1. Draw the structure of the main product of the following reaction at low temperature:

\[ \text{H-Er} \]

2. Draw the structure of the main product of the same reaction in Question 1 at high temperature:

3. Draw the structure of the major product of the following reaction:

\[ \text{heat} \]

4. Draw the structure of the reactant(s) that would produce the following product:

\[ \text{Diels-Alder} \]

5. What are the diene and dienophile that would produce the following Diels-Alder product?

\[ \text{Diels-Alder} \]

- a. i + ii
- b. i + iii
- c. i + iv
- d. ii + iii
- e. ii + iv
6. What are the diene and dienophile that would produce the following Diels-Alder product? Draw the structures of the diene and dienophile in the same window using MarvinSketch, and then copy the SMILE to the space given below.

\[ ? + ? \rightarrow \]

7. Draw an energy level diagram of the five pi molecular orbitals of pentadienyl cation. Draw a sketch of each MO and indicate which energy levels contain electrons. Which diagram below represents the HOMO of pentadienyl cation?

a. a
b. b
c. c
d. d
e. e
8. Which diagram in Question 7 represents the LUMO of pentadienyl cation?

a. a
b. b
c. c
d. d
e. e

9. Which of the carbocations shown below would you expect to be the most stable?

\[ \text{a} \quad \text{b} \quad \text{c} \]

a. a
b. b
c. c

d. b < c < a
e. c < a < b

10. Predict the order of the following compounds with respect to increasing wavelength of their $\pi \rightarrow \pi^*$ absorptions in the UV-visible spectrum?

\[ \text{a} \quad \text{b} \quad \text{c} \]

a. a < b < c
b. a < c < b
c. b < a < c
d. b < c < a
e. c < a < b