

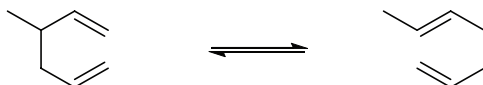
ACTIVITY 7A THE COPE REARRANGEMENT I

FOCUS QUESTION

What are the symmetry allowed products of the Cope Rearrangement?

MODEL 1

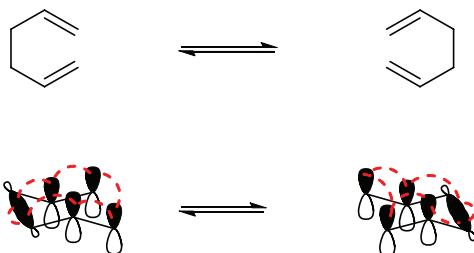
The Cope Rearrangement



1. Circle the bond in the reactant that is broken in this reaction.
2. Circle the bond in the product that is formed in this reaction.
3. Draw curved arrows to show electron flow in Model 1.
4. What is the order of this sigmatropic rearrangement?

MODEL 2

The Cope Rearrangement and Aromatic Transition State Theory



The dotted lines indicate orbital overlap in the transition state

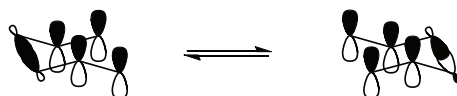
5. Draw arrows to indicate electron flow in the above reaction.
6. How many electrons are moving in this rearrangement?
7. Based on the dotted lines, is the transition state for the pathway Möbius or Hückel? Explain your reasoning.
8. Is this pathway symmetry allowed or symmetry forbidden?

9. Are the carbons involved in the breaking σ bond rotating in a conrotatory or disrotatory manner? How can you tell?
10. Are the carbons involved in the forming σ bond rotating in a conrotatory or disrotatory manner?
11. Summarize what you learned from Model 2 about the Cope Rearrangement by circling the correct words in the following sentence.

The Cope Rearrangement is (*symmetry allowed* or *symmetry forbidden*) when one σ bond forms in a (*conrotatory* or *disrotatory*) manner and the other σ bond breaks in a (*conrotatory* or *disrotatory*) manner.

MODEL 3

Another Possible Pathway for the Cope Rearrangement



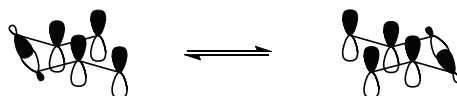
12. In Model 3, are the carbons involved in the breaking σ bond rotating in a conrotatory or disrotatory manner?
13. Are the carbons involved in the forming σ bond rotating in a conrotatory or disrotatory manner?
14. Draw dotted lines, like the dotted lines in Model 2, on the orbital diagrams in Model 3 to show orbital overlap in the transition state.
15. Draw in all nodes in Model 3. Is this transition state Möbius or Hückel?
16. Is this pathway allowed or forbidden?
17. Would your answer to 16 still apply if the type of rotation was switched for both the breaking σ bond and the forming σ bond? Explain your reasoning.

18. Summarize what you learned from Model 3 about the Cope Rearrangement by circling the correct words in the following sentence.

The Cope Rearrangement is (*symmetry allowed* or *symmetry forbidden*) when one σ bond breaks in a (*conrotatory* or *disrotatory*) manner and the other σ bond forms in a (*conrotatory* or *disrotatory*) manner.

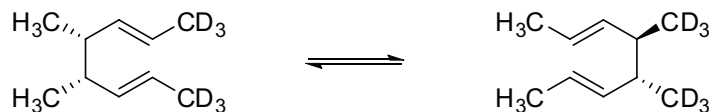
MODEL 4

A Third Possible Pathway for the Cope Rearrangement



19. In Model 4, are the carbons that are involved in the σ bond that is breaking, rotating in a conrotatory or disrotatory manner?
20. Are the carbons that are involved in the σ bond that is forming, rotating in a conrotatory or disrotatory manner?
21. Draw dotted lines on the orbital diagrams in Model 4 to show orbital overlap in the transition state.
22. Draw in all nodes in Model 4. Is this transition state Möbius or Hückel?
23. Is this pathway allowed or forbidden?
24. Based on Model 2, Model 3, and Model 4, complete the following sentence: The Cope Rearrangement is allowed when...
25. Based on Model 2, Model 3, and Model 4, complete the following sentence: The Cope Rearrangement is forbidden when...

26. Consider the following reaction:



a. Is the previous product one that would be formed in this Cope Rearrangement? Explain your reasoning.

b. If your answer to a is no, draw one of the products that **would** be formed.

REVISITING THE FOCUS QUESTION

What are the symmetry allowed products of the Cope Rearrangement?