

1. Which of these molecules are aromatic / antiaromatic / non-aromatic? Use the Hückel-rules and draw Frost-Musulin cycles to justify your answer.



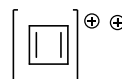
a)



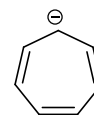
b)



c)



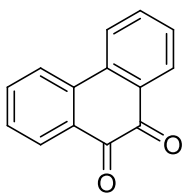
d)



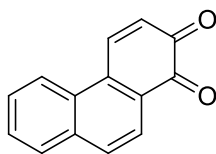
e)

2. Tropone (sum formula: C_7H_6O) is a **cyclic ketone**. It is protonated by tetrafluoroboric acid ($H^+BF_4^-$) and then forms a stable salt. Draw the structure of tropone and its salt. Why is it much easier to protonate it compared to cycloheptanone?

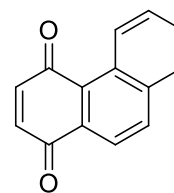
3. Phenanthrene can be oxidized with $KMnO_4$ into a single diketone compound. Which product isomer (**1**, **2** or **3**) is formed? Provide a brief explanation justifying your choice.



1



2



3