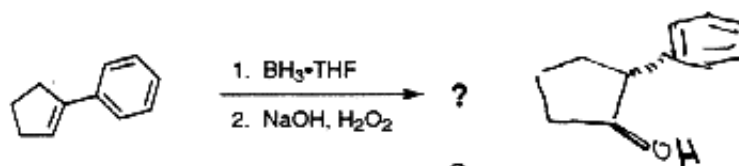
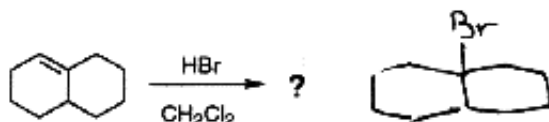


1. (40 points) Provide the missing starting materials, reagents, or products for the following reactions. Show only the major product. Carefully show the stereochemistry of each product if pertinent.

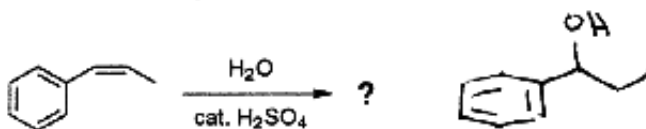
A.



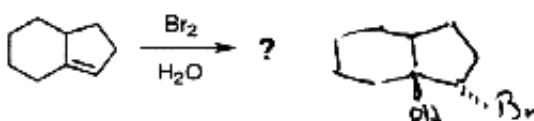
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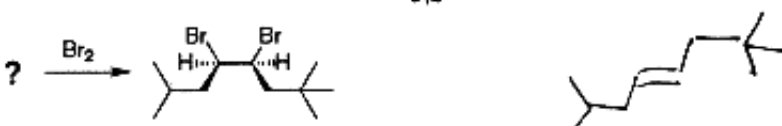
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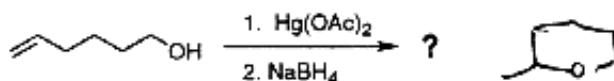
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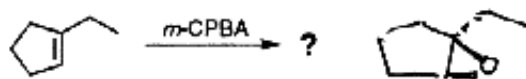
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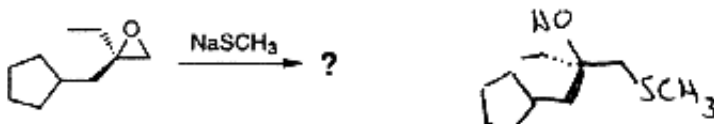
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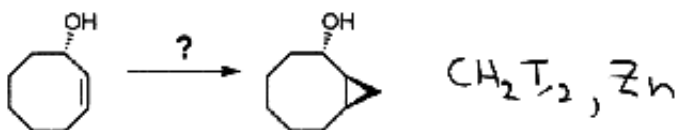
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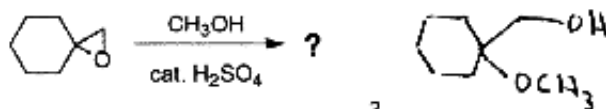
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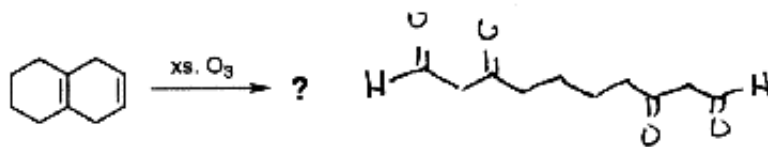
I.



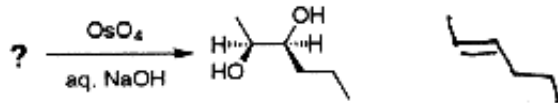
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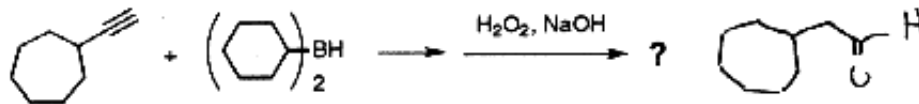
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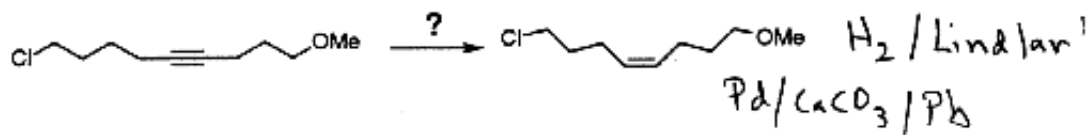
L.



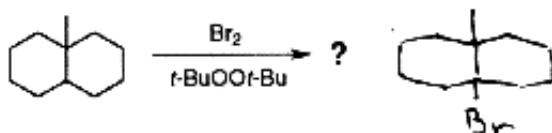
M.



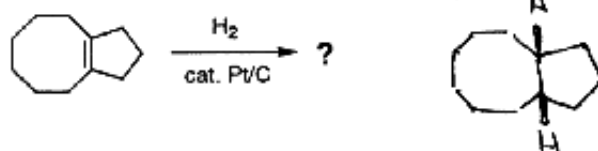
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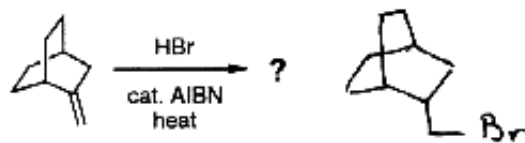
O.



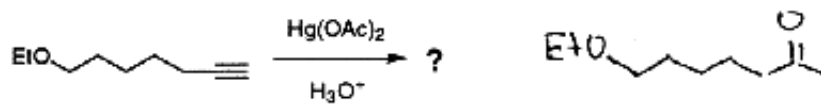
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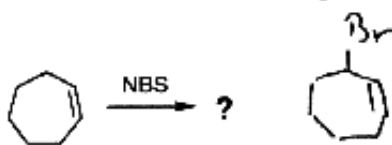
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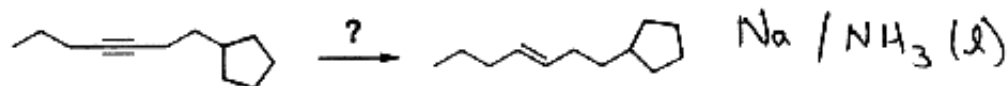
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S.

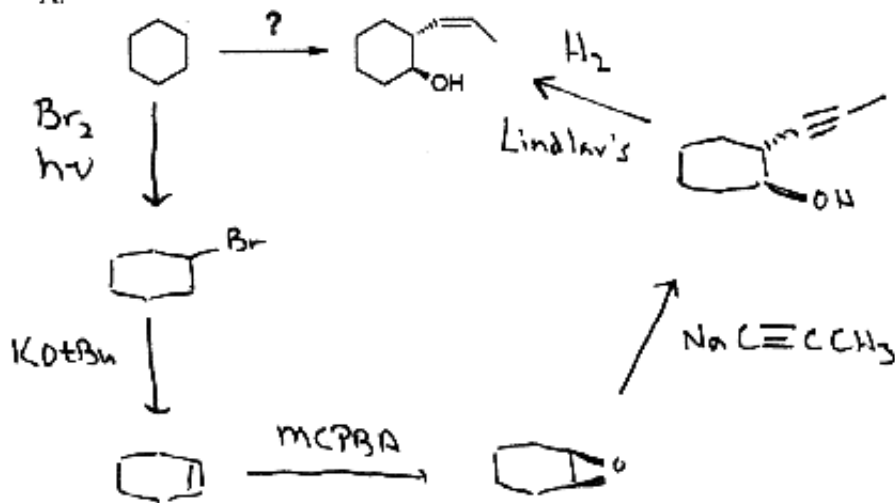


T.

