

Chem 331, Spring 2006

William Jenks

Name _____

PLEASE ALSO WRITE YOUR NAME ON THE TOP OF THE BACK OF YOUR EXAM

Please check off which recitation section you are registered for:

_____ Monday, 2:10 p.m.

_____ Tuesday, 9:00 a.m.

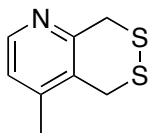
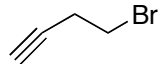
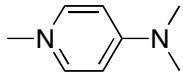
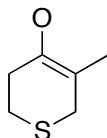
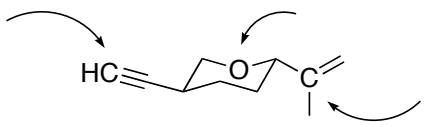

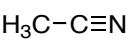

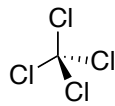
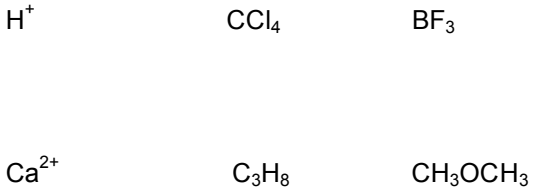
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MIDTERM 1
1 February, 2006

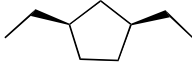
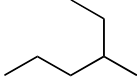
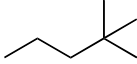
| Problem (max score) | Score |
|---------------------|-------|
| I (30) | |
| II (14) | |
| III (18) | |
| IV (12) | |
| V (10) | |
| VI (12) | |
| VII (6) | |
| Total (102) | |

I. 30 points. Short answers

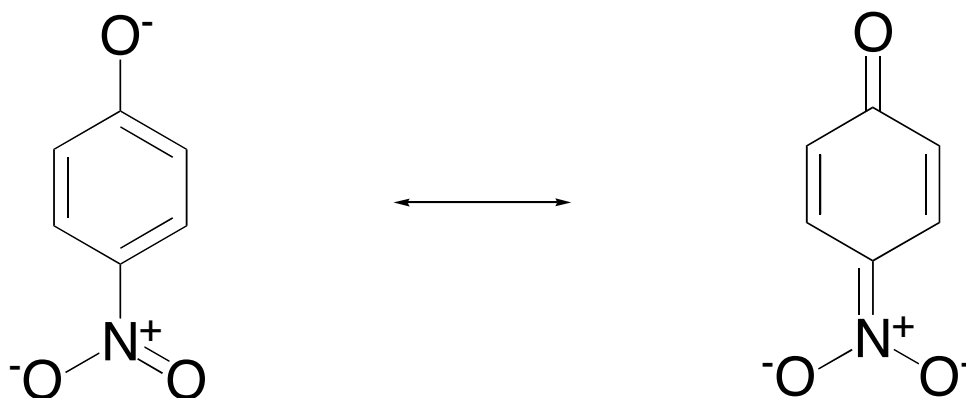
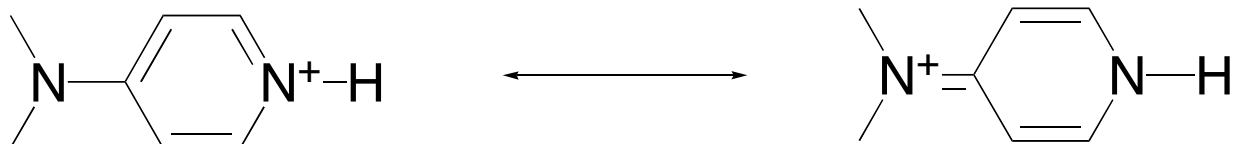
| | |
|--|--|
| <p>3 pts. Give the molecular formula (e.g., C₆H₁₂O₆)</p>  | <p>3 pts. Give the molecular formula</p>  |
| <p>3 pts. Place the formal charge on this cation:</p>  | <p>3 pts. Place the formal charge on this anion</p>  |
| <p>6 pts. Indicate the hybridization (sp, sp², or sp³) at the indicated atoms:</p>  | <p>6 pts. Using the standard dipole symbol indicated, draw the direction of the molecular dipole for these molecules. If there no molecular dipole, circle the molecule.</p>  <p>    </p> |
| <p>3 pts. Sketch 1,2-dibromoethane in a gauche conformation, using a Newman projection along the two carbon atoms.</p> | <p>3 pts. Circle all the compounds that are Lewis acids</p> <p>  </p> |

II. 14 points. There are 7 "constitutional" isomers of C_7H_{16} . Draw them all, using "skeleton structures".

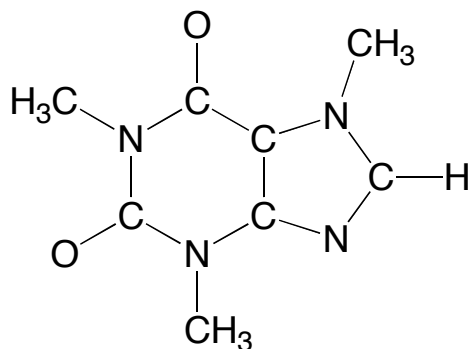
III. Nomenclature (18 points, 3 each). Provide a correct name for the following compounds or draw the corresponding compound, as appropriate.

| | |
|---------------------------|--|
| 1,1,2-triethylcyclohexane |  |
| 3-bromooctane |  |
| 2-cyclobutylheptane |  |

- IV. 12 points. For each pair of resonance forms, draw "curvy arrows" on the left-side structure that show how the electrons move to get to the right-side structure. You will also need to draw in the appropriate lone pairs.

