

Homework Assignment #5: Group Assignment

Following are group assignments for homework #5. The goals of this activity are to challenge you to work problems that are more complex and to practice working effectively in a group setting with people that you do not necessarily know well. The person with an 'O' after their name will be the organizer of the group and will be required to arrange meeting times and places to complete the assignment. The person with a 'W' after their name will be the person who prepares the final written assignment to be turned in for a grade. Groups will be re-assigned and roles will be changed for other sets of homework to be done in groups, so that you have the opportunity to work with a variety of different people and in different roles throughout the semester.

Submit only one set of answers per group. Please work with your assigned partners to prepare your final draft of answers. You may find it useful to make photocopies of the answer set, so that each group member may have it for reference. You may discuss ideas with other groups, but do not work formally with other groups. You may use your textbooks and any other written references from the library. Do not copy anyone else's work. The honor code pledge is printed below. By signing this page, you are acknowledging that you have read and understand the privileges and responsibilities that this code bestows.

This is due Friday, April 7, at the end of class.

On my honor, I pledge that I have not given, received, nor tolerated others' use of unauthorized aid in completing this work.

Signatures:

Group member #1

Group member #2

Group member #3

Group member #4

Group member #5

Groups are assigned as follows:

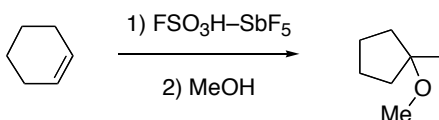
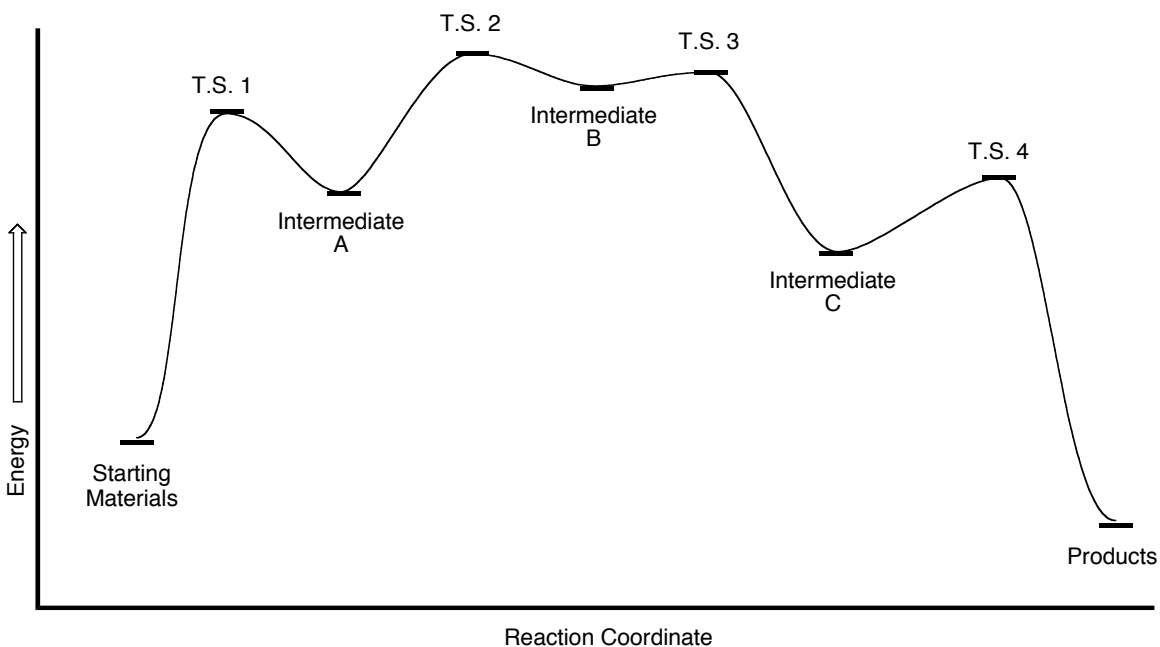
Laura Lynch Tami Korb Beth Wilmunen(O) Matt Jester Megan Olsen (W) Emily Degnan	Vwaire Orhurhu Kelly Wyttenhove Emily Gentholts Ben Maisenbach(W) Lindsey TeBrake Laura Hansen (O)	Andy Scott Evelyn Ross (O) Ashley Millette Ann Solinger Zach Zillmer (W) Dawn Lewis	Lynsi Espe Christine Askham Leigh Clanton (O) Andrea Astrup Jacob Hansen (W) Rachel Hatteberg	Leah Hogdal (O) Mike Harlow Susan Ekegren Shawna Mullen Isaac Perry (W) Jessica Hennes
Karly Slivik Linda Kanne (W) Britta Peterson John Gamble (O) Jessica Sussman Krista Danielson	Eva Cornell (O) Ali Linn Nichole Vogler Brandon Preuss Whitney Hohman Kristen Willer (W)	Amanda Franey Ross Puffer (W) Zeb Zacharias Amanda Zeiner(O) Scarlett Robinson	Mitch Burg Sara Purnell (O) Nick Hefty Eric Dale (W) Isaac Weeks	Ashley Grivna Andy Soleim Eric Lindquist (W) Mollie Kelly Kevin Horn (O)

