

Scroll down for 'B' version

Chem 242 (wnt 09) exam #2

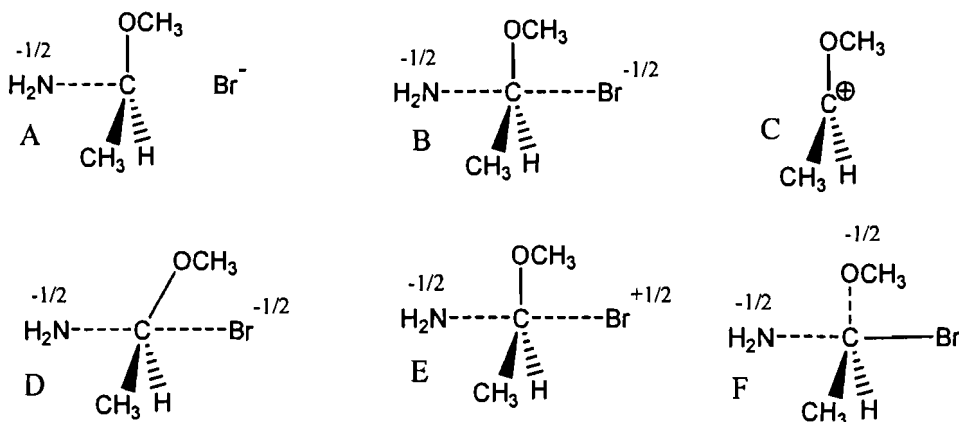
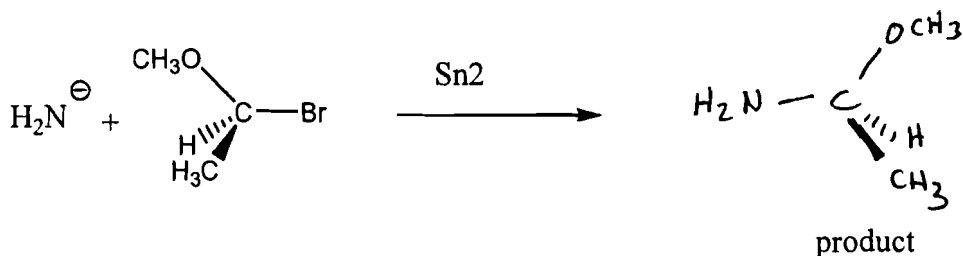
Name Dennis Rodman

1. (6 pts) Circle what is **true** about 'Free Radicals'

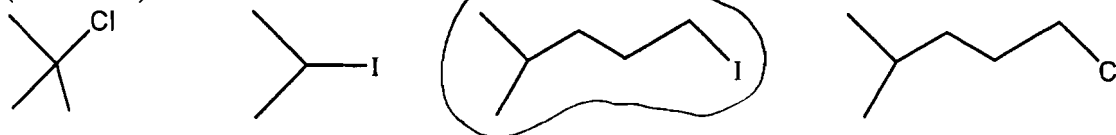
- a. Free radicals usually have a positive charge
- b. Free radicals have one unpaired electron
- c. Tertiary free radicals are more **stable** than primary free radicals
- d. Free radicals are 2 electrons short of a full octet.
- e. Carbon free radicals planar in shape.
- f. The 'Free Radicals' are the name of a politically active group of UW chemistry graduate students that find solutions to the precipitating problems of the world.

2. (4 pts) a) For the S_N2 reaction below, identify which structure (A-F) would be the Transition state for this reaction: B

b) (5 pts) Draw the product of this reaction showing all the pertinent stereochemistry.



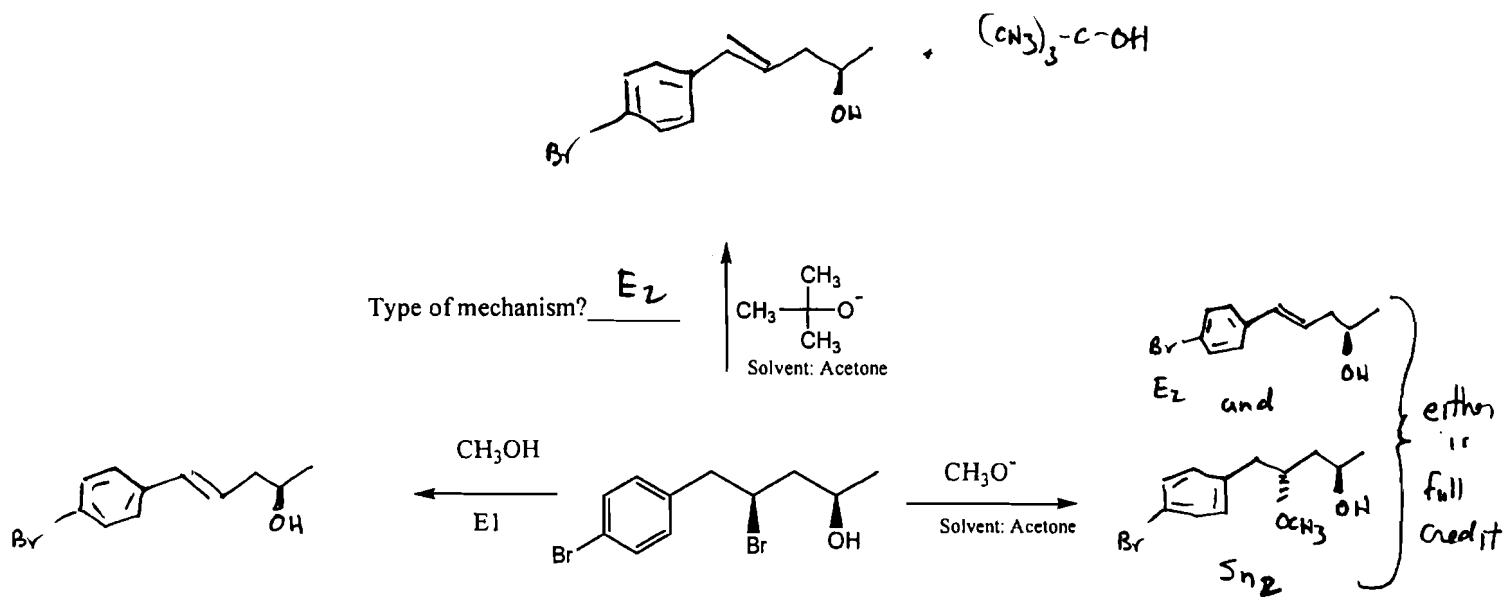
3 (3 pts). Which of the following compounds will undergo an S_N2 reaction most readily (circle one).



b. (3 pts) Briefly State the reason for your choice above.

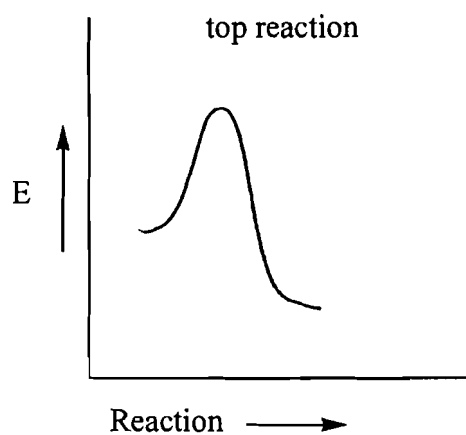
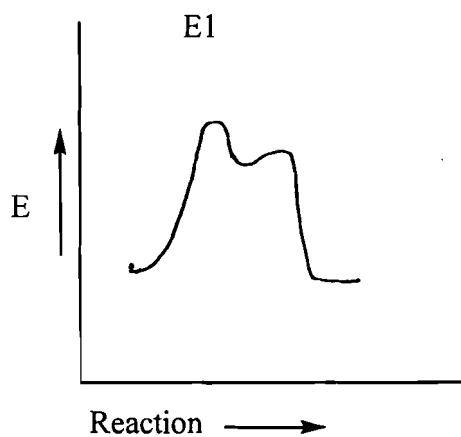
1° substrate and Best leaving group ($I > Cl$)

4. a. (18 pts-6 pts each) Draw the products for the following reactions (the mechanism is given for some reactions). For the top reaction declare what type of mechanism it is. Be sure to show the stereochemistry of the products.

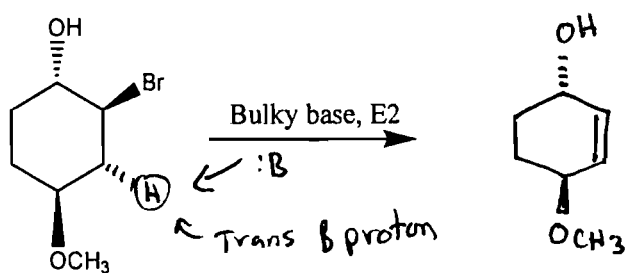


b. (3 pts) For the **E1 reaction** above draw the reaction coordinate diagram in the space provided below.

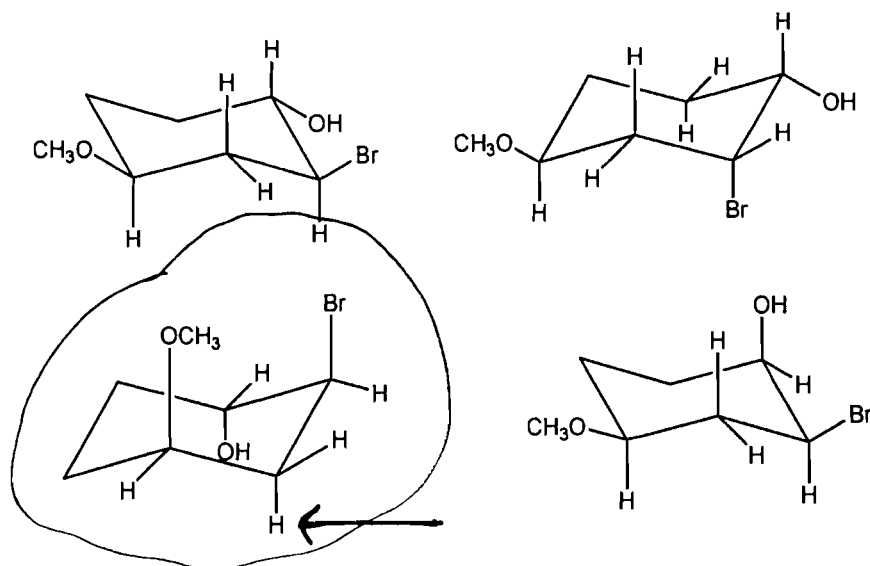
c. (3 pts) For the **top reaction** above draw the reaction coordinate diagram in the space provided below.



5. a (4 pts) For the reaction below draw the product of the E2 reaction.

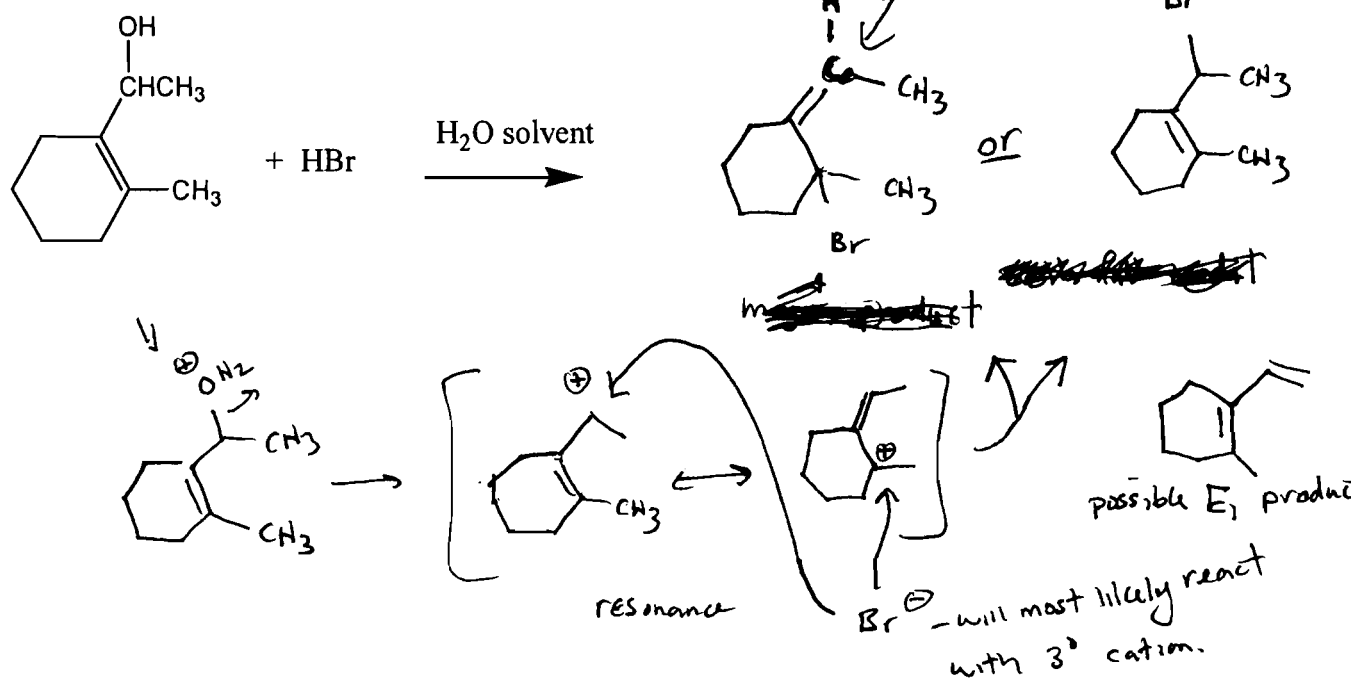


b.(3 pts) Of the chair conformations shown below, **circle** the conformation that represents the conformation that would be present for the E2 reaction above to occur.

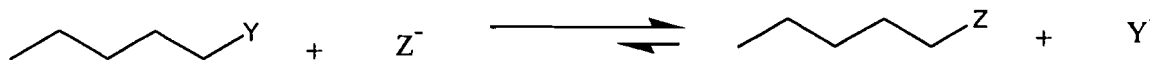


c. (3 pts) Draw an arrow (\rightarrow) to the hydrogen (in the structure that you circled), that would be pulled by the bulky base.

6. (6 pts) Draw the major organic product for the reaction below.



7. (4 pts) Based on the following Sn2 reaction, relate the relative acidities of the variable elements 'Y' and 'Z'. Note that the equilibrium arrows state that the reaction is shifted to the right,

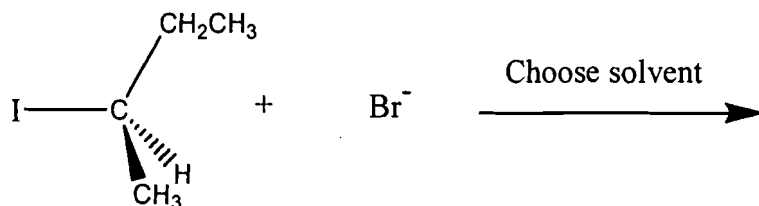


The possible relative acidities are given below (circle one)

- a) pK_a of HY > pK_a of ~~HX~~^{HZ}, (b) pK_a of ~~HX~~^{HZ} > pK_a HY, c) pK_a of HY = pK_a ~~HX~~^{HZ}

8. For the reaction below choose (circle) one of the 3 solvents to run the reaction:

Methanol, Acetone or Ethanol

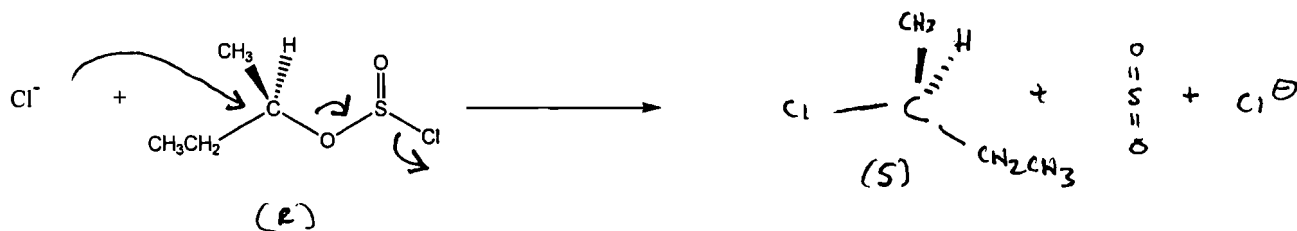


Given your choice of solvent above answer the following:

Acetone - Polar aprotic
ethanol/methanol polar protic

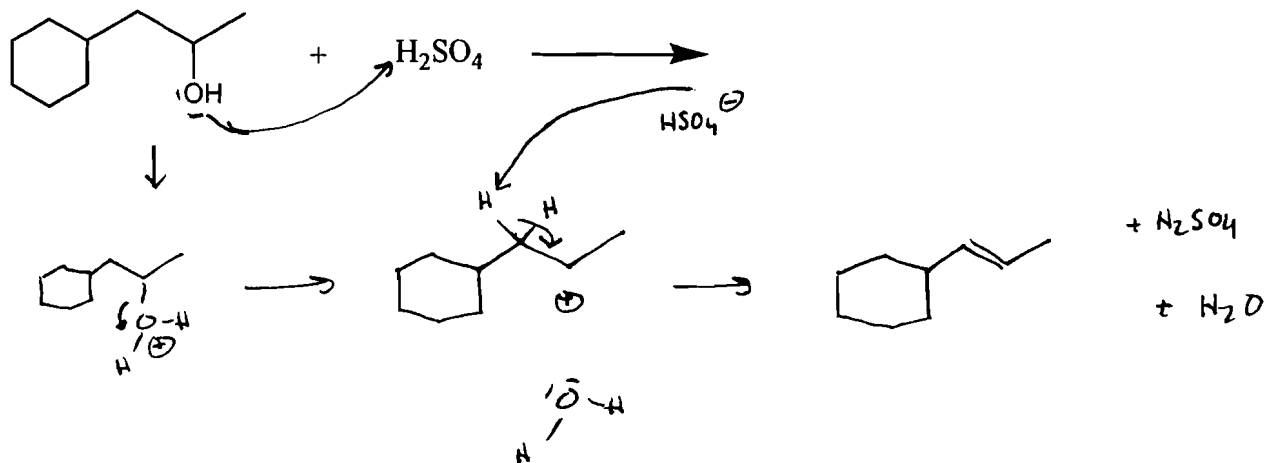
- a) (2 pts) Is your solvent choice a polar protic or polar aprotic solvent? _____
- b) (3 pts) Is the reaction mechanism Sn1, E1, Sn2 or E2 Sn2 for Acetone / Sn1/E1 for Methanol/Ethanol
- c) (2 pts) If I (Iodine) is replaced by an OH will reaction still occur? NO - OH bad leaving group

9. (7 pts). Draw **arrow pushing mechanism** for the last step of the reaction of alcohol with thionyl chloride (SOCl₂). Draw all the products and be sure to depict the pertinent stereochemistry of this reaction.

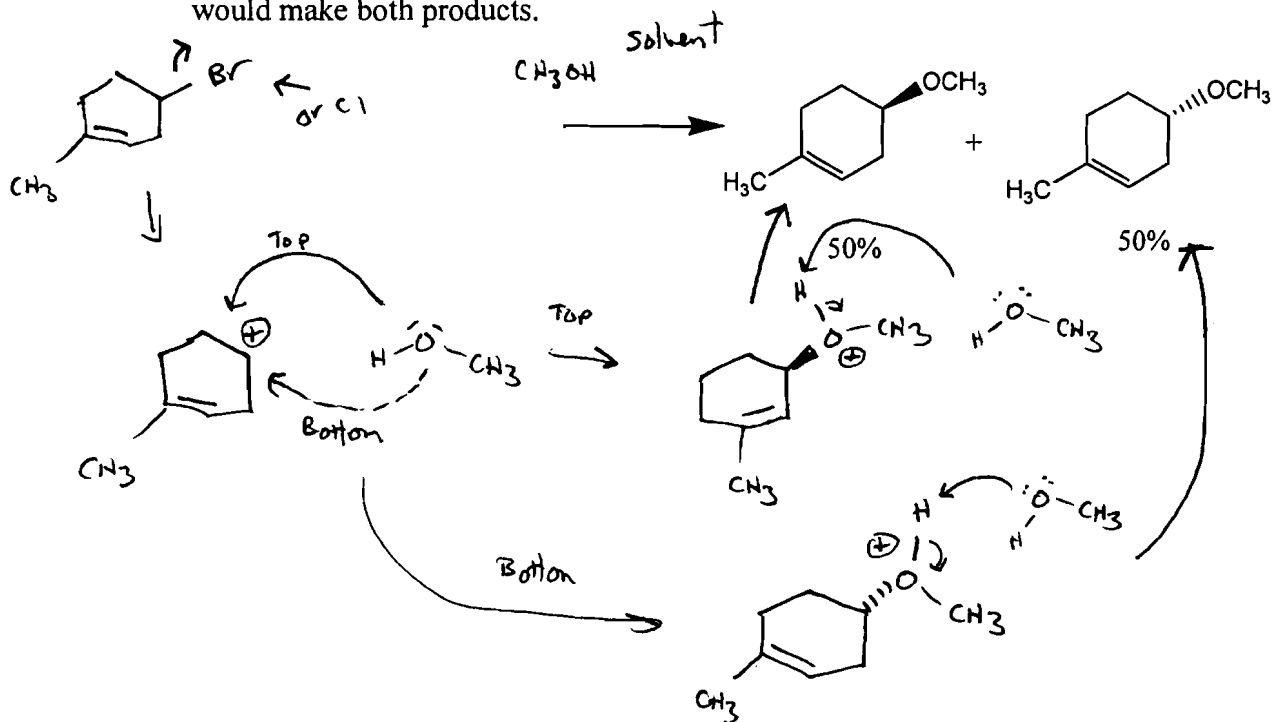


10. Answer only one (A or B) of the following two mechanism question—clearly state which one you want graded. Note: B is worth 3 more points as it is more challenging

A) (14 pts) For the Dehydration of the alcohol with sulfuric acid draw the **arrow pushing mechanism**.



B) (18 pts) Show the arrow **pushing mechanism** for the reaction that would produce the two products shown. Use the appropriate starting compound and solvent that would make both products.

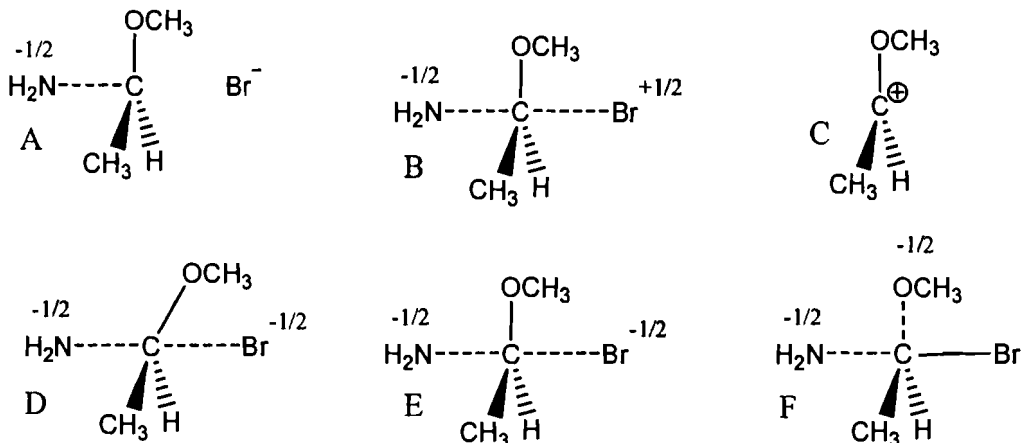
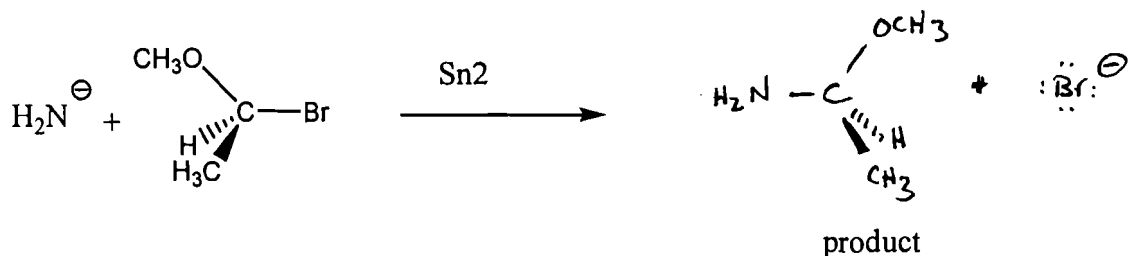


1. (6 pts) Circle what is **true** about 'Free Radicals'

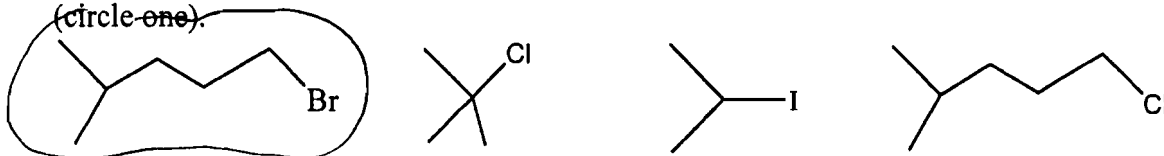
- (a) Tertiary free radicals are more **stable** than primary free radicals
 (b) Free radicals have one unpaired electron
 c. Free radicals usually have a positive charge
 d. Free radicals are 2 electrons short of a full octet.
 (c) Carbon free radicals planar in shape.
 (f) The 'Free Radicals' are the name of a politically active group of UW chemistry graduate students that find solutions to the precipitating problems of the world.

2. (4 pts) a) For the Sn2 reaction below, identify which structure (A-F) would be the Transition state for this reaction: E

b) (5 pts) Draw the product of this reaction showing all the pertinent stereochemistry.



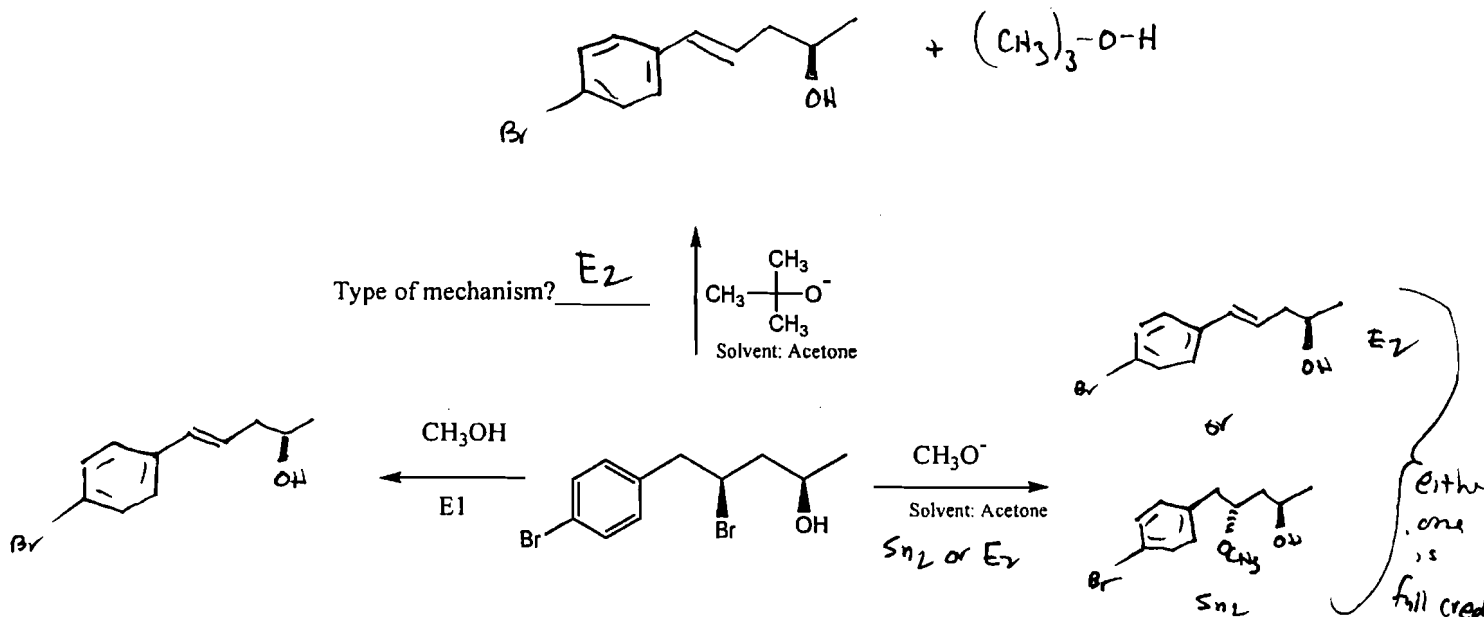
3 (3 pts). Which of the following compounds will undergo an Sn2 reaction most readily (circle one).



b. (3 pts) Briefly State the reason for your choice above.

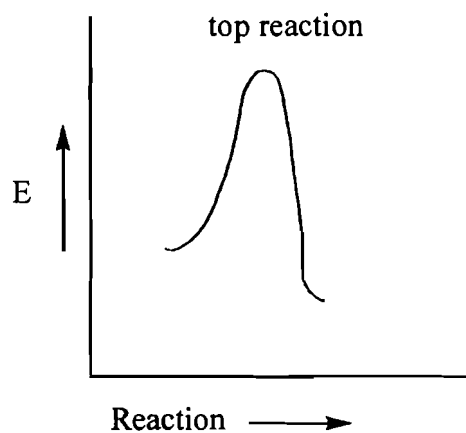
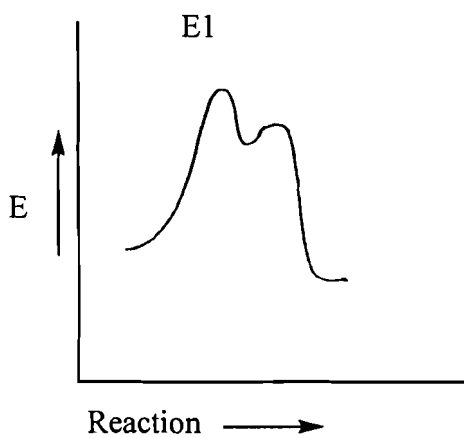
1° substrate and Br⁻ Better leaving group than Cl⁻

4. a. (18 pts-6 pts each) Draw the products for the following reactions (the mechanism is given for some reactions). For the top reaction declare what type of mechanism it is. Be sure to show the stereochemistry of the products.

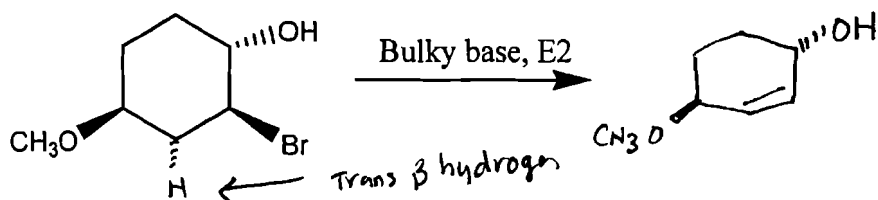


b. (3 pts) For the **E1 reaction** above draw the reaction coordinate diagram in the space provided below.

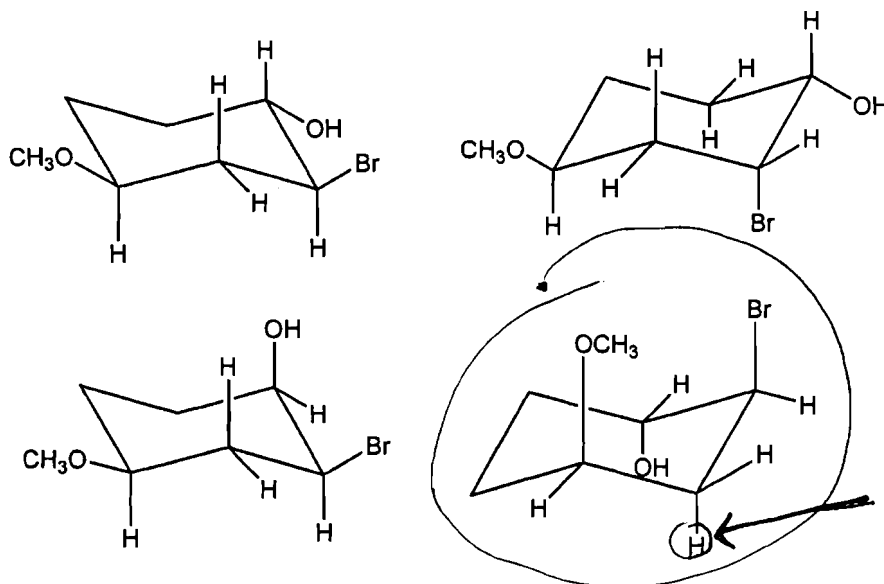
c. (3 pts) For the **top reaction** above draw the reaction coordinate diagram in the space provided below.



5. a (4 pts) For the reaction below draw the product of the E2 reaction.

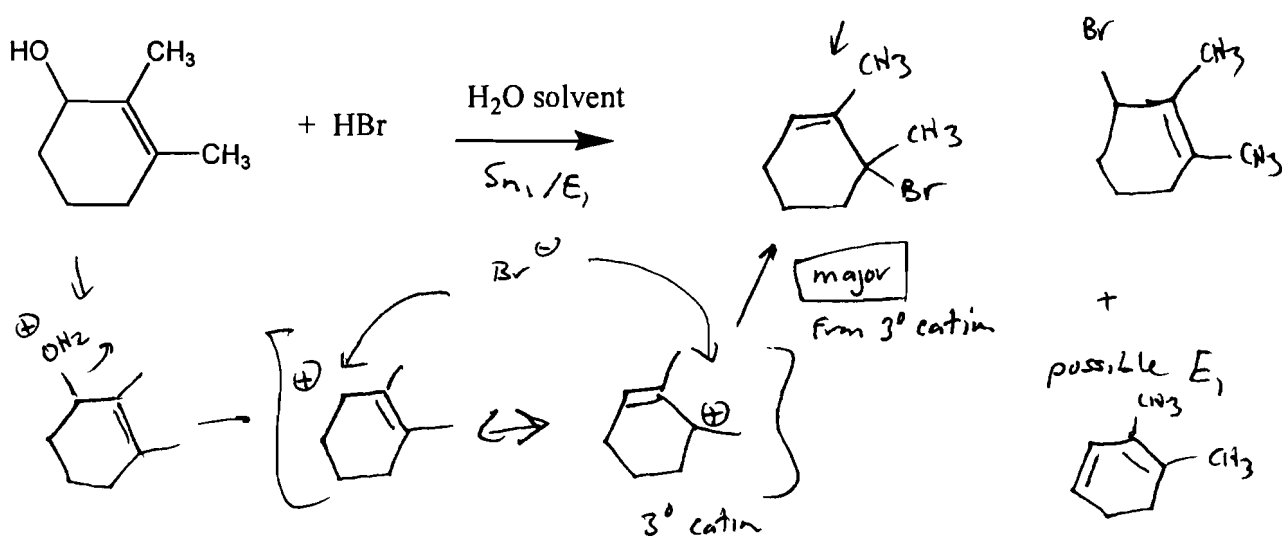


b. (3 pts) Of the chair conformations shown below, **circle** the conformation that represents the conformation that would be present for the E2 reaction above to occur.

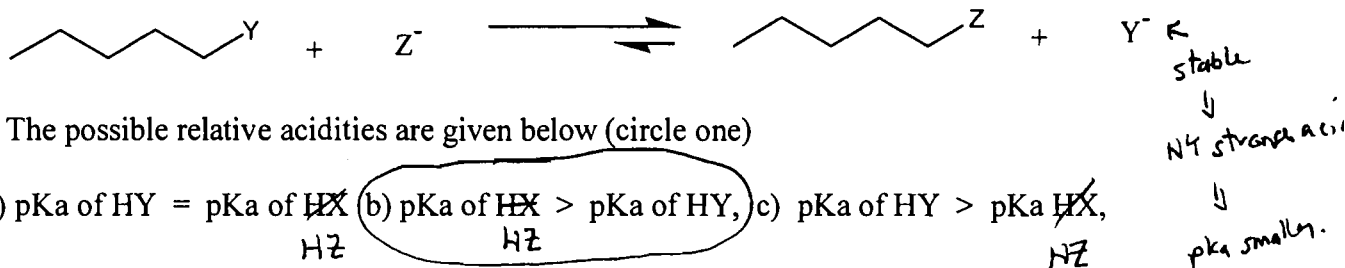


c. (3 pts) Draw an arrow (\rightarrow) to the hydrogen (in the structure that you circled), that would be pulled by the bulky base.

6. (6 pts) Draw the major organic product for the reaction below. *Best answer*

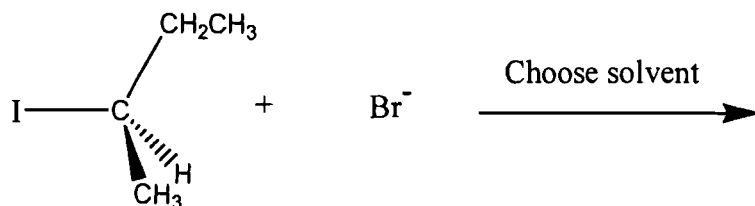


7. (4 pts) Based on the following Sn2 reaction, relate the relative acidities of the variable elements 'Y' and 'Z'. Note that the equilibrium arrows state that the reaction is shifted to the right,



8. For the reaction below choose (circle) one of the 3 solvents to run the reaction:

Acetone, Water, or Ethanol



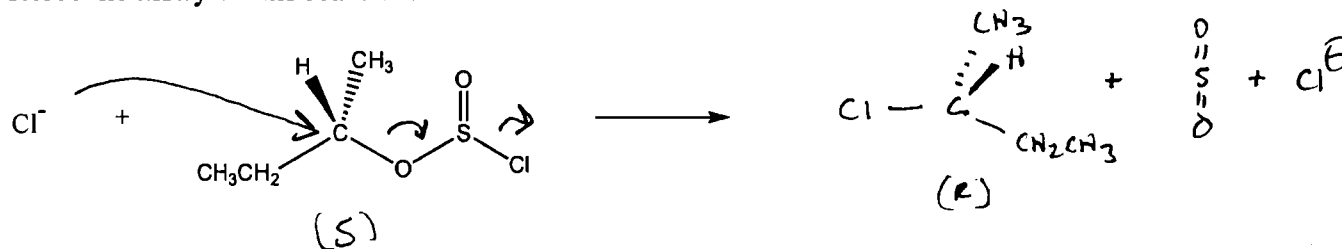
Given your choice of solvent above answer the following:

a) (2 pts) Is your solvent choice a polar protic or polar aprotic solvent? Acetone → polar aprotic

b) (3 pts) Is the reaction mechanism Sn1, E1, Sn2 or E2 ethanol/H2O → Sn1/E1

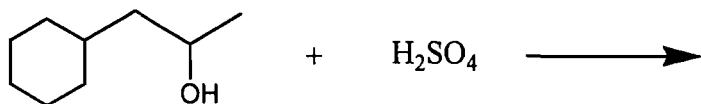
c) (2 pts) If I (Iodine) is replaced by an OH will reaction still occur? NO - Bad leaving group.

9. (7 pts). Draw **arrow pushing mechanism** for the last step of the reaction of alcohol with thionyl chloride (SOCl₂). Draw all the products and be sure to depict the pertinent stereochemistry of this reaction.



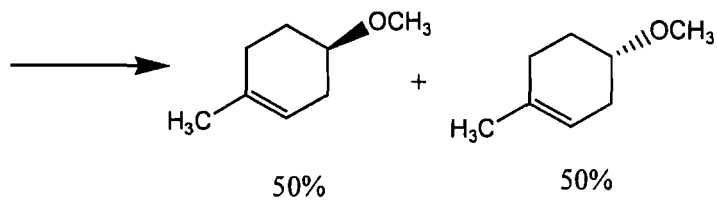
10. Answer only one (A or B) of the following two mechanism question—**clearly state which one you want graded**. Note: B is worth 3 more points as it is more challenging

A) (14 pts) For the Dehydration of the alcohol with sulfuric acid draw the **arrow pushing mechanism**.



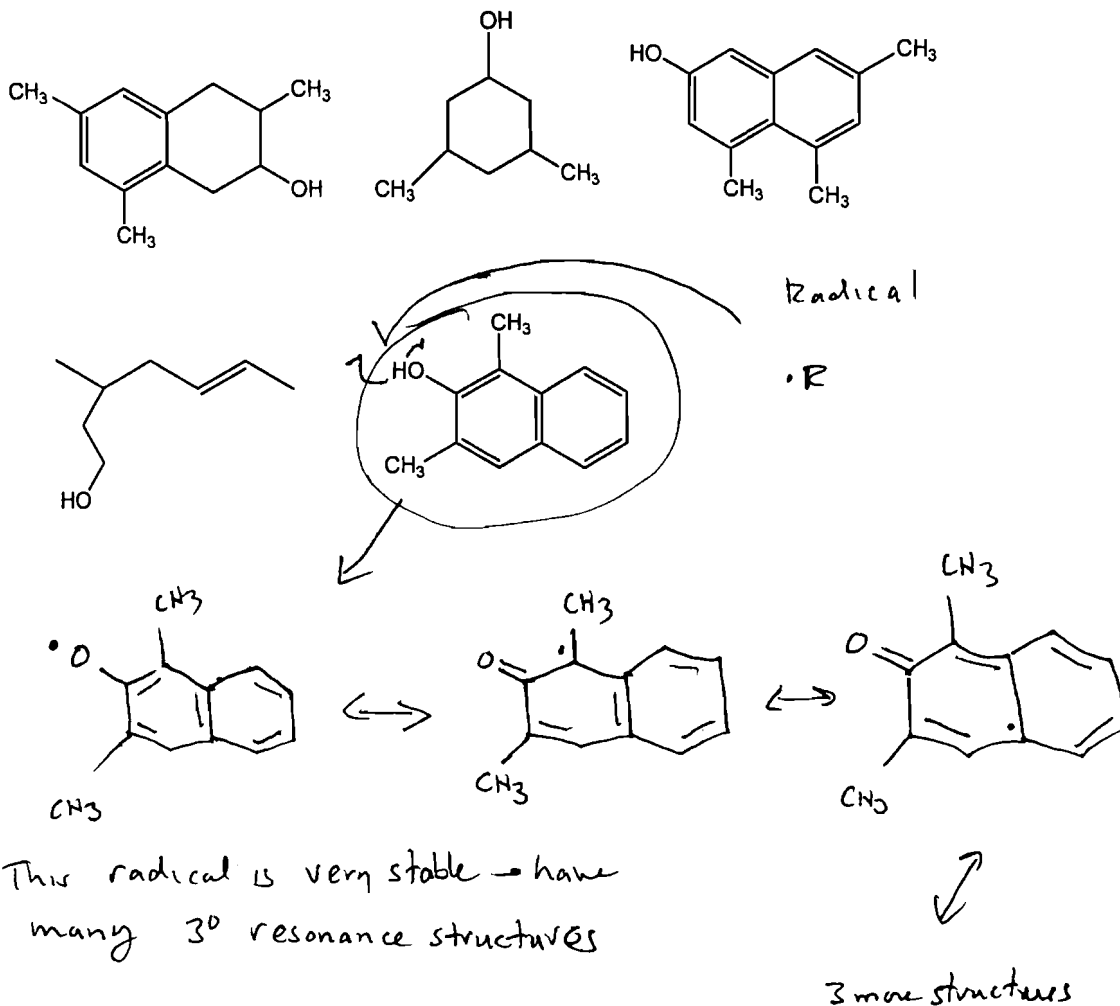
See Key for A version

B) (18 pts) Show the arrow **pushing mechanism** for the reaction that would produce the two products shown. Use the appropriate starting compound and solvent that would make both products.



See Key for A version

11. (7 pts) Circle the compound below would you consider to be the best possible 'anti oxidant'. Briefly explain why (Hint: Your explanation should show at least one resonance structure.)



Extra credit: (2 pts) What reaction mechanism did Julius Caesar refer to at the moment of his death in 44 BC.

E_2 Brutus, E_2 ?

(2 pts) Which Question(s) in this exam were produced by fellow students?

3, 7, 8, 10B