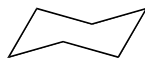


- V. 10 points. Complete the Lewis structure for caffeine, which is illustrated below. *None of the atoms should have a formal charge.* Draw in the appropriate double bonds AND lone pairs. (You do not have to do anything to the CH_3 groups, which I have abbreviated for clarity.)

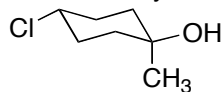


VI. 12 points. Use the cyclohexane templates to answer the following questions.

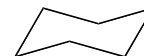
3 pts. Draw the lowest energy conformation of bromocyclohexane



3 pts. Draw the ring-flipped conformation of the following substituted cyclohexane

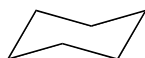


Draw ring-flipped conformer:

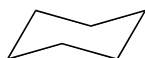


6 pts. Draw the lowest energy conformation (or either one if they are the same) for *cis*-1,3-dimethylcyclohexane and also for *trans*-1,3-dimethylcyclohexane

cis:



trans:



Circle the lower energy isomer (*cis* or *trans*)

VII. 6 points. Draw an isomer of $C_{10}H_{18}$ that

a) has only sp^3 -hybridized carbons

b) has at least one carbon with sp^2 hybridization

c) has at least one carbon with sp hybridization

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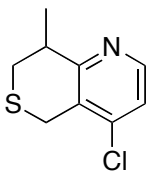
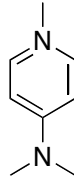
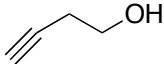
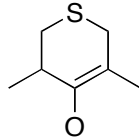
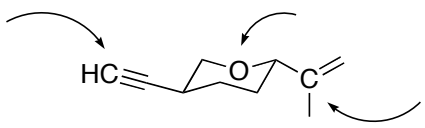

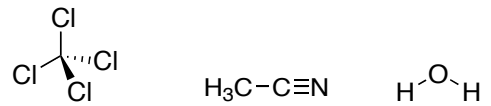
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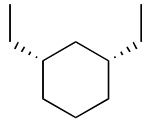
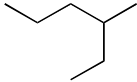
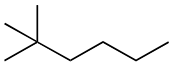
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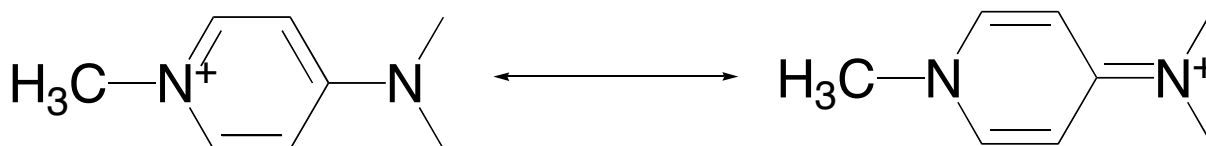
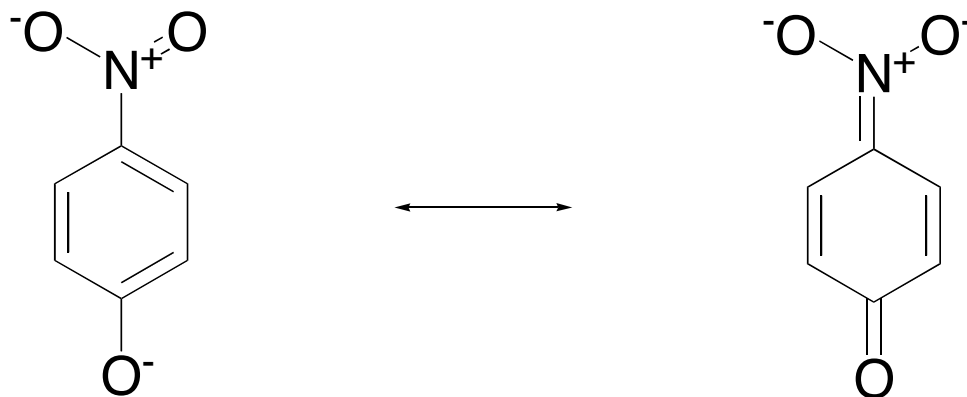
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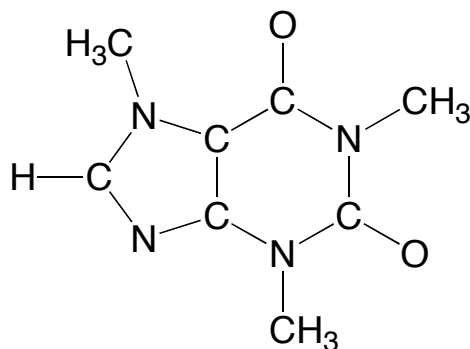
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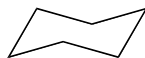


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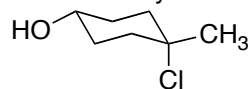


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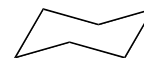
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Circle the lower energy isomer (*cis* or *trans*)

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