Chemistry 218, Problem Set 4


Recommended problems from the text: 12.18, 12.20-12.21, 12.25, 12.35 (f, i), 12.41 (a, b, c, f), 12.42-12.45, 12.47-12.48, 12.60, 16.1-16.2, 16.3-16.7 (review), 16.8, 16.16-16.22, 16.26, 16.30-16.31, 16.43-16.54.

1. Fill in the products which form when the reactants (vertical row) are treated with the reagents (horizontal row). Indicate relevant stereochemistry in the product. Draw the mechanism for each reaction.

<table>
<thead>
<tr>
<th></th>
<th>OsO₄</th>
<th>O₃; Me₂S</th>
<th>9-BBN; H₂O₂, NaOH</th>
<th>mCPBA</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="" alt="Chemical Structure" /></td>
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</tbody>
</table>

2. Show how you can make the following compounds from any alkene that only contains carbons and hydrogens. All reactions can be performed in a single step.

(a) ![Chemical Structure](attachment:structure6.png)  
(b) ![Chemical Structure](attachment:structure7.png)  
(c) ![Chemical Structure](attachment:structure8.png)  
(d) ![Chemical Structure](attachment:structure9.png)

3. Draw the molecular orbitals and fill in the electrons for the following molecule:

![Molecular Orbital](attachment:orbital.png)
4. Determine which of the following compounds are conjugated. If a compound is conjugated, sketch the \( \pi \)-molecular orbitals and fill in the orbitals with the appropriate number of electrons.

(a) \[ \text{ } \]
(b) \[ \text{ } \]
(c) \[ \text{ } \]
(d) \[ \text{ } \]
(e) \[ \text{ } \]
(f) \[ \text{ } \]
(g) \[ \text{ } \]
(h) \[ \text{ } \]

5. Give the Diels-Alder product(s) of the following reactions. Keep in mind you may have to do a bond rotation first.

(a) \[ \text{ } \]
(b) \[ \text{ } \]
(c) \[ \text{ } \]
(d) \[ \text{ } \]
(e) \[ \text{ } \]
(f) \[ \text{ } \]

6. Choose the appropriate diene and dienophile to prepare the following compounds:

(a) \[ \text{ } \]
(b) \[ \text{ } \]
(c) \[ \text{ } \]
7. The following are Diels-Alder reactions which have appeared in the literature. Predict the products for each one.

(a) A hetero-Diels-Alder reaction, where an aldehyde is the dienophile:

(b) An intramolecular Diels-Alder reaction, where the diene and dienophile are attached:

(c) An intramolecular hetero-Diels-Alder reaction:

(d) A Diels-Alder reaction using an alkyne as the dienophile: