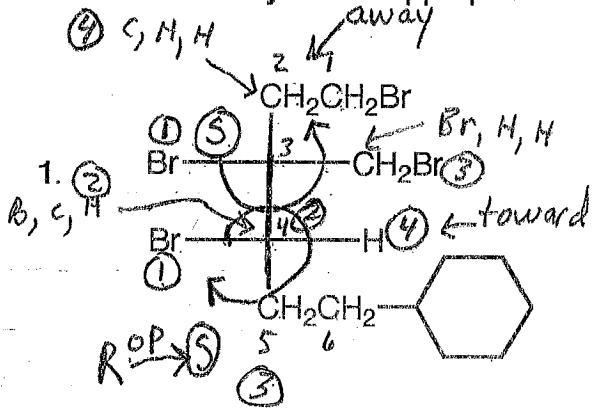
Exam 2, F 2023

A. Nomenclature: (15 points)
Give an acceptable IUPAC name for each of the compounds. Be sure to indicate the **stereochemistry** where appropriate.

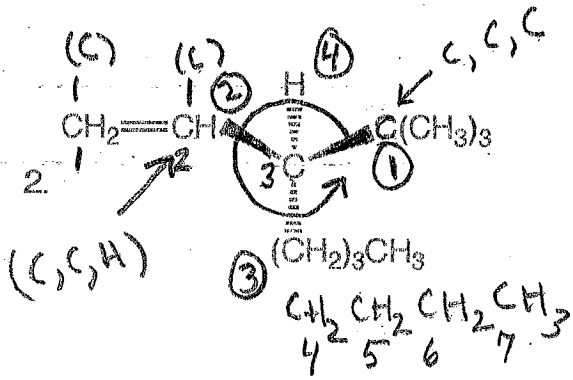
(-1) for numbering

1.



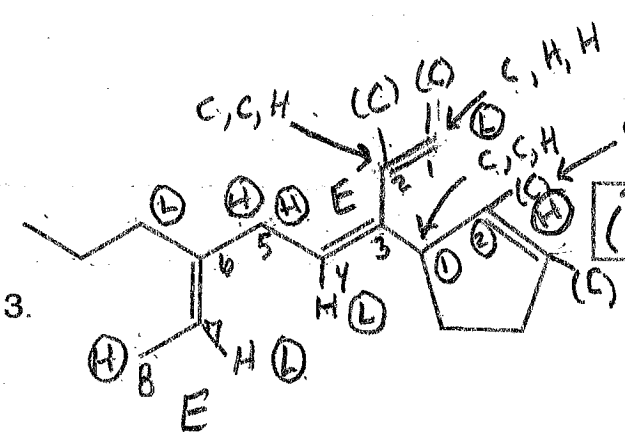
(3S,4S)-1,3,4-tribromo-3-bromomethyl-6-cyclohexylhexane

2.



(S)-3-t-butyl-1-heptene

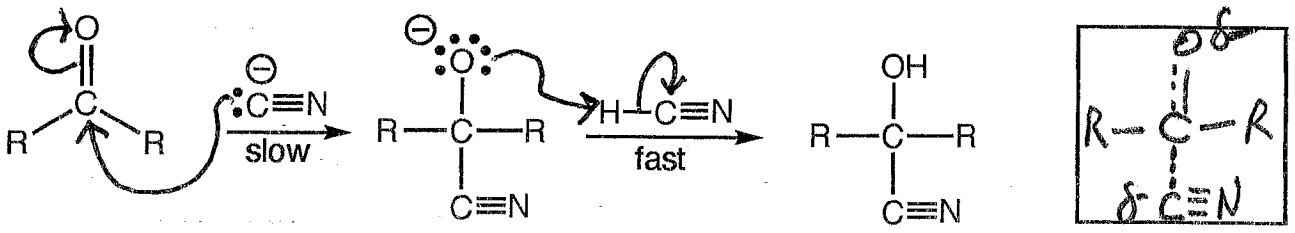
3.



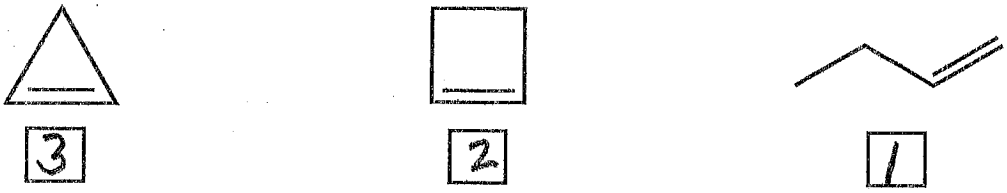
(3E,6E)-3-(2-cyclopentenyl)-6-propyl-1,3,6-octatriene

Facts: Total points = 29

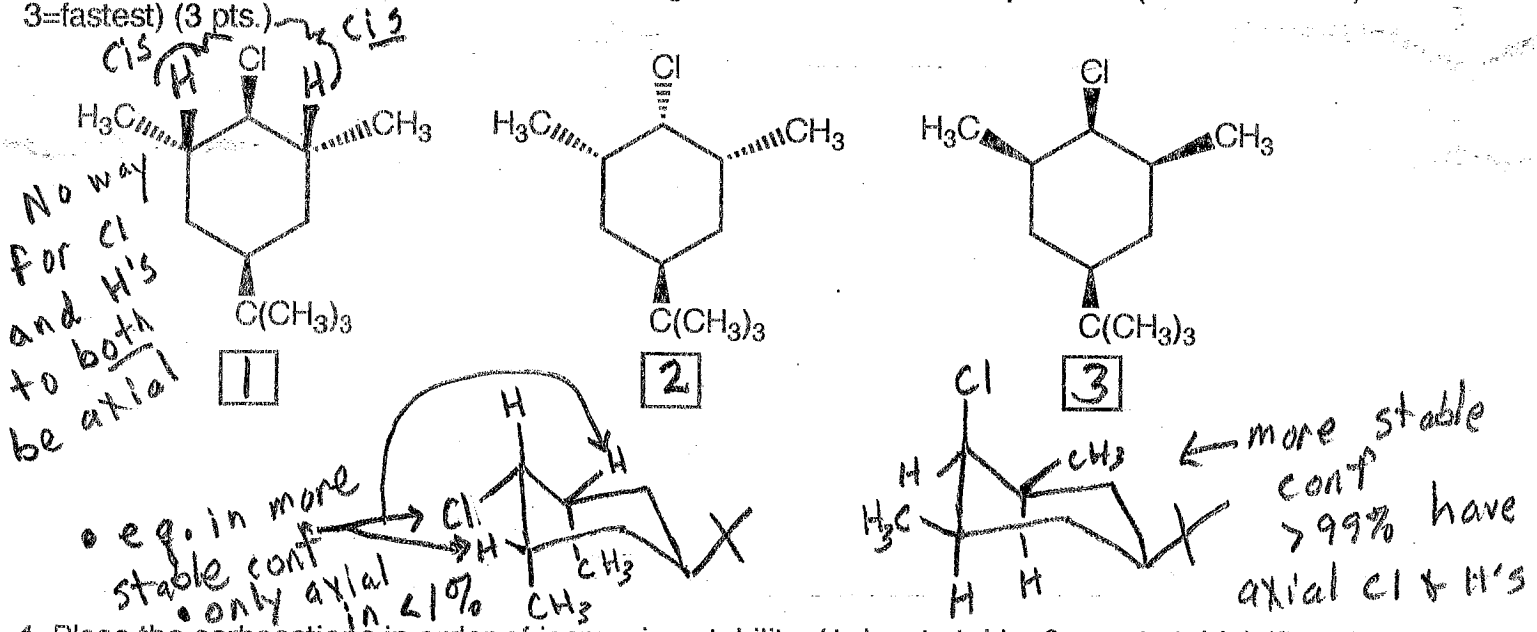
1. When treated with NaCN/HCN, an aldehyde or ketone forms a cyanohydrin. The mechanism of this process is below. Draw the structure of the higher energy transition state in the box provided. (4 pts)



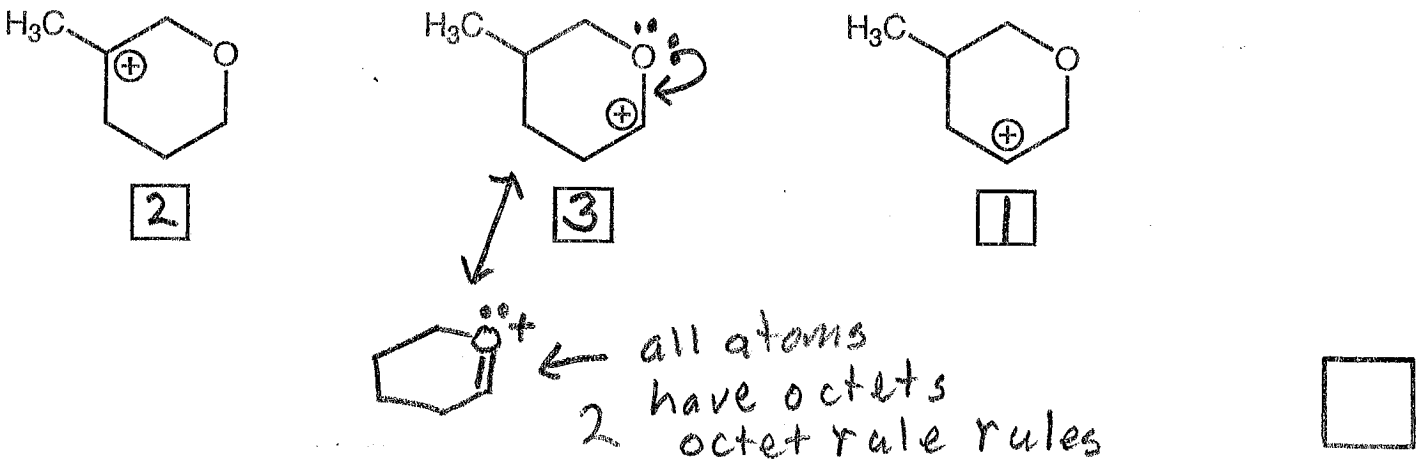
2. Place the following alkenes in order of increasing reactivity. (1=least reactive, 3=most) (3 pts.)



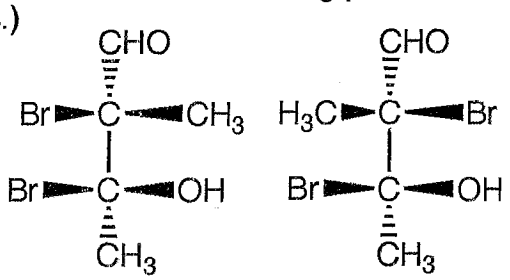
3. Place the alkyl halides in order of increasing reaction rate in an E2 process. (1=slowest rate, 3=fastest) (3 pts.)



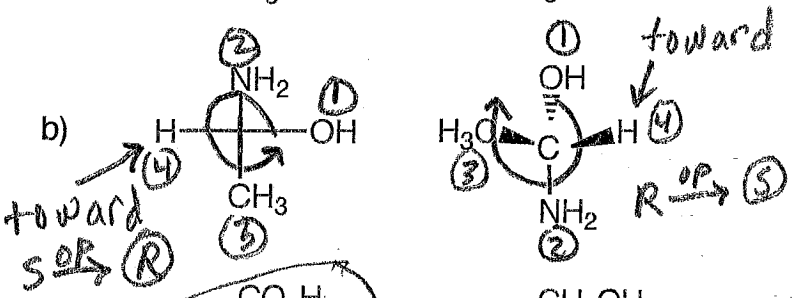
4. Place the carbocations in order of increasing stability. (1=least stable, 3=most stable) (3 pts.)



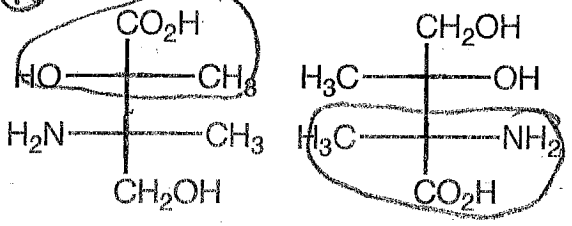
5. Label each of the following pairs as identical, structural isomers, enantiomers or diastereomers. (9 pts.)

a) 

diastereomers

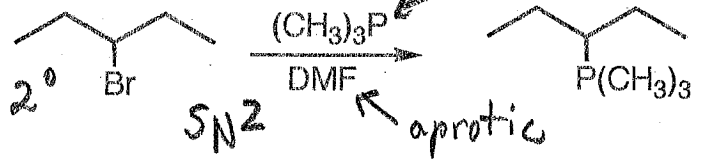
b) 

enantiomers

c) 

structural

6. In the box provided, place the letter of the reaction with the faster rate. If the rate is the same, write **S** in the box. (3 pts.)

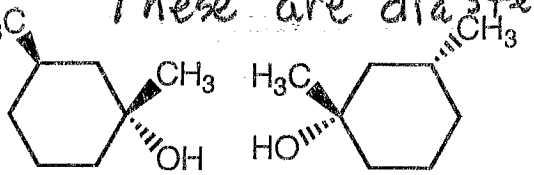
a) 

a

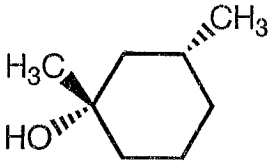
b) 

7. Label the following as optically active (**OA**) or optically inactive (**OI**) when observed with a polarimeter. (4 pts.)

These are diastereomers, not enantiomers. Rotation is not cancelled.

a) A 50:50 mixture of 

OA

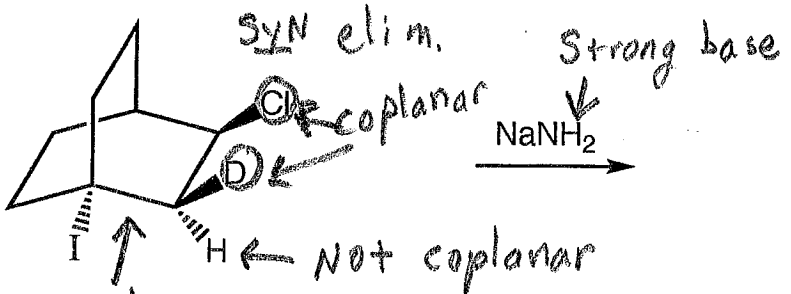
b) pure 

OA

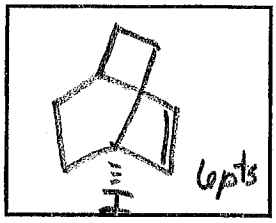
chiral

C. Reactions: Total = 36 points, 6 points each
Please provide the major product in the answer box unless otherwise indicated. Indicate **stereochemistry** if applicable.

1.



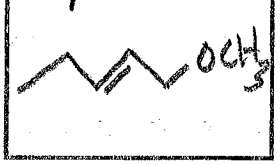
Syn elim.
coplanar
Strong base
Not coplanar
double bond can't form
violates Bredt's Rule



2.

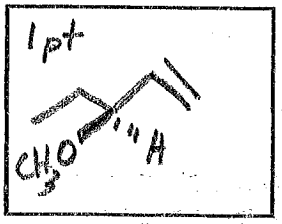
weak Nu
protic solvent
CH_3OH
Heat

2pts



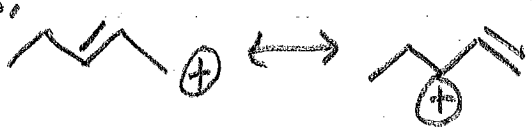
+

1pt

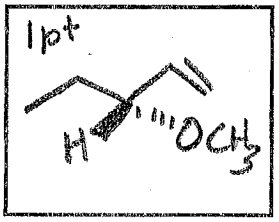


+

1°, res stab.

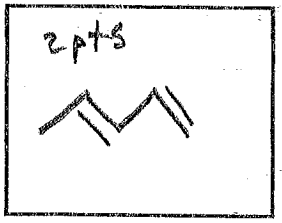


1pt

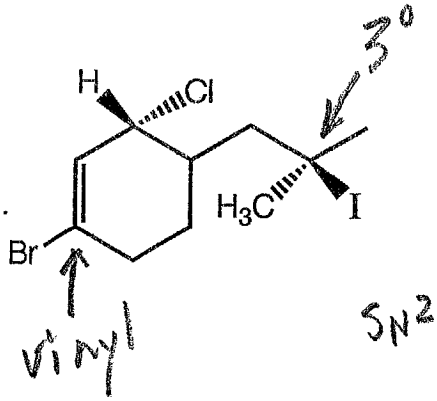


+

2pts

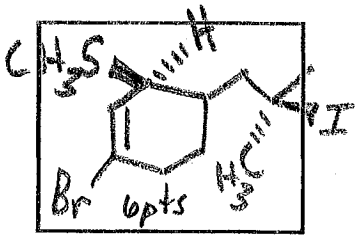


3.

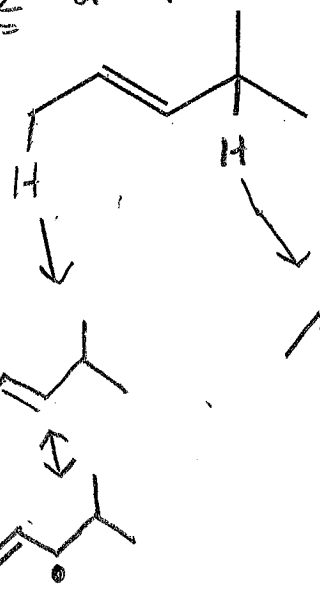


3°
vinyl

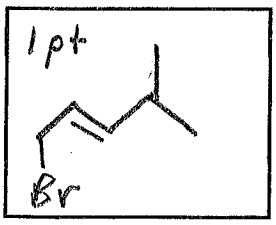
strong Nu
weak base
$CH_3S^-Na^+$ (XS)
DMSO
aprotic
S_N2



4. 2 allylic H's



NBS / Light



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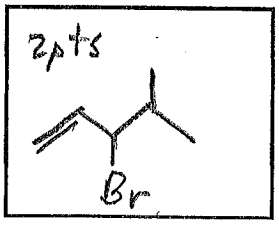

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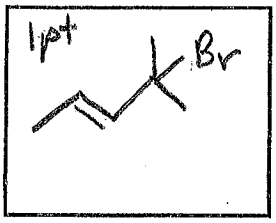

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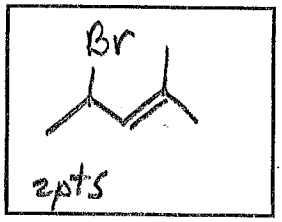
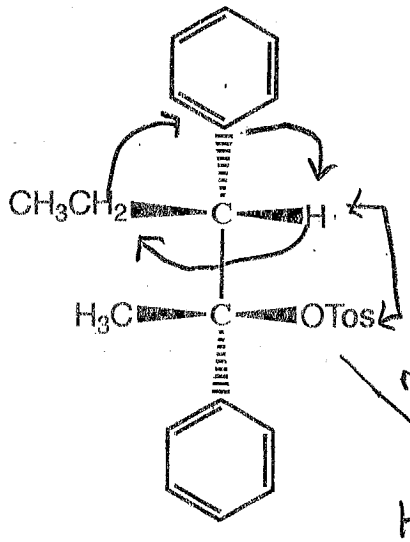


5.



strong base

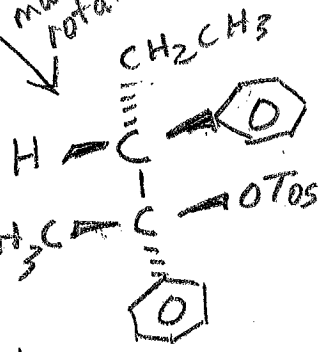
E2

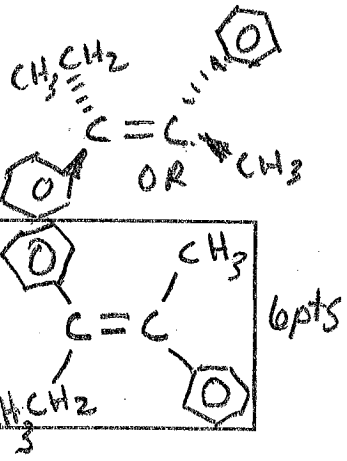
SYN

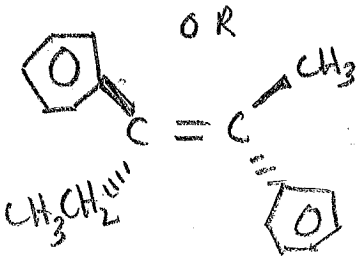
$CH_3O^- Na^+$

CH_3OH

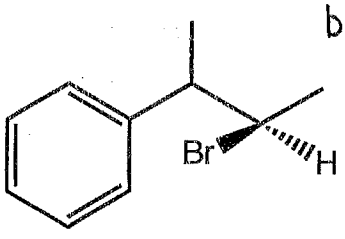
must rotate for anti







6.

