Multiple Choice

1. Suggest a method for performing the conversion of cyclopentane to 3-bromocyclopentene. Text 13.19

   ![Conversion Diagram]

   \[ \text{Br}_2 \xrightarrow{\text{hv}} \text{NBS} \xrightarrow{\Theta \text{OC(CH}_3)_3} \text{Br} \]

2. Arrange the following dienes in order of increasing reactivity in the Diels-Alder reaction. Text 13.36

   ![Diene Diagram]

   \[ \text{A} \xrightarrow{\text{i}} \text{B} \xrightarrow{\text{i}} \text{C} \xrightarrow{\text{i}} \text{D} \xrightarrow{\text{i}} \text{E} \xrightarrow{\text{i}} \text{F} \]

3. Choose the diene and dienophile that would give the following Diels-Alder product. (WS2 pt2; q2)

   ![Product Diagram]

   \[ \text{A} \text{i} + \text{ii} \quad \text{B} \text{ii} + \text{iii} \quad \text{C} \text{ii} + \text{iv} \quad \text{D} \text{i} + \text{v} \quad \text{E} \text{ii} + \text{v} \quad \text{F} \text{iii} + \text{iv} \]
4. Arrange the following compounds in order of increasing $S_{N}1$ reactivity. Hint: consider Huckel's rule

Text 14.27

5. Choose the mono bromonaphthlene that would be predicted not to be a major product of the bromination of $\beta$-naphthol. (hint: examine the relative stabilities of the intermediates) class quiz

6. Select the carbon atom that is most reactive in bromination with NBS. Hint: the weakest C-H bond. class quiz
7. Below are the four molecular orbitals of a diene and the two molecular orbitals of a dienophile. Choose the HOMO-LUMO interaction that is important in the Diels-Alder reaction. class quiz

<table>
<thead>
<tr>
<th>diene</th>
<th>dienophile</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Psi_4$</td>
<td>$\pi^*$</td>
<td>$\Psi_1$ and $\pi$</td>
<td>$\Psi_1$ and $\pi^*$</td>
<td>$\Psi_2$ and $\pi$</td>
<td>$\Psi_2$ and $\pi^*$</td>
<td>$\Psi_3$ and $\pi^*$</td>
<td>$\Psi_4$ and $\pi^*$</td>
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<td>$\Psi_3$</td>
<td>$\pi$</td>
<td>$\Psi_1$ and $\pi$</td>
<td>$\Psi_1$ and $\pi^*$</td>
<td>$\Psi_2$ and $\pi$</td>
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<td>$\Psi_2$</td>
<td>$\pi$</td>
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<tr>
<td>$\Psi_1$</td>
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</tbody>
</table>

8. Select the molecular orbital that represents the highest occupied molecular orbital of pentadienyl anion. (WS2 online quiz; q7)

pentadienyl anion

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
</table>

9. Choose the major product of the following reaction. (WS4 online quiz; q7)

$$\text{Cl}_2 \xrightarrow{\text{FeCl}_3} ? \stackrel{\text{Cl}}{\text{O}}$$

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
</table>
10. Choose the order that has the following compounds correctly arranged with respect to increasing wavelength of the lowest energy electronic absorption (light). class quiz

11. Give the structure of the major product of the following reaction. HINT: D is the symbol for deuterium, an isotope of hydrogen which shows the same reactivity as hydrogen in this reaction. (WS3 online quiz; q10) 5 pts

12. Nicotine is a biologically active alkaloid found in tobacco. The pKₐ values for the two nitrogen atoms are 8.0 and 3.12. Give the structure of the predominant species of nicotine present at pH = 5.0. class quiz 5 pts

13. Predict the major product of the following reaction. Text 15.24 5 pts

14. Predict the product of the following intramolecular Diels Alder reaction. 5 pts
15. Using the curved arrow formalism show the bond making and bond breaking that occurs in the following transformation. Other structures may be required for a good answer. class quiz 10 pts

\[
\begin{align*}
\text{Ar} & \quad + \quad \text{Cl} & \quad \text{AlCl}_3 & \quad \text{PhCHCH}_3 \\
& & & \\
\text{苯} & \quad + \quad \text{Cl} & \quad \text{AlCl}_3 & \quad \text{苯乙烯}
\end{align*}
\]

16. Give reagents that could be used to transform benzene into 1-chloro-3-propylbenzene (the number of arrows do not necessarily correspond to the number of required steps, but more than one step will be necessary. Your answer only needs to show the reagents). (WS4 online quiz; q8) 10 pts

\[
\begin{align*}
\text{Ar} & \quad \text{Cl} & \quad \text{苯乙烯}
\end{align*}
\]

17. Give a good synthesis of the following compound from benzene and compounds containing four carbon atoms or less. class quiz 10 pts

\[
\begin{align*}
\text{PhCHCH}_3 & \quad \text{PhCHCH}_3 & \quad \text{OH}
\end{align*}
\]