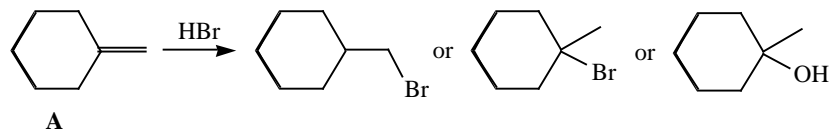
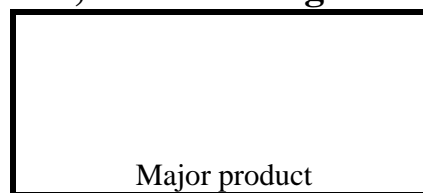
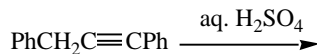


1. Consider this reaction:



- (a) (3 points) Circle the major product of this reaction.
- (b) (5 points) Write a complete mechanism for the formation of the major product. Label the rate-determining step as "rds."
- (c) (8 points) Briefly explain your choice of major product.
- (d) (8 points) Briefly explain your choice of the rate-determining step.
- (e) (3 points) By adding, subtracting or otherwise changing at most three atoms of molecule **A**, rewrite the reaction so it is obviously faster. Include the reaction products but not the mechanism.

2. Consider this reaction:



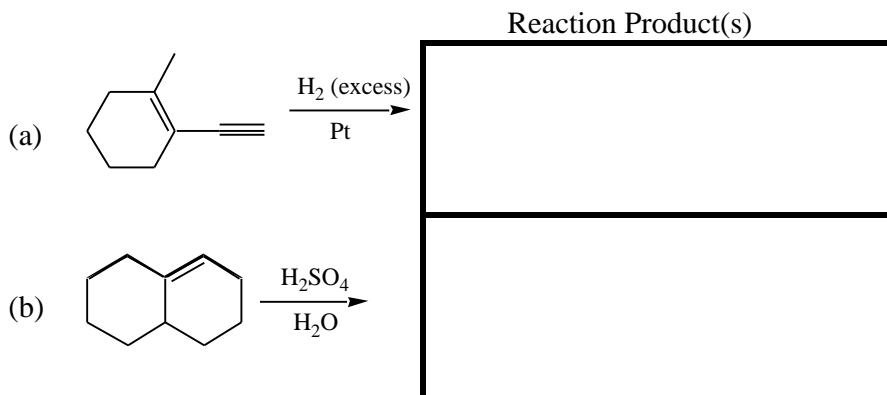
(a) (3 points) Write the major reaction product in the box.

(b) (10 points) Write the complete mechanism for the formation of this major product.

(c) (2 point) Does this reaction obey Markovnikov's Rule (circle one):

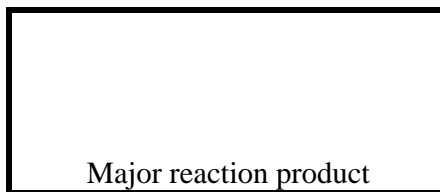
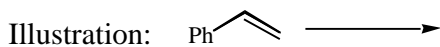
Yes No Cannot determine

3. (6 points) In the boxes draw the organic product(s) for each reaction. If more than one product is formed, indicate which is major, if possible. If no reaction occurs write "NR." Do not include any mechanism details. Pay careful attention to stereochemistry.



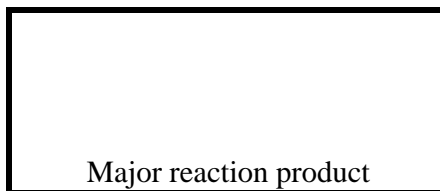
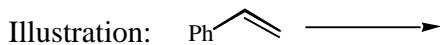
4. (21 points) Each electrophile listed below can undergo addition to an alkene. In each case briefly explain why the molecule is an electrophile (two sentences should be adequate), then illustrate its electrophilicity by writing its reaction with $\text{PhCH}=\text{CH}_2$. Include all necessary reactants, and write the major reaction product in the box.

(a) Electrophile = $\text{Hg}(\text{OAc})_2$



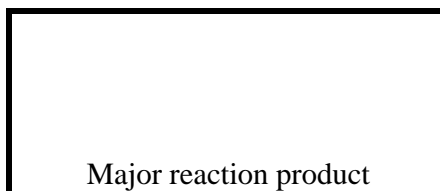
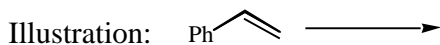
Explanation:

(b) Electrophile = BH_3



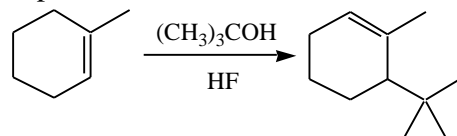
Explanation:

(c) Electrophile = Ozone

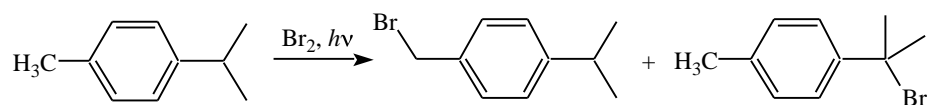


Explanation:

5. (8 points) Provide a complete mechanism.

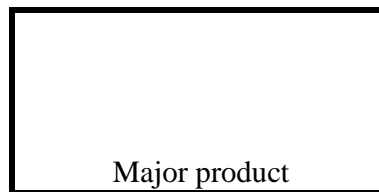
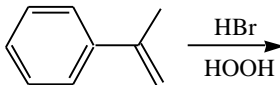


6. Consider this reaction:



- (a) (3 points) Circle the major product.
(b) (10 points) Provide a complete mechanism for the formation of the major product. Include all important resonance contributors.

7. Consider this reaction:



(a) (3 points) Write the major product of this reaction in the box.

(b) (9 points) Provide a complete mechanism for the reaction.