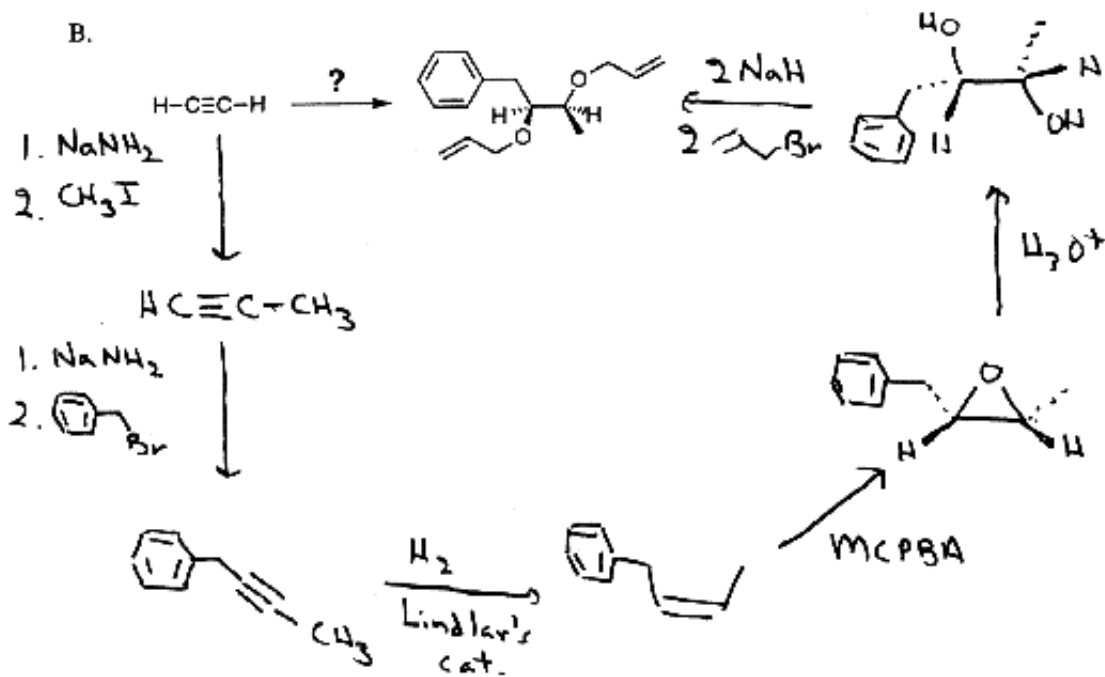


2. (30 points) Using the starting materials given and any other substrates or reagents, outline syntheses of the desired products.

A.

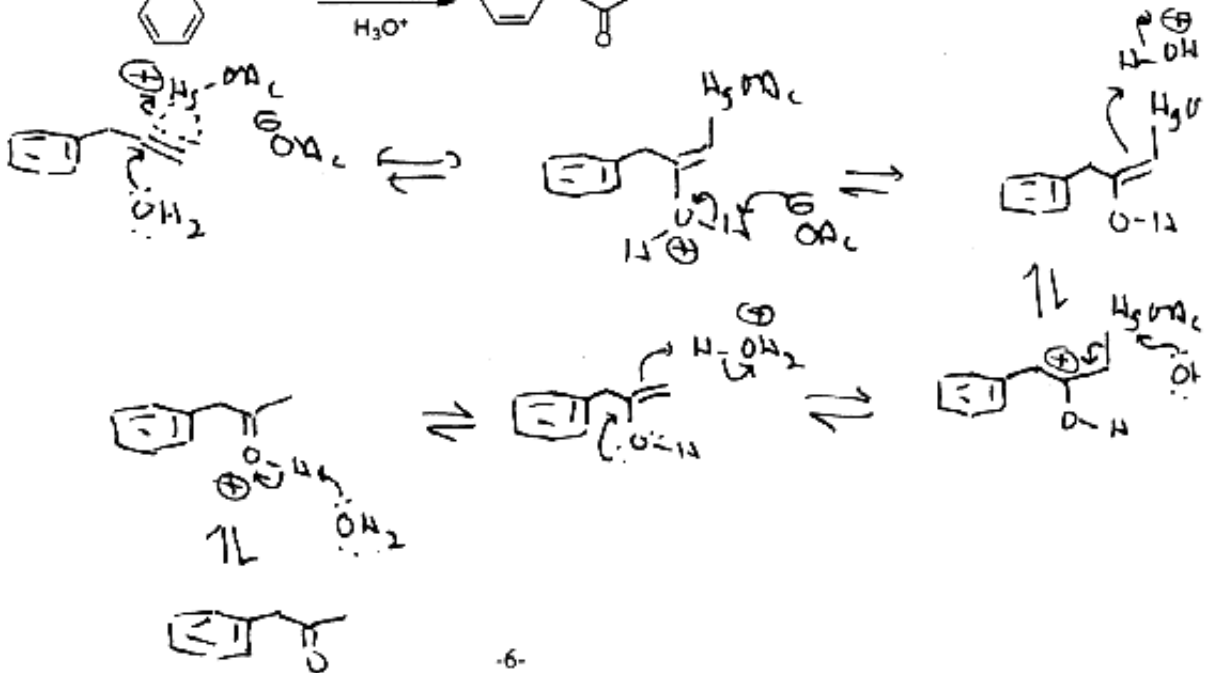
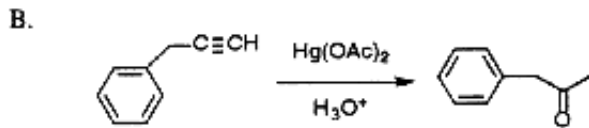
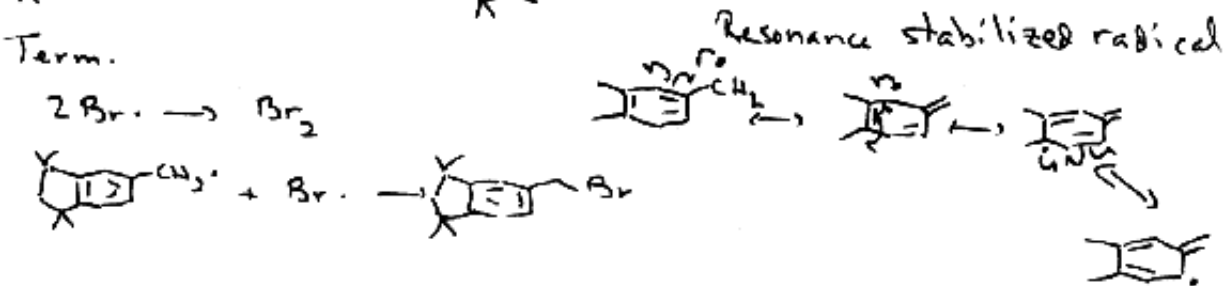
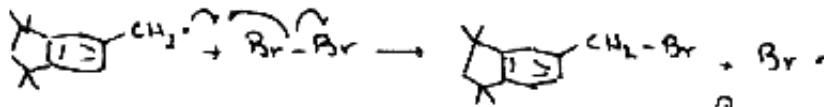
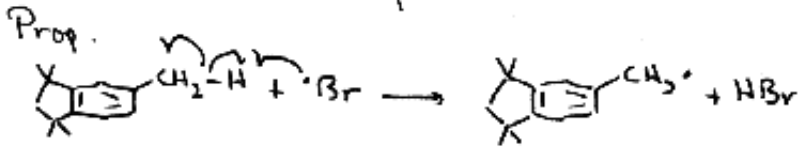
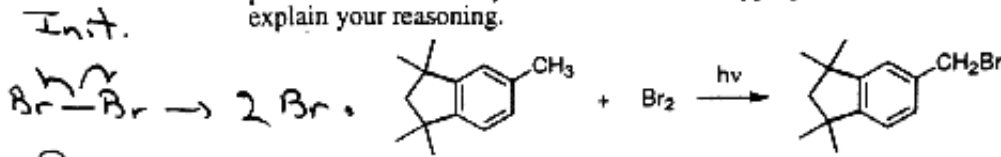


B.

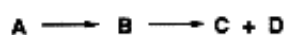


3. (20 points) Using the arrow formalism, draw a **DETAILED, STEPWISE** mechanism for the following transformations.

A. For the following reaction indicate the initiation, propagation, and termination steps. Why is the product shown the only one formed? Draw appropriate structures of the key intermediate that explain your reasoning.



4. (10 points) Consider the following reaction:



In the rate-determining step of this two-step process A is converted to intermediate B. This process is endergonic. B is a common intermediate for conversion to products C and D. For this last step, C is the kinetic product and D is the thermodynamic product. The overall conversion from A to both C and D is exergonic. Draw the energy versus reaction progress diagram for this process.

