charges.

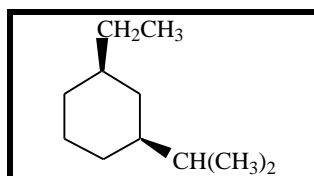


3. (2 points) Draw another very important resonance contributor.



4. (6 points) Supply no more than six words per blank to best complete these statements.
 - (a) A covalent bond is formed by _____ and _____.
 - (b) The hybridization of the carbonyl carbon atom is _____.
 - (c) The O-C-C bond angle is _____. *Refers to the single-bonded oxygen.*
 - (d) The most electron deficient atom in the given molecule is _____.
5. (8 points) Sketch a picture that shows how the orbitals of individual atoms contribute to the bonding and electronic structure of the carbonyl group.

The questions on this page refer to this molecule:

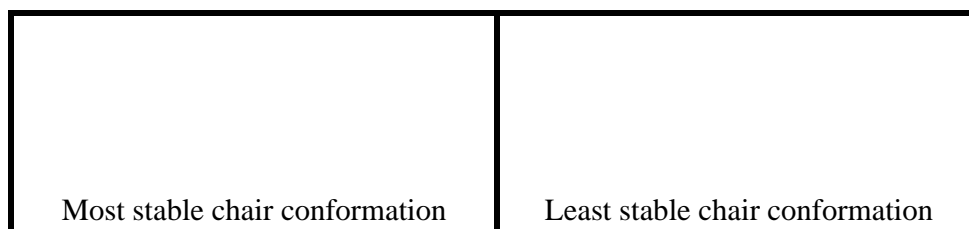


6. (1 points) What is the single most important factor that influences the conformation of *any* molecule?
7. (6 points) Suggest two distinctly different reasons why cyclohexane adopts a chair conformation instead of a flat conformation.

Reason #1:

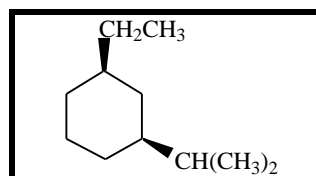
Reason #2:

8. (6 points) Very briefly (2 – 3 sentences) describe why the size of a group influences its preference for an axial or equatorial position. A drawing may clarify your answer, but it is not required.
9. (6 points) Draw the two chair conformations of the given molecule in the boxes.

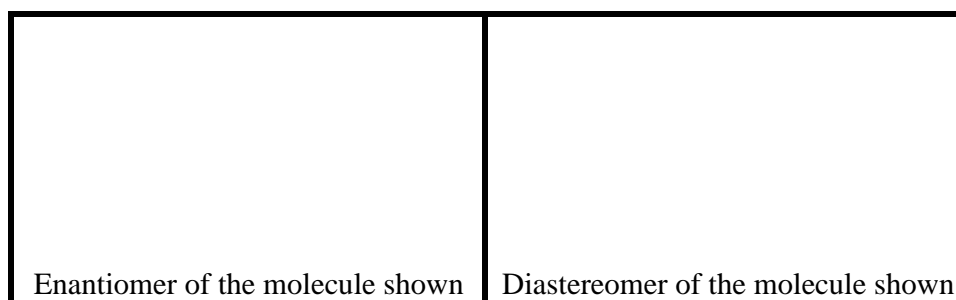


10. (6 points) Draw a Newman projection of the most stable conformation along the carbon-carbon bond that joins the ring and $\text{CH}(\text{CH}_3)_2$ groups. Put the $\text{CH}(\text{CH}_3)_2$ group in front. You may abbreviate the ring as “ring.”

The questions on this page refer to this molecule:



11. (3 points) Circle the best answer in each case.
- (a) The molecule is: Cis Trans Cannot determine
- (b) The stereocenter bearing the CH(CH₃)₂ group is: R S Cannot determine
- (c) The molecule is: Optically active Optically inactive Cannot determine
12. (2 points) In one sentence or less describe the meaning of the wedged lines in the given molecule.
13. (6 points) Draw the appropriate structures in the boxes.

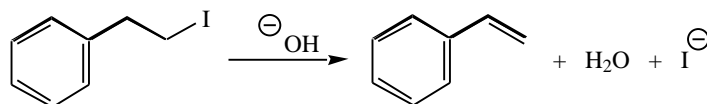


14. (3 points) By adding, subtracting or otherwise changing at most three atoms change the structure of the given molecule to make it achiral.
15. (6 points) Very briefly explain why we bother to study stereochemistry. An answer such as "It is necessary to pass the course" will receive zero credit.

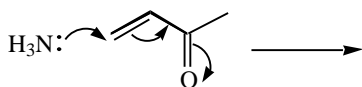
16. (3 points) Draw a molecule that has exactly four carbons, but obviously more strain than cyclopropane.

17. (2 points) What is the single most important feature that influences the basicity of *any* molecule?

18. (3 points) Add curved arrows to show how the following mechanism step occurs.



19. (2 points) Based on the curved arrows shown draw the product(s) of this mechanism step.



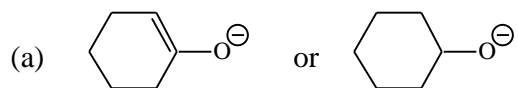
20. (9 points) Briefly but clearly define each term.

Resonance:

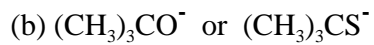
Strain:

Stereoisomers:

21. (10 points) For each pair of molecules, circle the strongest base and briefly explain your answer using no more than three sentences.

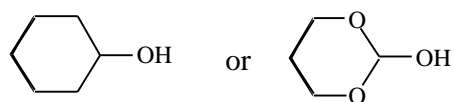


Explanation:



Explanation:

22. (5 points) Circle the most acidic molecule and briefly explain your reasoning using no more than three sentences.



Explanation: