Exam 3 Summer 2016

Name Key Seat Number_____

Student ID_____

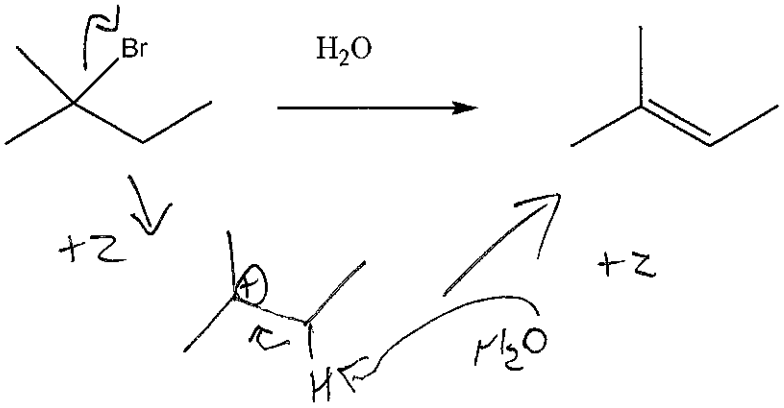
The exam consists of 8 questions worth 102 points on a total of 9 pages. It will be scored out of 100 points. The maximum score you may receive is 100 points.

1. _____/ 12
2. _____/12
3. _____/20
4. _____/12
5. _____/12
6. _____/12
7. _____/12
8. _____/10

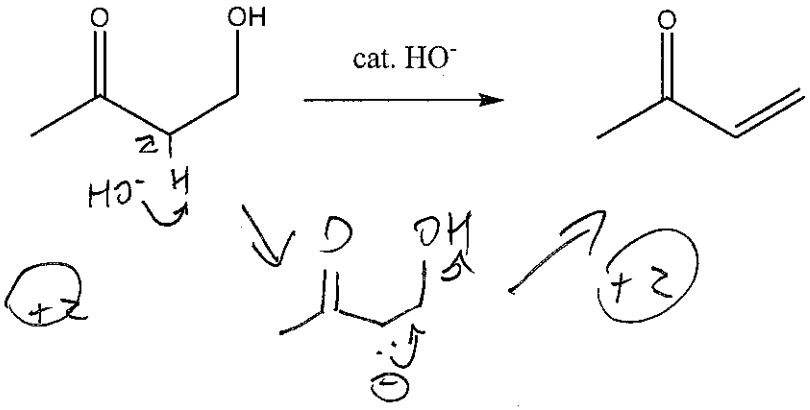
Total:

Regrading: All requests for regrades must be submitted in writing within 48 hours of the return of the exam. You must explicitly state what has been misgraded and why it is an error. The entire exam will be regraded, which could result in points being added or deducted overall.

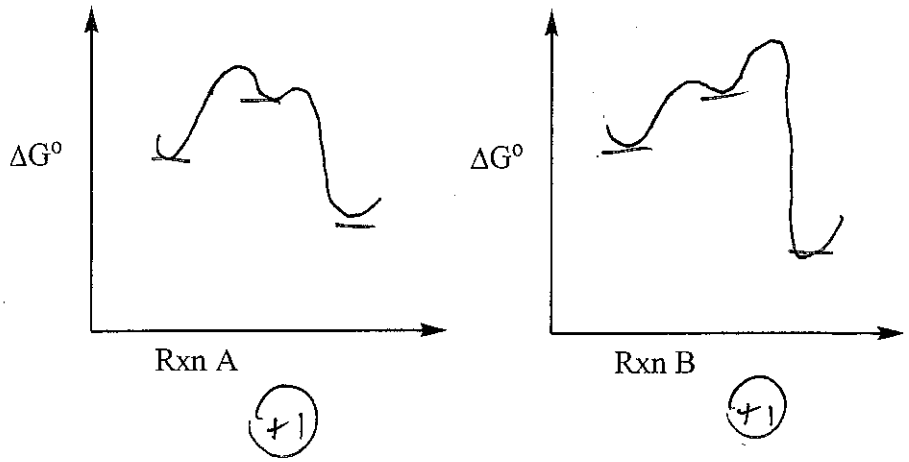
1. (12pts) A. Provide an arrow mechanism for the E1 reaction below:



B. Provide an arrow mechanism for the $E1_{cb}$ reaction below:



C. Draw energy diagrams for both of the reactions above. How do they differ from one another?



+1 +1

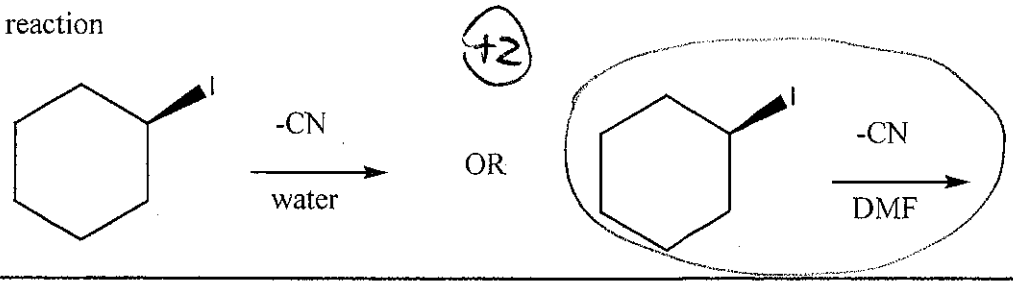
+2 Ether First vs second step is rate l.m.t.n.g

or

carbanion vs carbocation intermediate

2. (12pts) In each pair of reactions, CIRCLE the one that is faster, and give a SHORT explanation of why it is faster.

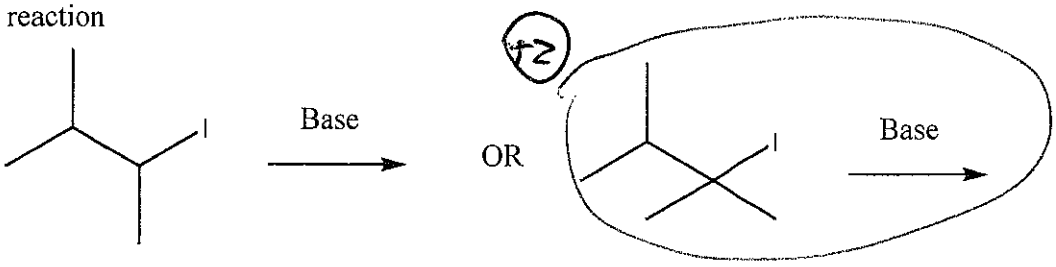
A. Sn2 reaction



Explain:

+2 polar aprotic solvent activates Nu:⁻

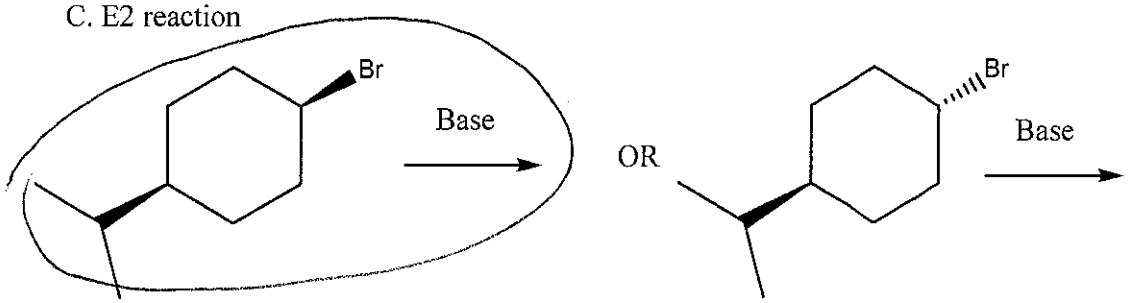
B. E2 reaction



Explain:

+2 More substituted alkene forms faster

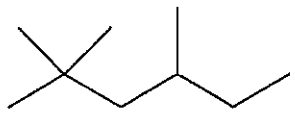
C. E2 reaction



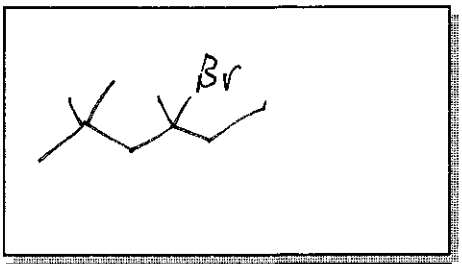
Explain:

+2 More stable chair conformation puts LG axial

3. (20pts) Predict the major product(s) of 5 of the following 6 reactions. Be sure to include proper stereochemistry. Put an "X" in the box you do not want graded, or else the first 5 will be graded.



NBS, light

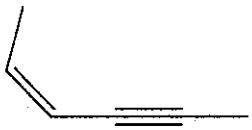


+2 bromination
+2 3°

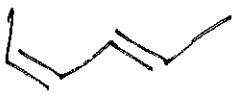
R-3-methylpent-1-yne

1. BH_3 THF
2. HO^-/H_2O_2

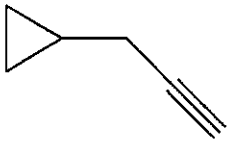
+2 aldehyde
+2 structure



Na, NH_3 (l)

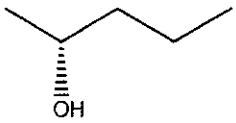


+2 alkene
+2 trans

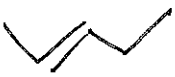


1 equiv. HBr

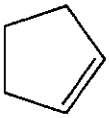
+3 HBr add
+1 regio



H_2SO_4, heat



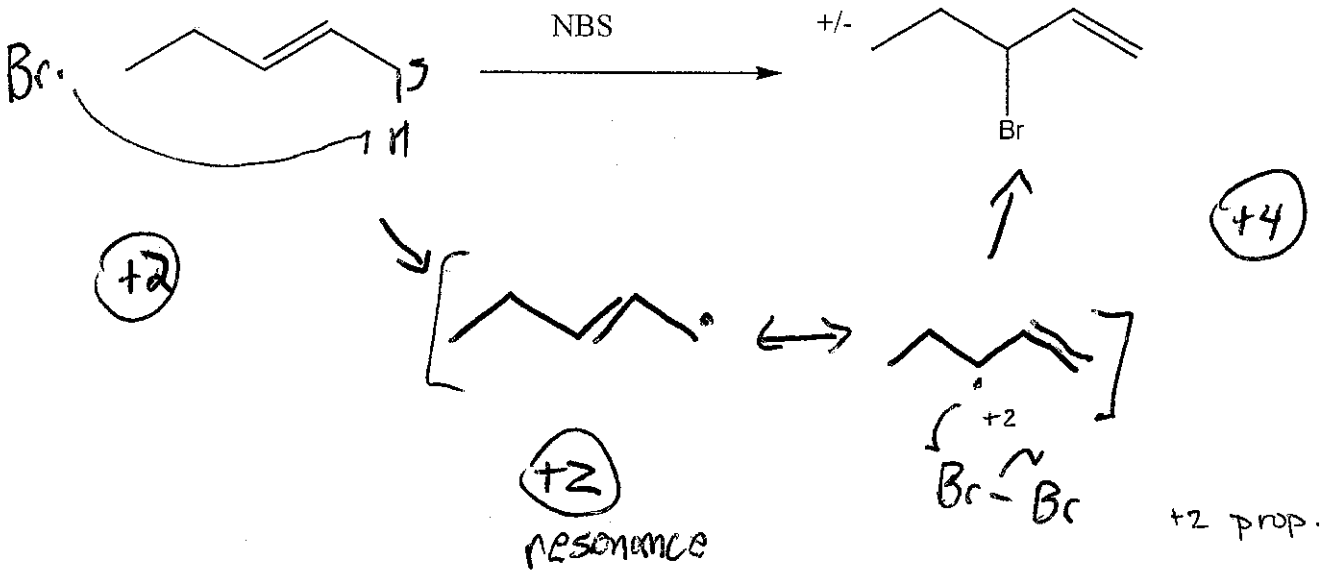
+3



NBS, light

+2 bromination
+2 allylic

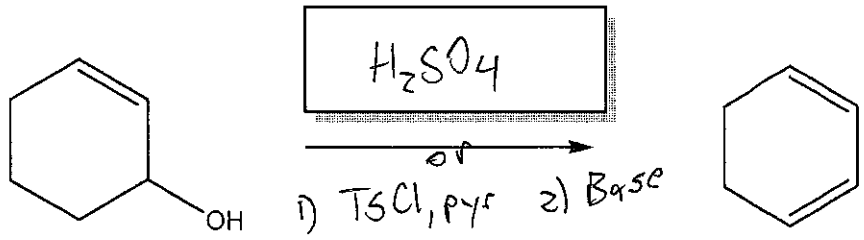
4. (12pts) Provide arrow mechanisms to account for the following products. Remember that NBS is a reagent used to release a low concentration of Br_2, so you can simply use Br_2 as your starting reagent.

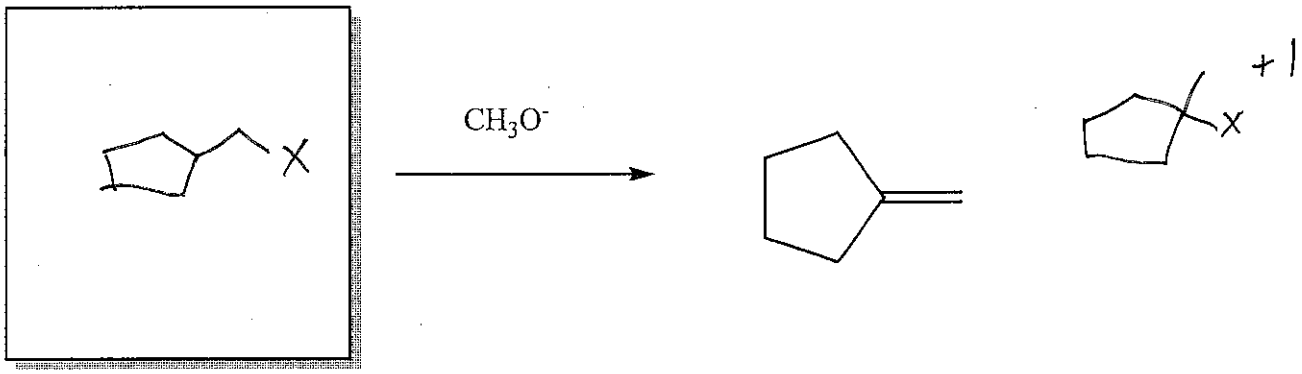


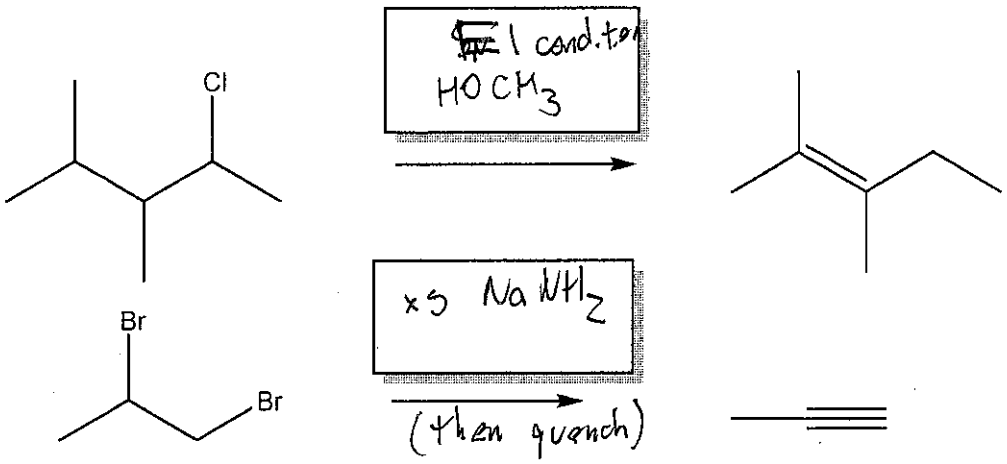
Draw structures for two other products that will be formed under these conditions.

+4

5. (12pts) Provide the reagents or starting materials necessary for each of the following <u>elimination</u> reactions.

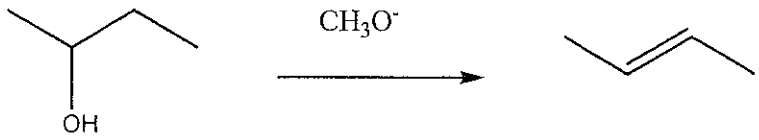






6. (12pts) Give a physical explanation (not a trend) for why each of the reactions below does not produce the product indicated. (Do not say "because it forms a different product," or "because another product is favored.")

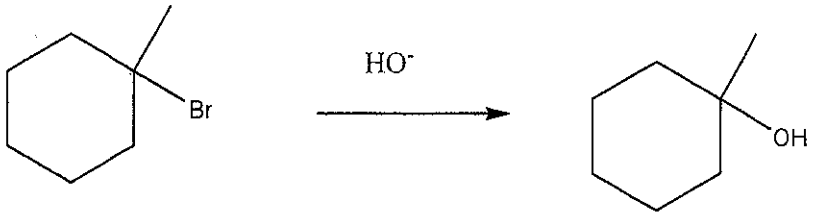
A.



Answer:

Leaving group is too unstable...

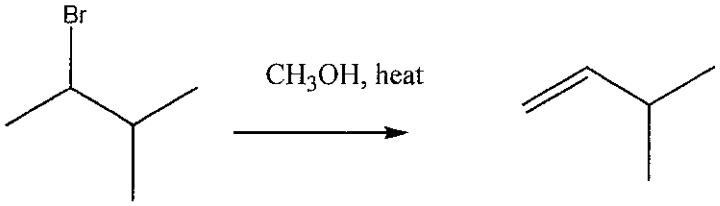
B



Answer:

3° bromide is too sterically hindered...

