Electrocyclization Practice

16.31 Circle each compound that has a conjugated \( \pi \) system:

![Chemical structures](image1)

16.40 Rank the following dienophiles (from least reactive to most reactive) in terms of reactivity in a Diels–Alder reaction:

![Chemical structures](image2)

16.42 Predict the products for each of the following Diels–Alder reactions:

(a) \( \text{Cyclohexene} + \text{HOOC-CH=CHCOOH} \)

(b) \( \text{Butadiene} + \text{CH=CHCO} \)

(c) \( \text{Ethylene} + \text{CH=CHCO} \)

(d) \( \text{Propadiene} + \text{HC=CN} \)
**16.35** Draw the major product expected when 1,3-butadiene is treated with one equivalent of HBr at 0°C, and show a mechanism of its formation.

**16.36** Draw the major product expected when 1,3-butadiene is treated with one equivalent of HBr at 40°C, and show a mechanism of its formation.

**16.46** Cyclopentadiene reacts very rapidly in Diels–Alder reactions. In contrast, 1,3-cyclohexadiene reacts more slowly and 1,3-cycloheptadiene is practically unreactive. Can you offer an explanation for this trend?