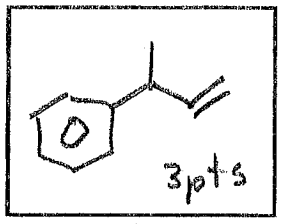


bulky

strong base

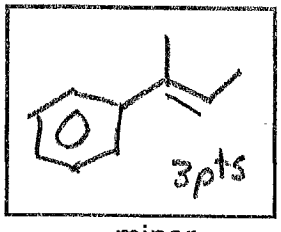
$(CH_3)_3CO^- K^+$

$(CH_3)_3COH$



major

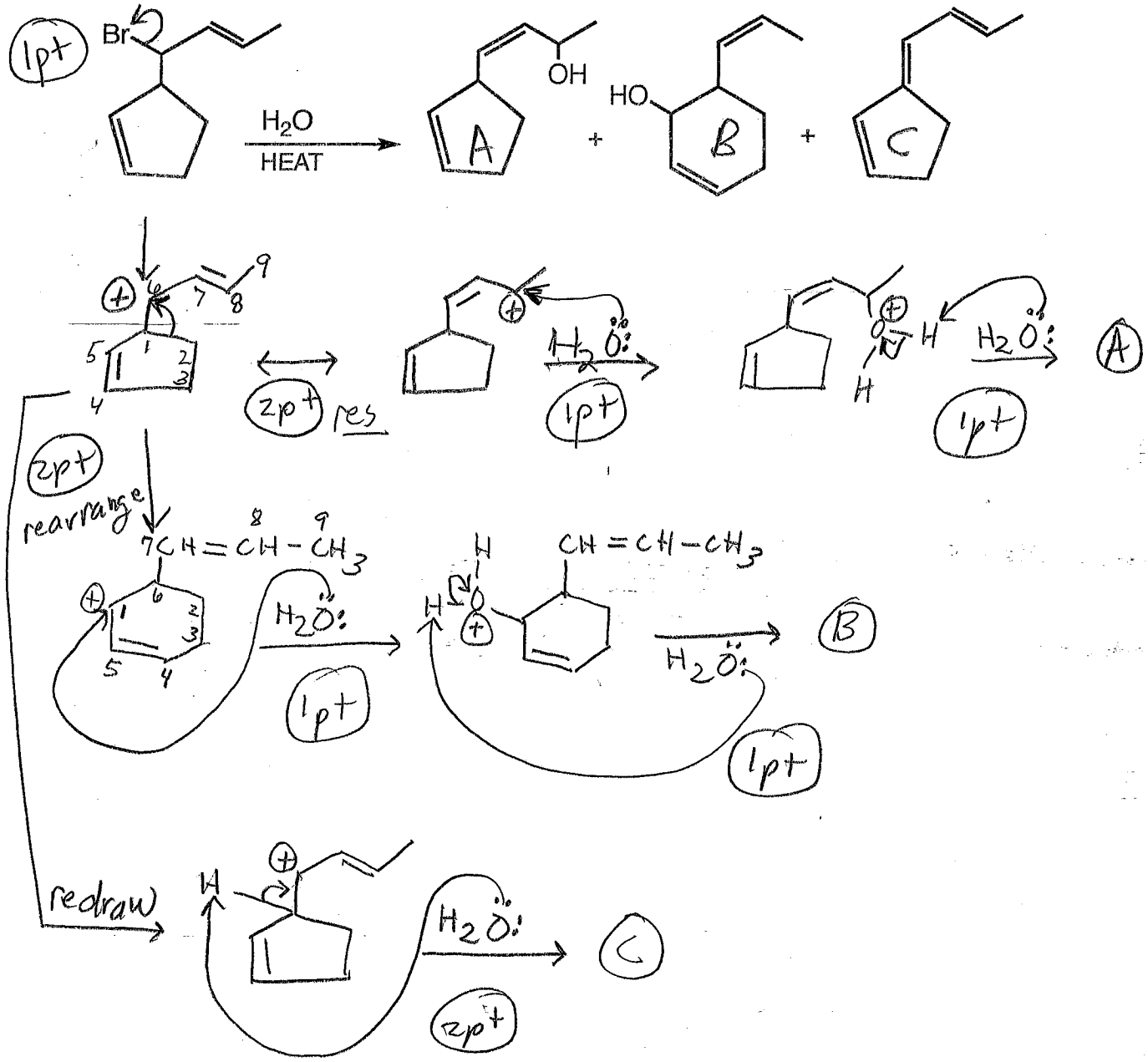
+



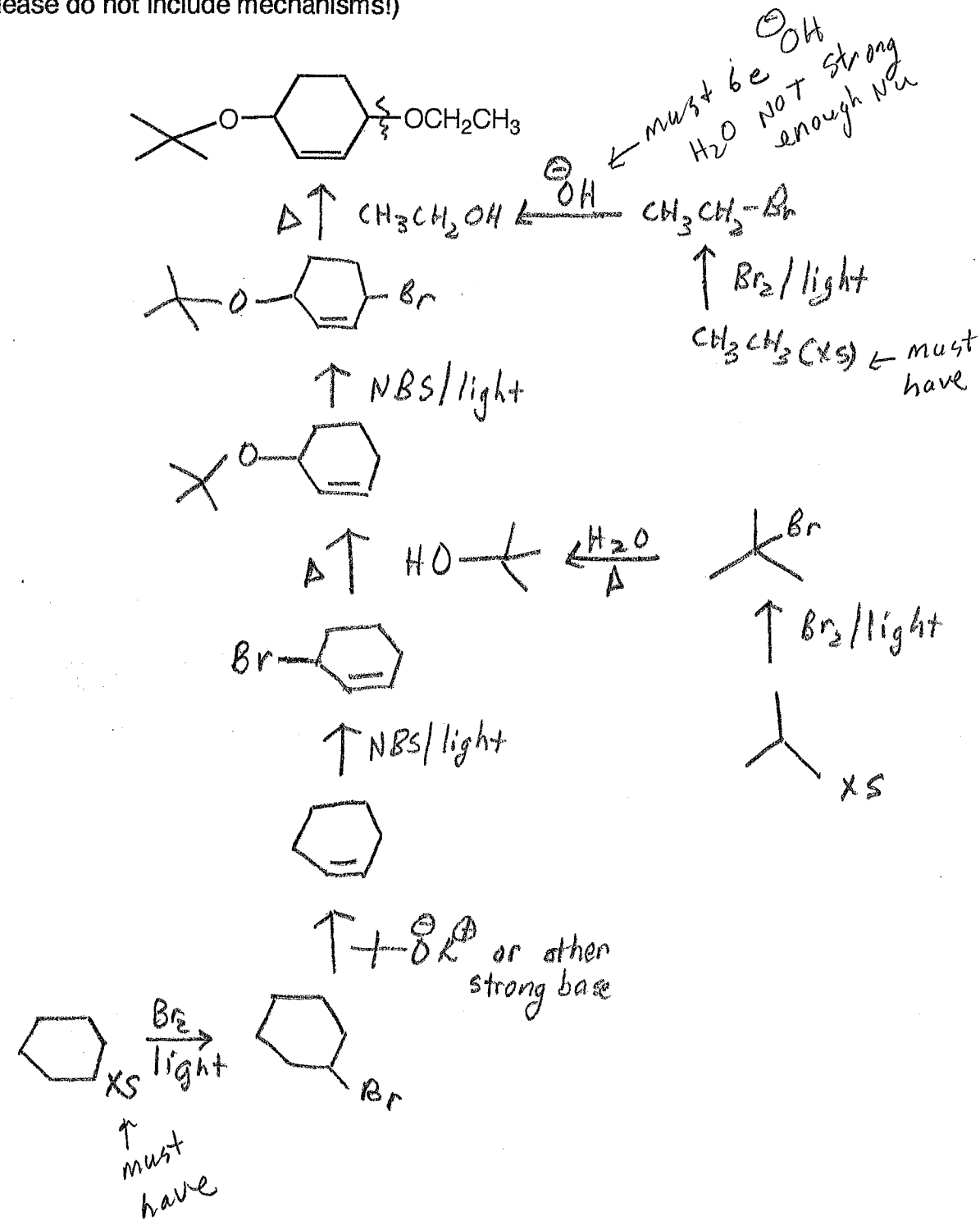
minor

D. Mechanism: (11 points)

The reaction presented below produces several products. Provide clear mechanisms to explain the formation of the three products shown. Use curved arrows to indicate "electron flow". Remember to show only one step at a time. **Show all intermediates and all formal charges. Please do not show transition states.**



E. Synthesis: (9 points)
Synthesize the molecule below from cyclohexane, alkanes of four carbons or less, and any inorganic reagents. (Please do not include mechanisms!)



May not do this: