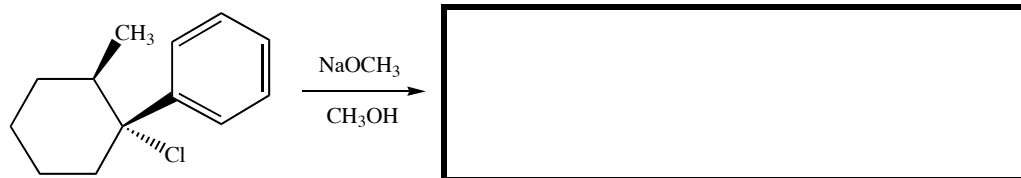


All questions on this page refer to this reaction:



- (2 points) Write the major **E2** product of this reaction in the box above.
- (5 points) Write the **E2** reaction mechanism. Include the transition state structure of the rate-determining step. OK to use "Ph."
- (4 points) Will this **E2** reaction proceed at a reasonable rate (circle one): Yes No
Very briefly explain your reasoning (20 words or less).

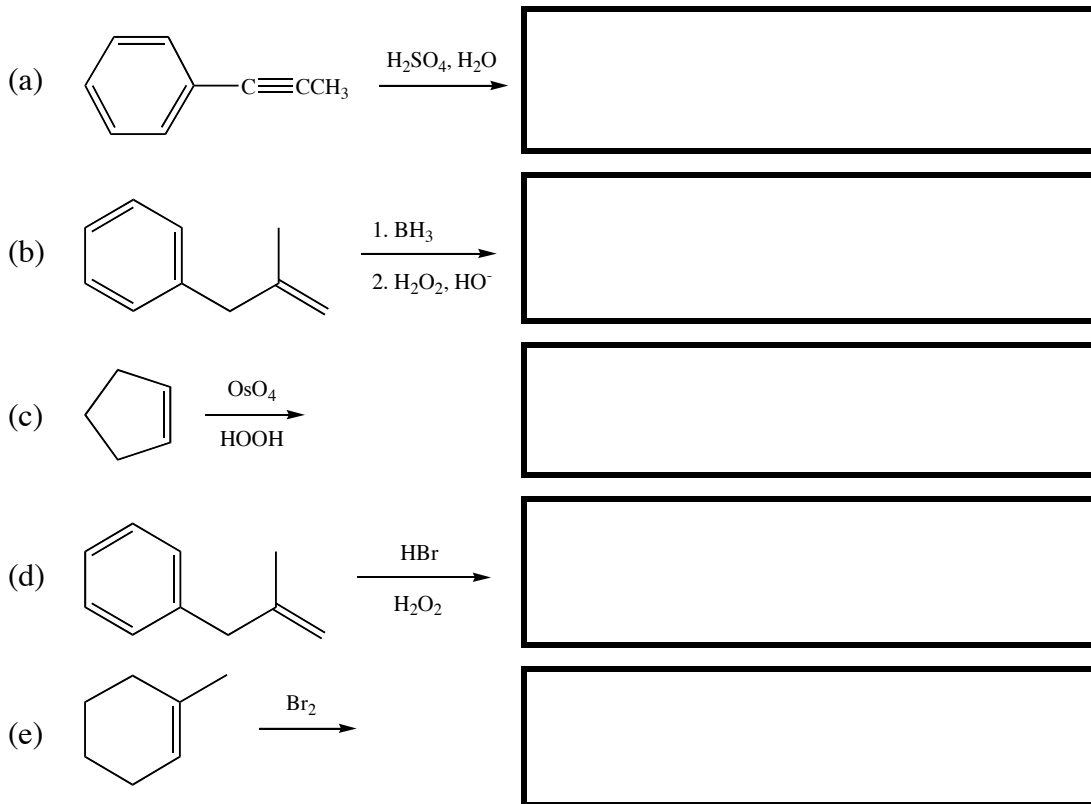
- (7 points) By adding, subtracting or otherwise changing at most six atoms anywhere in the reaction (electrophile, solvent, base, nucleophile, product, etc.) rewrite the reaction so that it must *obviously* proceed by an **E1** mechanism. Include the major product and reaction mechanism. OK to use "Ph."

Revised reaction:

Mechanism:

- (6 points) Short answer: Finish each sentence in twenty words or less.
 - The revised reaction does not occur by the E2 mechanism because...
 - The product I've written for the E1 reaction is the major product because...

6. (15 points) Write the organic product(s) in the boxes. If more than one organic product is formed, indicate which product is major. Be sure to indicate stereochemistry if relevant. If no reaction occurs, write "NR." *Do not include any mechanism details.* OK to use "Ph."



7. (5 points) Fill in the blank and complete each sentence in ten words or less.

(a) The reaction of BH_3 with a carbon-carbon pi bond is called _____.

(b) BH_3 is an electrophile because...

(c) HBr is an electrophile because...

8. (2 points) Circle the best answers.

(a) The reaction of BH_3 with an alkene is: Markovnikov anti-Markovnikov Zaitsev

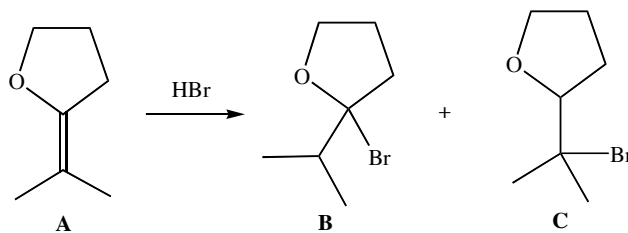
(b) The reaction of BH_3 with an alkene involves a carbocation:

Never Sometimes Always

9. (3 points) Circle all the adjectives that describe the reaction of an alkene with H_2/Pt .

Syn Anti Electrophilic Not electrophilic Concerted Stepwise

All questions on this page refer to this reaction:



10. (2 points) Complete this sentence in ten words or less: This is an addition reaction because...

11. (1 point) Circle the major product of the reaction: A B C

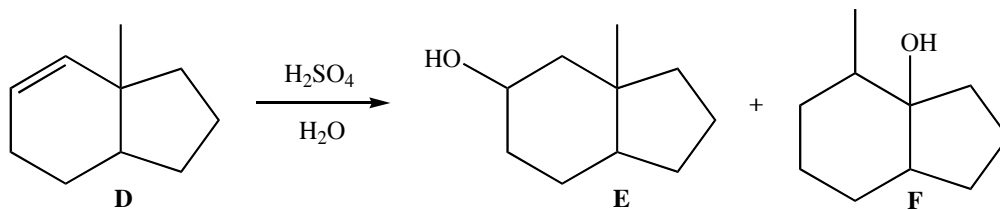
12. (5 points) Provide a mechanism for the formation of the major product. Label the rate-determining step as "rds."

13. (2 points) Does this reaction obey Markovnikov's Rule (circle one)?

Yes No Rule not applicable

14. (3 points) By adding, subtracting or otherwise changing at most three atoms of the nucleophile, rewrite the reaction so that it is obviously slower. Include the major product, but not the reaction mechanism.

Questions 15 and 16 refer to this reaction:



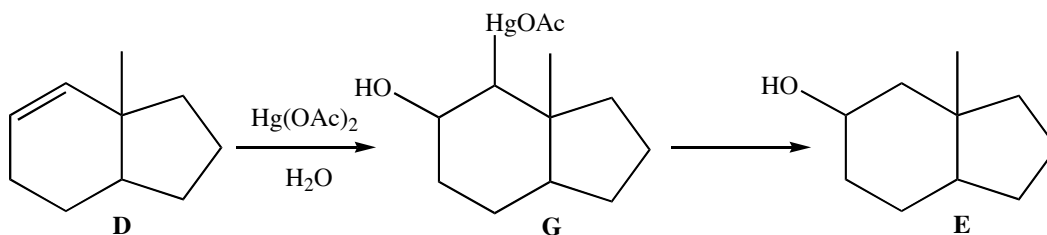
15. (10 points) Provide a mechanism.

16. (6 points) Complete each sentence in 15 words or less.

(a) No reaction occurs if pure H_2O is used instead of $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ because...

(b) No reaction occurs if $\text{KOH}/\text{H}_2\text{O}$ is used instead of $\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ because...

17. (8 points) Provide a mechanism for this partial reaction, which leads to product **E**. Also provide the reagent(s) for the transformation of **G** into **E**.



18. (3 points) Reaction of molecule D (previous page) with $\text{Hg}(\text{OAc})_2/\text{H}_2\text{O}$ then NaBH_4 gives product E but not product F. Briefly explain (20 words or so).

19. (2 points) Draw all of the important resonance contributors for the secondary radical formed by removal of a hydrogen atom from isopropyl methyl ether, $\text{CH}_3\text{OCH}(\text{CH}_3)_2$.

20. (9 points) Circle the major product of this reaction, and provide a mechanism for its formation.

