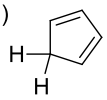
FRO-III-2022 CORRECTION OF QUESTIONS OF THE WEEK 1

1)

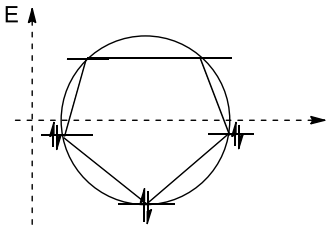
a) 

cyclopentadiene is non-aromatic since it contains a sp^3 carbon.

b) 

cyclopentadienyl anion is **aromatic** because it fullfills all Huckel rules: monocyclic, planar, all sp^2-hydridized atoms and contains 6 π electrons (4n+2, n=1).

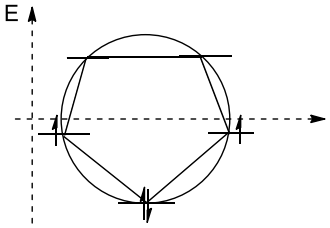
Frost-Musulin Cycle:



no unpaired electrons

c) 

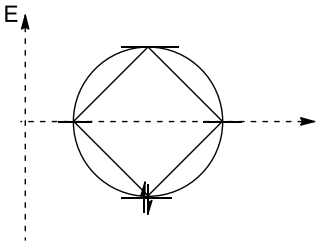
cyclopentadienyl cation is **anti-aromatic** as it has 4 π electrons (4n, n=1).



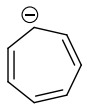
two unpaired electrons

d) 

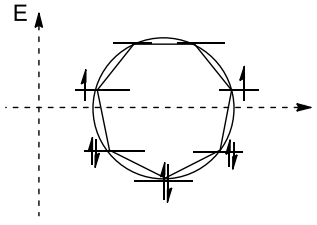
cyclobutenyl dication is **aromatic** as it has 2 π electrons (4n+2, n=0).



no unpaired electrons

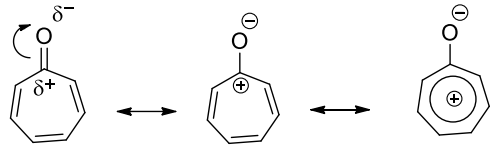
e) 

cycloheptatrienyl anion is **anti-aromatic** as it has 8 π electrons (4n, n=2).

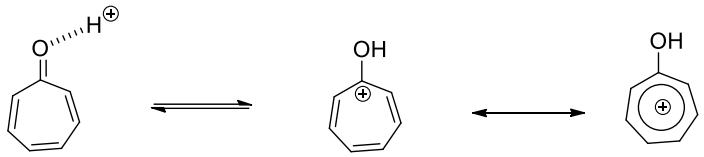


two unpaired electrons

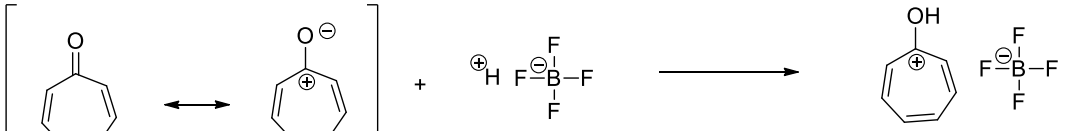
2)



aromatic 6 π electrons



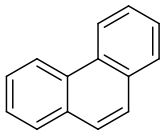
The basicity of tropone is due to aromatic stabilization of the aromatic cycloheptatrienyl cation (tropyllium) ion. This species is aromatic and hence is stabilized by mesomeric resonance.



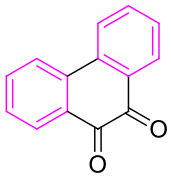
tropone

stable aromatic salt

3)

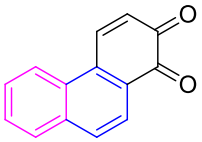


phenanthrene



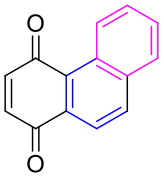
1

2 benzoid ring



2

1 benzoid ring
+ 1 quinoid ring



3

1 benzoid ring
+ 1 quinoid ring

Benzoid rings have more mesomeric stabilization than quinoid rings. The most stable product i.e the one containing the most benzoid rings will be formed preferentially. So product **1** is formed in the oxidation of phenanthrene with $KMnO_4$.