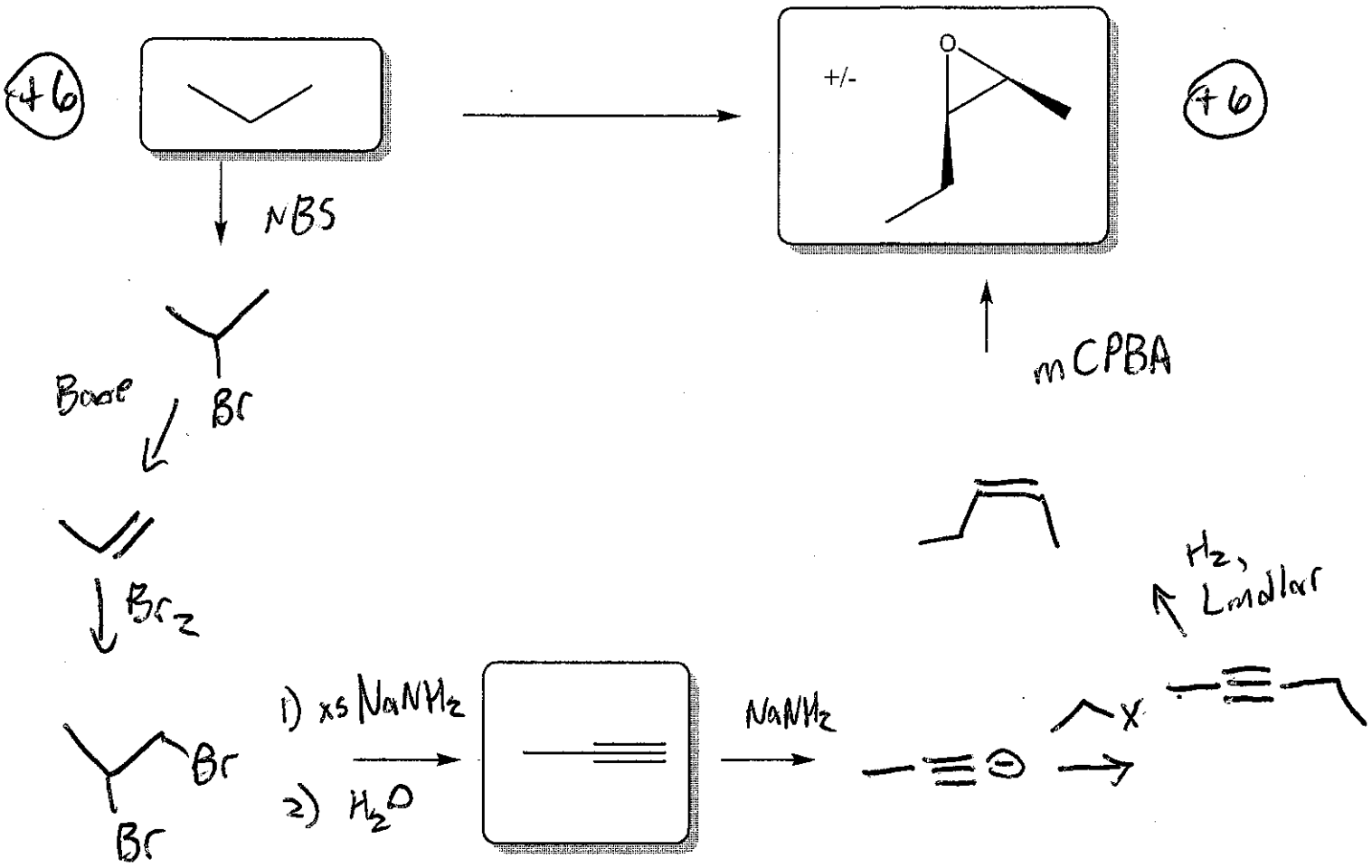
C.



Answer:

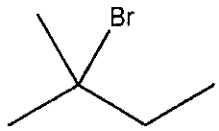
The more substituted alkene forms preferentially due to greater stability (hyperconjugation...)

7. (12pts) Provide all reagents necessary for this multistep syntheses. To help you out, propyne is a synthetic intermediate along the way. Proved reagents to get to propyne and then to get to the final product.

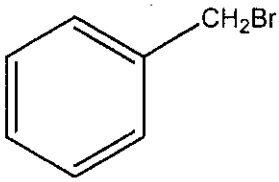


8. (10pts) For each reaction, indicate whether the major product(s) will be formed through an E1, E2, Sn1, Sn2, E1cb or more than one mechanism.

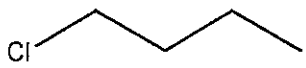
+2 each



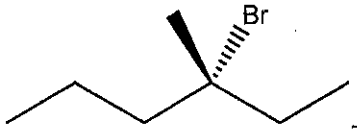
CH_3O^- → mechanism: E2



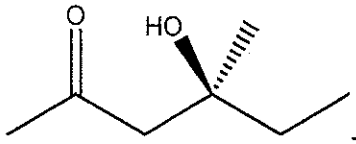
H_2O → mechanism: S_N1



HS^- → mechanism: S_N2



CH_3OH → mechanism: $E1/S_N1$



HO^- → mechanism: $E1_{cb}$