

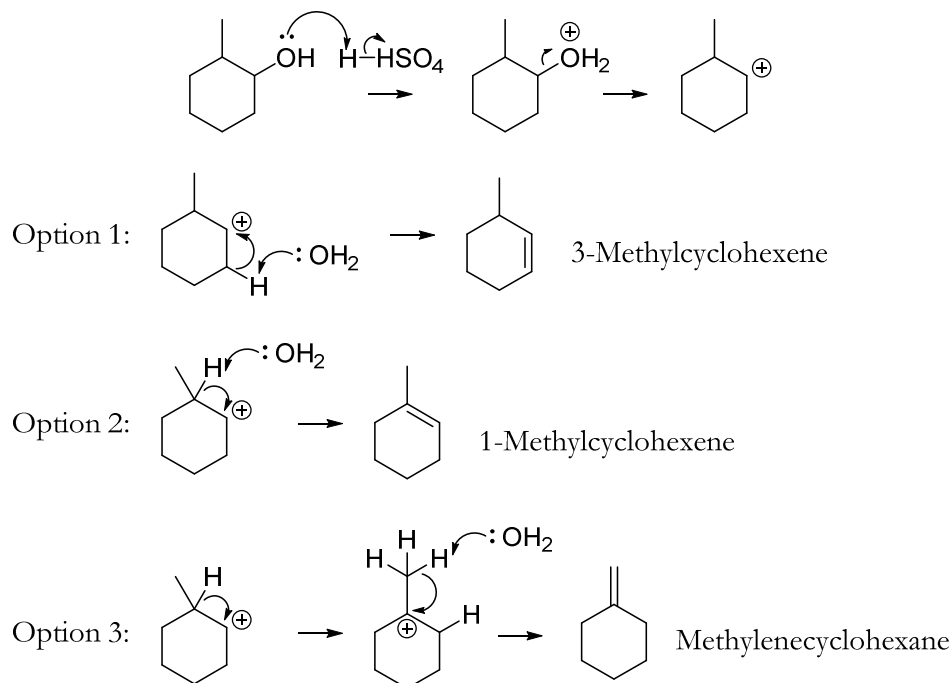
Experiment 12

Regiochemistry of Eliminations: Formation of a Cycloalkene Mixture

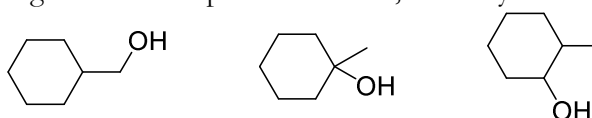
Study Questions

- 1) Show the mechanism for the formation of each of the three products expected in this experiment.

Answer:



- 2) Below are three alcohols. Which is dehydrated fastest and which slowest under reaction conditions similar to that given in the experiment above, and why?



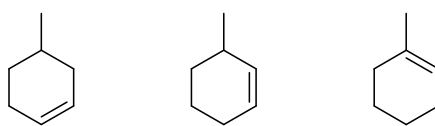
Answer: The rate is determined by carbocation stability. The first alcohol shown makes a primary carbocation, so it's the slowest. The second makes a tertiary carbocation, so it's the fastest. The third makes a secondary carbocation, so it's intermediate.

- 3) If you took the product mixture from this reaction and ran it through a gas chromatograph, what would you expect to see in terms of relative peak areas and retention times?

Answer: The boiling points of the products are 103°C for 3-methylcyclohexene, 110°C for 1-methylcyclohexene, and 103°C for methylenecyclohexane. Only two peaks should be visible since two of the products will overlap, but the second peak should be larger since 1-methylcyclohexene is the expected major product.

- 4) A student dehydrated 4-methylcyclohexanol with sulfuric acid. He found that the product mixture included three alkenes, shown below. Explain his results.

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Answer: The carbocation that forms initially can rearrange to give alkenes in multiple different locations.