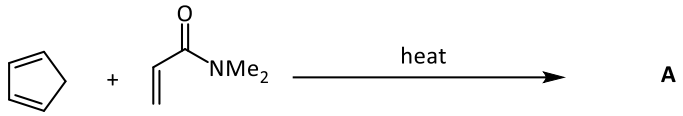
Pericyclic Chemistry – Take-Home Problems

All four parts carry equal weighting. You are only required to carry out a Woodward-Hoffmann analysis where stated explicitly in the question.

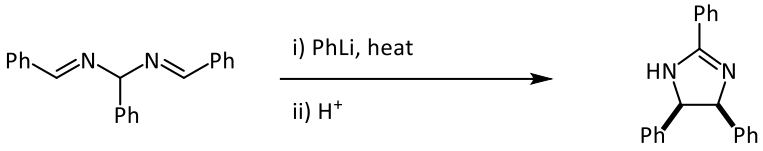
(1) Below is an example of a Diels-Alder reaction.



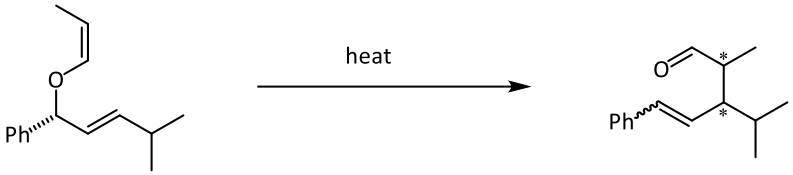
(i) Give a mechanism and predict the major product (**A**), explaining its stereochemistry.

(ii) Explain why the reaction proceeds more rapidly when the NMe_2 group is replaced by a CH_3 group. Justify your answer by considering the relevant frontier molecular orbitals.

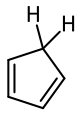
(2) For the following reaction give a mechanism and explain the stereochemical outcome using the Woodward-Hoffmann Rules.



(3) Give a mechanism for the Claisen rearrangement below. Use a suitable stereochemical model to determine the alkene geometry and stereochemistry at centres marked (*).



(4) Explain why the ^1H NMR spectrum of cyclopentadiene (**B**) contains only one peak at room temperature. Give a mechanism for the key pericyclic step, and show that the reaction is allowed by the Woodward-Hoffmann Rules.



B