Note: Use the Photo directory to get email addresses. If you can't find an email in the directory, I will help, but don't ask me first.

Hint: It does little good to have everyone work on every problem. Part of effectively working in a group is being able to delegate workload. Assign each person in the group a problem, and then meet again to go over the answers. Make sure that you understand the answers that other group members present. **Remember, you are responsible for knowing all of the material, not just the problem(s) delegated to you.**

Names _____

1) Consider the potential energy diagram for the reaction shown below. Cyclohexene is stirred with a combination of fluorosulfonic acid (FSO₃OH) and antimony pentafluoride (SbF₅) at -60° C. Fluorosulfonic acid is a very strong acid, and antimony pentafluoride is a very strong Lewis Acid. Together, they make a powerful "super acid" whose conjugate base is unreactive (it doesn't show up in the organic products) - think of it as just H⁺. After stirring for a while, intermediate **C** is formed, and then methanol is added. Intermediate **B** is very high in energy. The only thing that makes this work is that intermediate **C** is much, much more stable. What are the structures of intermediates **A**, **B**, and **C**.



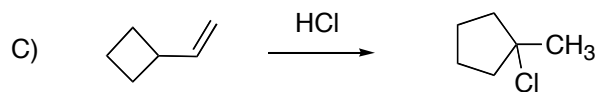
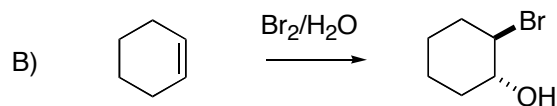
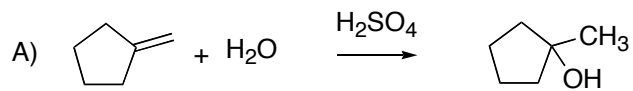
Intermediate A (3 pts):

Intermediate B (4 pts):

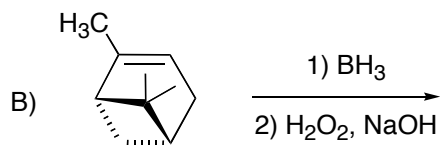
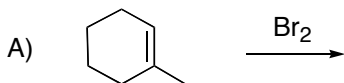
Intermediate C (3 pts):

Names _____

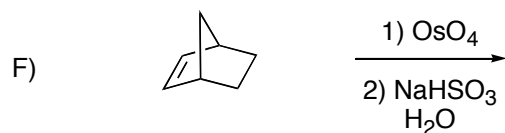
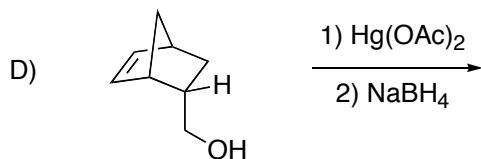
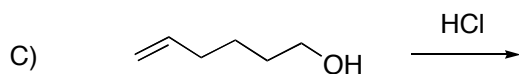
2) (6 pts each) Using curved arrow notation, provide a reasonable mechanism for the following reactions. Be sure to show proton transfers.



3) (5 pts each) Predict the *major* organic products for each of the following reactions. Pay particular attention to regio- and stereochemistry. If a reaction is stereospecific/stereoselective, the products you draw should reflect this. Building models of the starting material may help you determine the proper stereochemistry of the products.



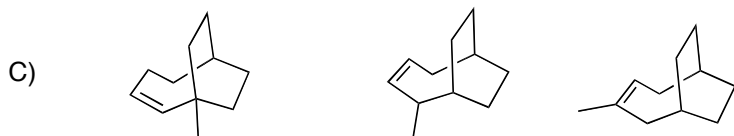
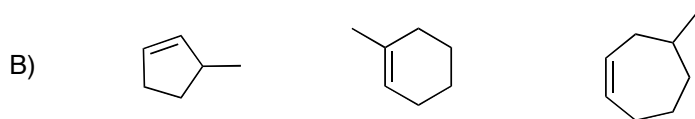
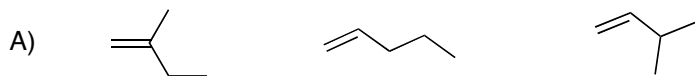
Building a model of this one will help



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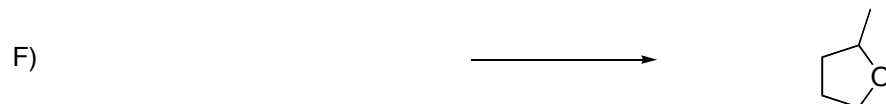
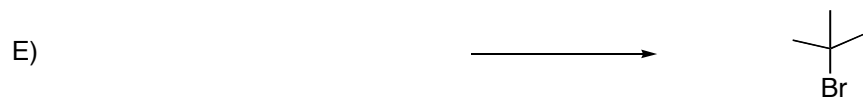
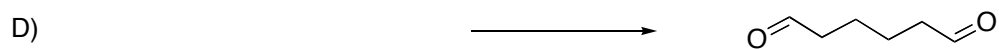
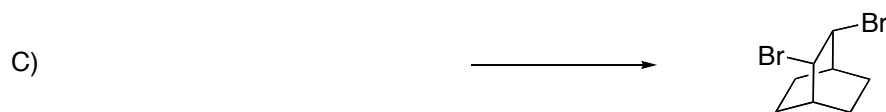
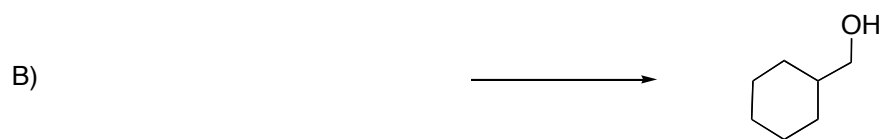
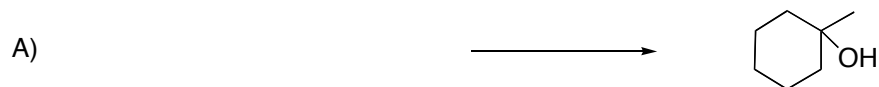
Names _____

4) (3 pts each) For addition of hydrogen halides and the acid catalyzed addition of water to alkenes, the transition states are of similar, but slightly higher, energy to the intermediate carbocations. Given that information, use what you know about energy diagrams to predict which molecule in each of the following sets will react fastest with HBr. Circle the molecule that will react fastest. Hint: consider everything you know about how to stabilize charge.



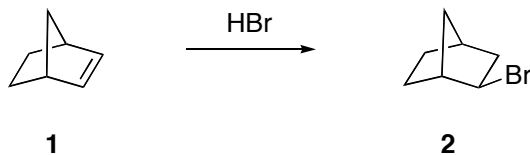
Names _____

5) (5 pts each) Knowing what products result from the reaction of a given starting material with a given reagent is important information. Knowing how to work backwards to figure out how to make a given molecule is even more important for synthesis. Provide starting materials and reagents to make the following molecules.

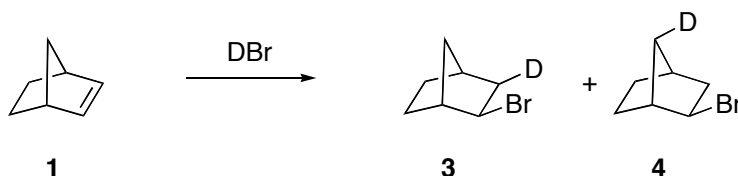


Names _____

Extra Credit (10 pts). Addition of HBr to norbornene (**1**) to get **2** is an interesting reaction because the mechanism is not as straight forward as one might think.



Although it is not apparent in product **2**, two different products are formed. In one of them, the hydrogen from the acid is not on the carbon adjacent to the bromine. By substituting a deuterium (an isotope of hydrogen) for the acidic hydrogen, we can track where the hydrogen actually ends up. For example, reacting **1** with DBr (which reacts just like HBr) provides two different observable products, **3** and **4**, in equal amounts.



Using everything you know about carbocations, explain why you get **two** regioisomeric products. (HINT: Draw the intermediate and think about what all can happen.)