Multiple Choice

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

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

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

3. Choose the diene and dienophile that would give the following Diels-Alder product. (WS2 pt2; q2)
4. Arrange the following compounds in order of *increasing* $S_N1$ reactivity. Hint: consider Hückel’s rule

Text 14.27

5. Choose the mono bromonaphthalene 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

\[
\begin{array}{ccc}
\psi_4 & \psi_3 & \psi_2 & \psi_1 \\
\_ & \_ & \_ & \_ \\
\pi^* & \pi & \pi & \\
\end{array}
\]

A \ \psi_1 \text{ and } \pi \\
B \ \psi_1 \text{ and } \pi^* \\
C \ \psi_2 \text{ and } \pi \\
D \ \psi_2 \text{ and } \pi^* \\
E \ \psi_3 \text{ and } \pi^* \\
F \ \psi_4 \text{ and } \pi^*

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

\[
\text{pentadienyl anion}
\]

A  B  C  D  E  F

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

\[
\text{O} \quad \text{Cl}_2 \quad \text{FeCl}_3 \quad ? \quad \text{Cl} \quad \text{A} \quad \text{B} \quad \text{C} \quad \text{D} \quad \text{E} \quad \text{F}
\]
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

\[
\text{\ce{\text{CH2=CH2}}} \quad \text{\ce{\text{CH2=CH=O}}} \quad \text{\ce{\text{CH2=CH2}}} \quad \text{i} \quad \text{ii} \quad \text{iii}
\]

\[
\begin{align*}
\text{A} & \quad \text{increasing wavelength} \\
\text{B} & \quad \text{increasing wavelength} \\
\text{C} & \quad \text{increasing wavelength} \\
\text{D} & \quad \text{increasing wavelength} \\
\text{E} & \quad \text{increasing wavelength} \\
\text{F} & \quad \text{increasing wavelength}
\end{align*}
\]

Short Answer

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

\[
\begin{align*}
\text{\ce{\text{CH2=CH2}}} & \quad \text{D-Cl} \\
& \quad \text{high temperature} \\
& \quad \text{\ce{\text{CH2=CH-Cl}}} \quad \text{D}
\end{align*}
\]

12. Nicotine is a biologically active alkaloid found in tobacco. The \( pK_a \) values for the two nitrogen atoms are 8.0 and 3.12.

Give the structure of the predominant species of nicotine present at \( \text{pH} = 5.0 \). class quiz 5 pts

\[
\text{nicotine} \quad \text{H}^+ \quad \text{\ce{\text{N}}} + \text{CH}_{3}
\]

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

\[
\begin{align*}
\text{\ce{\text{C6H6}}} & \quad \text{+} \quad \text{\ce{\text{CH3Br}}} \\
& \quad \text{AlBr}_3 \\
& \quad \text{\ce{\text{C6H5Br}}}
\end{align*}
\]
14. Predict the product of the following intramolecular Diels Alder reaction. 5 pts

\[
\begin{array}{c}
\text{heat} \\
\text{product}
\end{array}
\]

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

\[
\begin{array}{c}
\text{AlCl}_4^- \\
\text{bond making} \\
\text{AlCl}_3 \\
\text{bond breaking}
\end{array}
\]

16. Give reagents that could be used to transform benzene into 1-bromo-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

\[
\begin{array}{c}
\text{Benzene} \\
\text{COCl} \\
\text{AlCl}_3 \\
\text{Cl}_2 \\
\text{CH}_3\text{Li} \\
\text{H}_3\text{O}^+ \\
\text{H-Br}
\end{array}
\]
17. Give a good synthesis of the following compound from benzene and compounds containing four carbon atoms or less. Class Quiz 10 pts