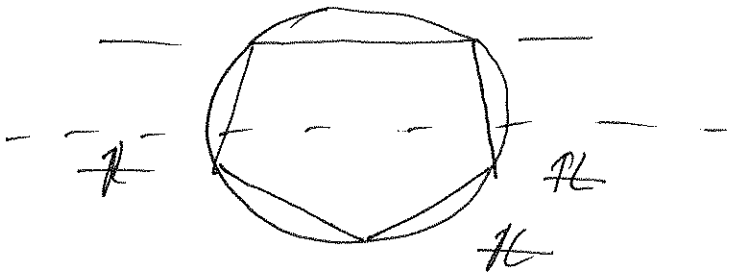
Problem set 2 – Answers

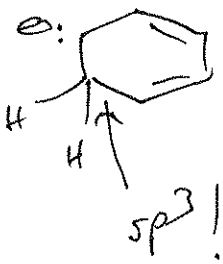
1. 

Aromatic

6 π e⁻, ~~[illegible]~~ planar, cyclic, fully conjugated

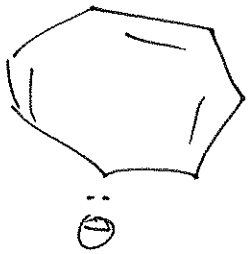


All e⁻ paired, in bonding orbitals

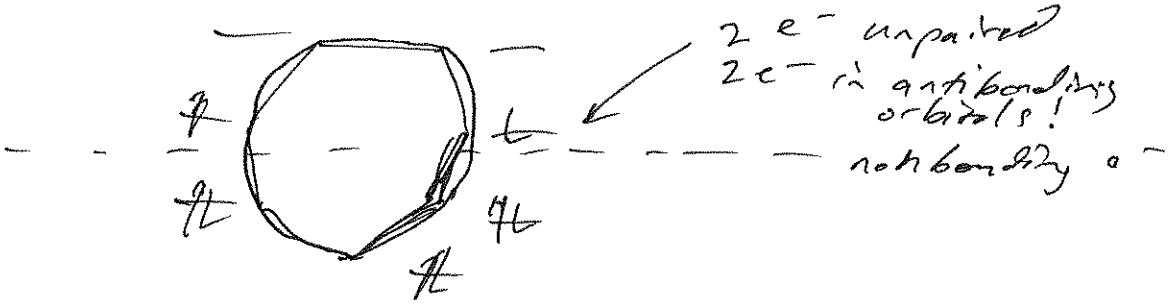
2. 

not fully conjugated

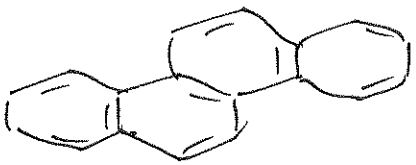
⇒ not aromatic



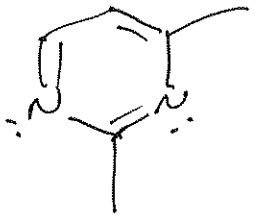
8 π e⁻! ⇒ not aromatic



2 e⁻ unpaired
2 e⁻ in antibonding orbitals!
nonbonding e⁻

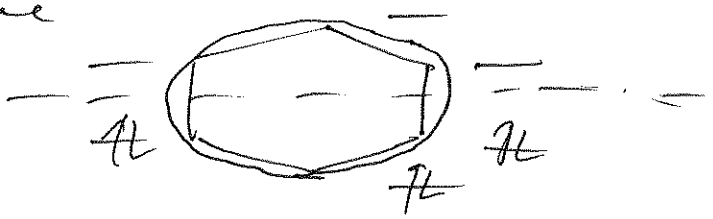


planar
cyclic
fully conjugated
$4n+2$ π e⁻
(18 π e⁻ = 4(4) + 2)
⇒ aromatic



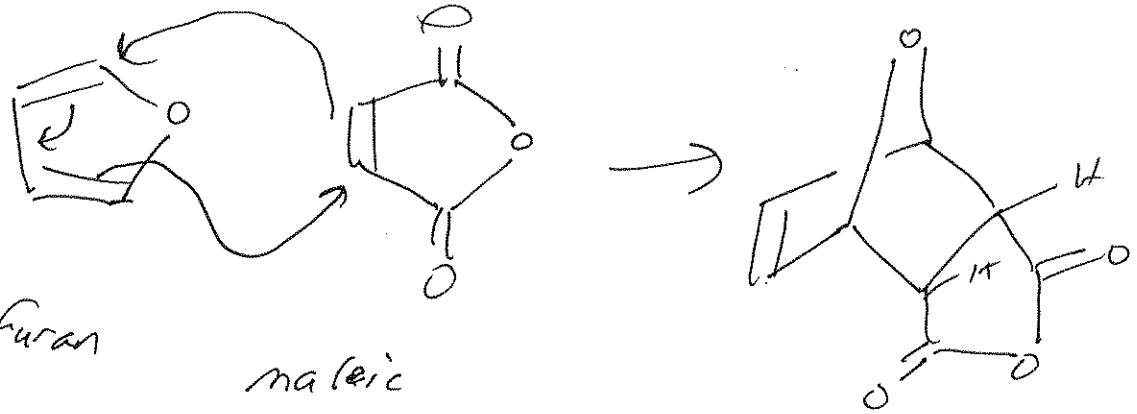
planar
cyclic
$4n+2$ π e⁻ (6 π e⁻)
fully conjugated ⇒ aromatic

As benzene



All e⁻ paired ∴ bonding orbitals

2.



furan

maleic anhydride

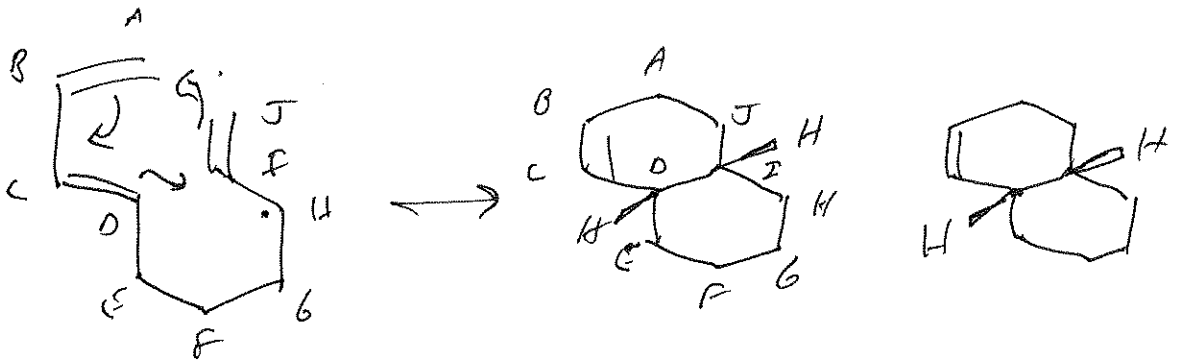
endo

furan: highly electron-rich

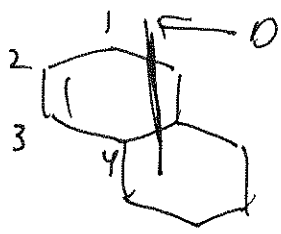
electron-donating oxygen at

2 positions raises Homo

energy ⇒ fast Diels-Alder



Note: in reverse, see Diels-Alder via alkene

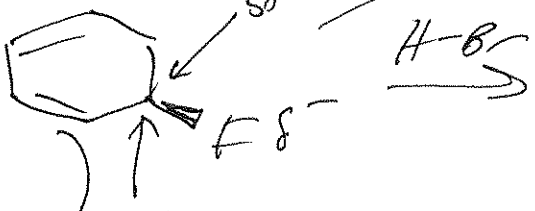


Diels-Alder forms bonds to C1

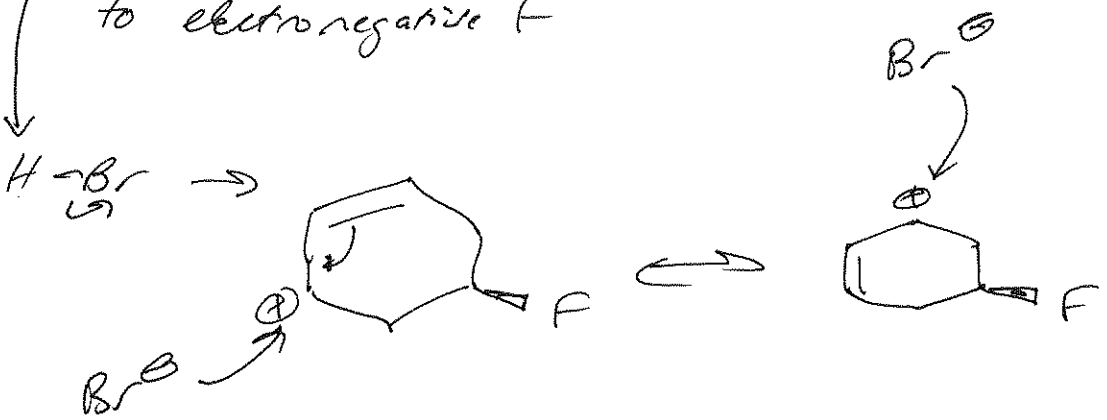
and C4, resulting in

alkene between C2 and C3

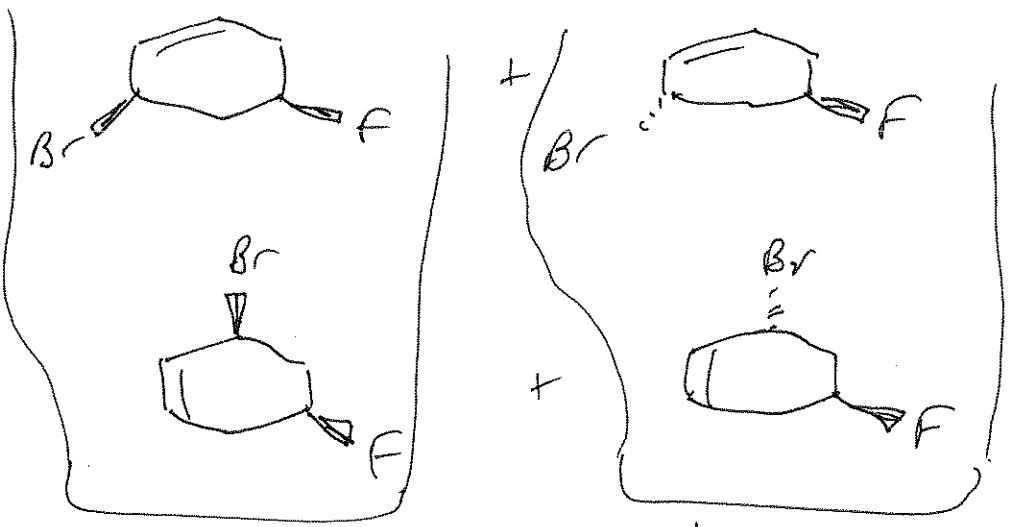
stereochemistry set ⇒ single enantiomer



δ⁺ here due to electronegative F



products from $Br^{\ominus}$ attack at either position and from either face of ring, generates 4 products in theory



these are enantiomers!

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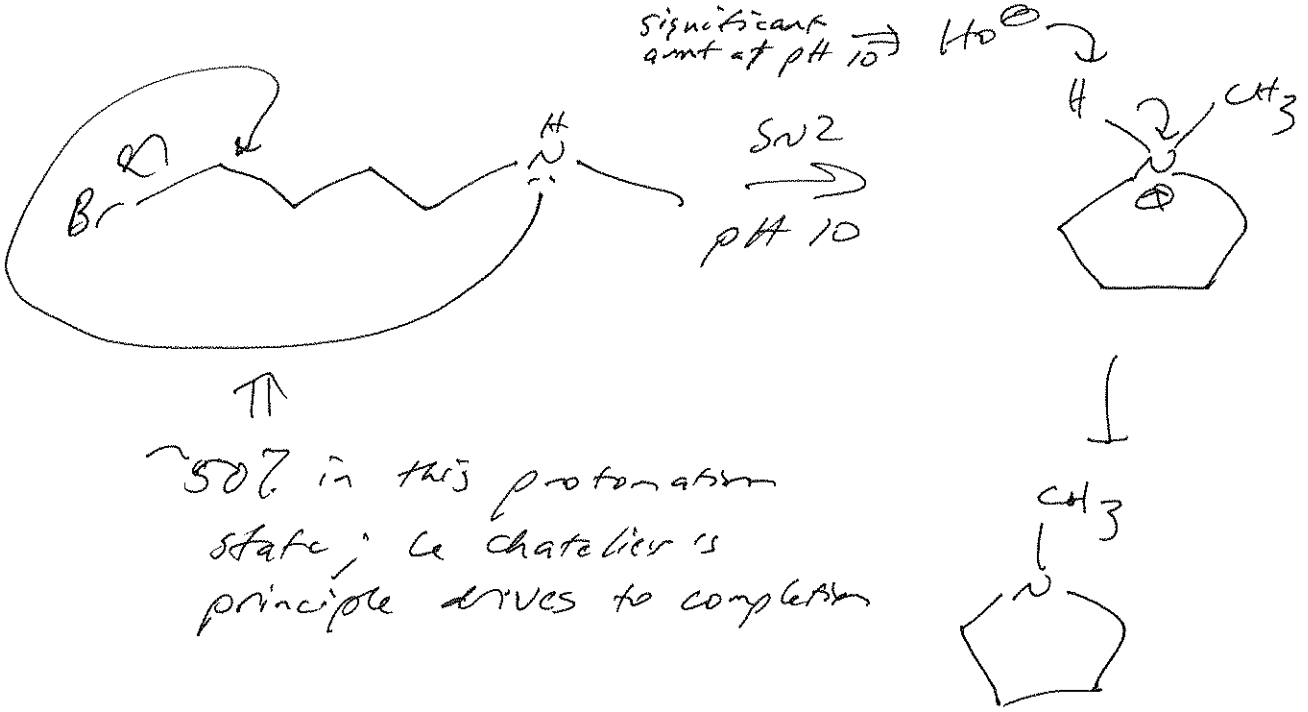
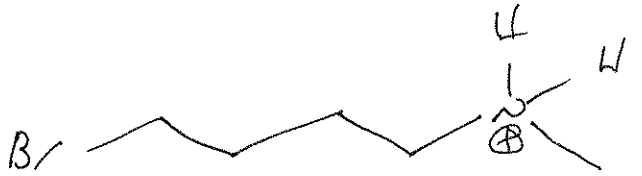


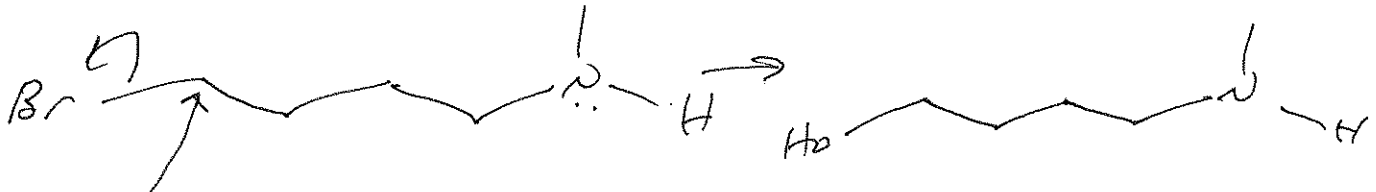
pH 5



⇐ almost exclusively

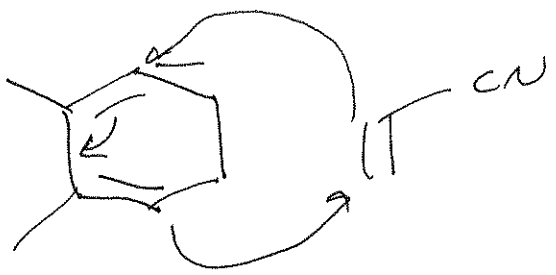
⇒ no nucleophile, no reaction

pH 15

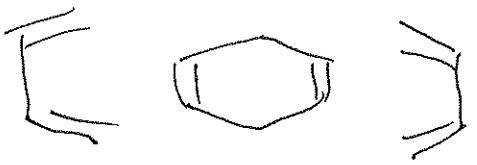


⇐ $[^-OH]$ is 10^5 higher at pH 15 than pH 10 ⇒ fast

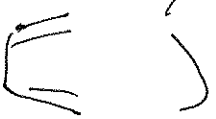
3.



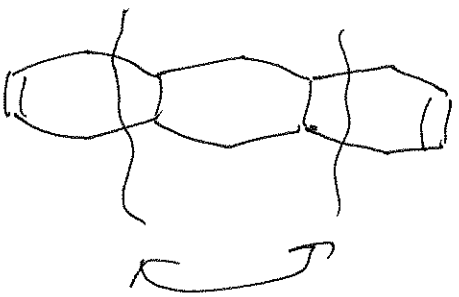
⟶ adt.



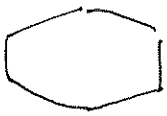
⟶ 2 sequential Diels-Alder rxns. (If use 2. equiv.



(see as



bonds formed by Diels-Alder



⇒

⇒

∴

Diels-Alder Δ ⟶

H_2 / Pd/C ⟶