Problem Set #3 Chem 260

1. Show the product(s) formed in the following reactions. Be sure to clearly show stereochemistry and regiochemistry of all major products where appropriate.

a) 1) HBr, 2) CH_3OH, Δ

b) Cl_2, H_2O

c) H_2, Pd/C (enantiomers)

d) ^-O Na^+

e) $CH_3CH_2O^-Na^+$, CH_3CH_2OH

f) H_2SO_4, Δ

g) H_2, Pd/C (enantiomers)

h) H^+, H_2O

i) Br_2 (enantiomers)

j) $NaNH_2$

k) $CH_3CO_2^-$ Na^+

l) 1) HBr, 2) KCN, Δ

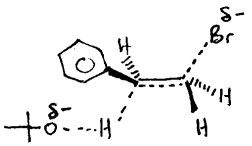
m) H_2SO_4, Δ

n) $CH_3O^-Na^+$, CH_3OH

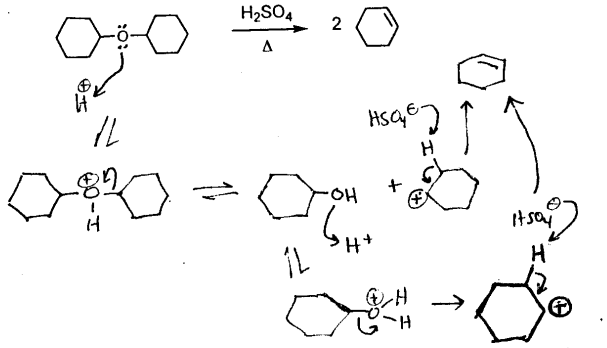
o) HBr (diastereomers)

p) CH_3NH_2

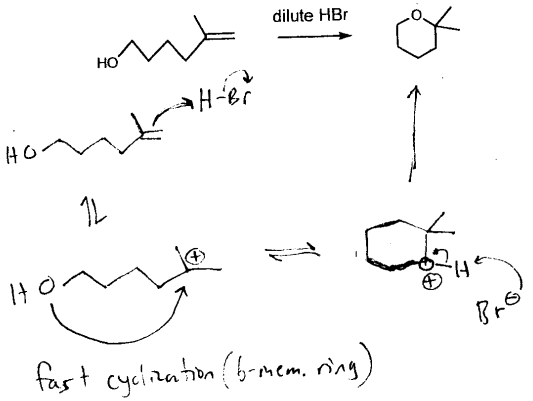
2) Draw the transition state for the reaction shown in question 1d.



3) Draw a mechanism that can explain how the following reaction takes place.



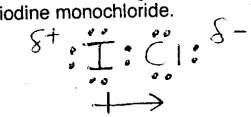
4) Draw a mechanism that can explain how the following reaction takes place.



fast cyclization (6-mem. ring)

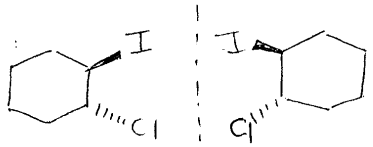
5) Iodine monochloride (ICl) is an effective reagent for the introduction of two different halogen atoms into an organic molecule.

a) Draw a Lewis structure of ICl. Using the polarity arrow ⟶ indicate your prediction of the bond dipole in iodine monochloride.



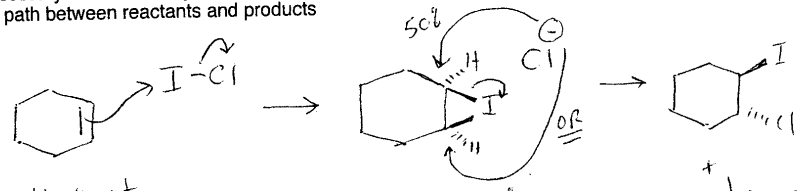
(Cl is more electronegative)

b) Provide the product(s) of the reaction between iodine monochloride and cyclohexene.



both trans enantiomers

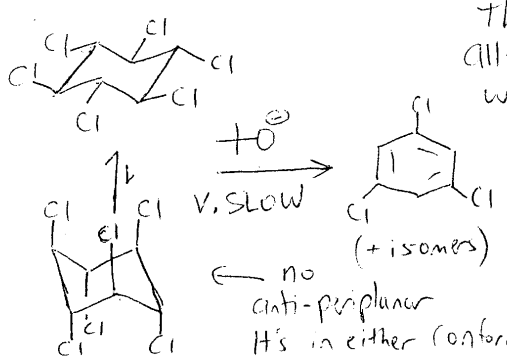
c) Using the curved arrow formalism to represent electron movement, provide a mechanistic rationale for this transformation. Although the depiction of "transition states" is not necessary for full credit, your answer should clearly describe any reaction intermediates on the path between reactants and products



attack at more positive atom

+ enantiomer

6) There are nine possible stereoisomers of 1,2,3,4,5,6-hexachlorocyclohexane. All of them will react with excess potassium t-butoxide to give trichlorobenzene ($C_6H_3Cl_3$). One stereoisomer reacts 10,000 times slower than the others. Draw the structure of the slowest reacting stereoisomer and briefly explain why this stereoisomer reacts so slowly.

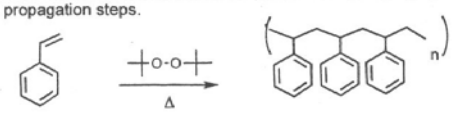


← no anti-periplanar H's in either conformation

The reaction of the all-equatorial isomer will be very slow since there is no possibility for an anti-periplanar arrangement between a Cl and an H in either conformation

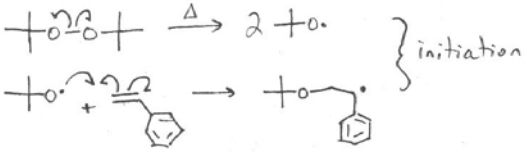
∴ V. SLOW E2 ELIMINATION

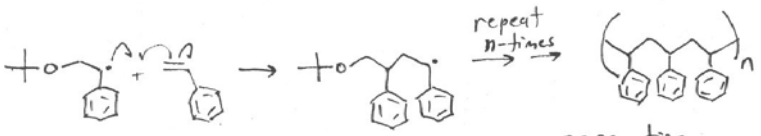
7) a. Draw a mechanism for the polymerization of styrene to give polystyrene. Include both initiation and propagation steps.



stryrene

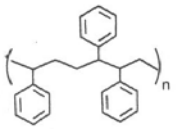
polystryrene





propagation

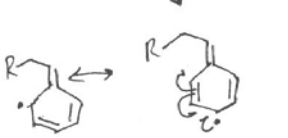
b) Explain why the phenyl groups always alternate in the polymer.



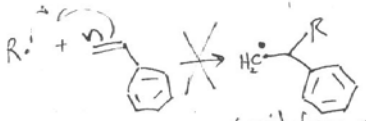
not formed!!

radical allways adds to the end that generates the more stable radical

stable benzylic radical



four resonance structures!



wont form, much less stable