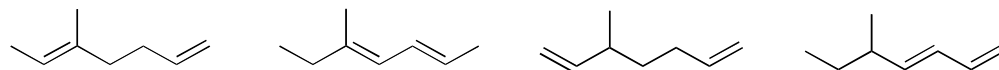


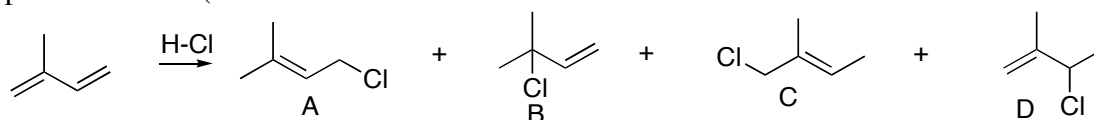
1. Rank the heats of hydrogenation for the following, 1 being most heat released and 4 being least heat. (Think: will the more stable isomer release more heat or less heat when it is hydrogenated?)



2. Rank the rate of reaction of the following toward  $S_N1$  substitution ( $AgNO_3/CH_3CH_2OH$ ), 1 being most reactive and 4 being least reactive. (Think: what determines the rates for  $S_N1$  reactions?)

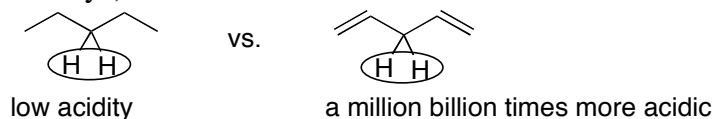


3. Products **A** and **B** combine to make up over 90% of the product mixture. Products A+B come from one common intermediate. Draw the intermediate and explain why products A/B dominate over products C/D. (Think: what determines the rate of reaction for an HCl addition reaction to alkenes?)

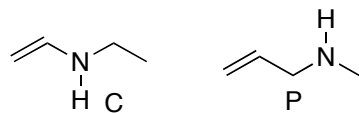


4. Draw the mechanism for formation of products A and B above.

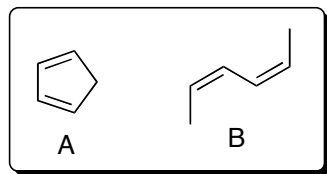
5. 1,4-pentadiene is much more acidic than pentane. Explain why. (Think: what determines acidity?)



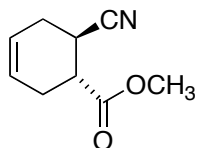
- 6a. Which is more stable, C or P?
- b. What is the overall hybridization of the N atom in C?
- c. What is the hybridization of the N lone pair in C?
- d. What is the overall hybridization of the N atom in P?
- e. What is the hybridization of the N lone pair in P?
- f. Given that amines with  $sp^3$  lone pairs are more basic than amines with p lone pairs, which is more basic, C or P?



7. Diels-Alder Reactivity: Explain why diene **A** is more than a million times more reactive than diene **B**.



8. Give the reactants (including stereochemistry) that would give the following D-A product.



9. Draw the major Diels-Alder product.

