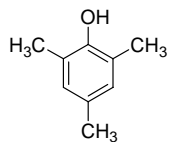
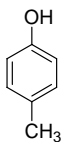


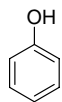
Consider the following phenols.



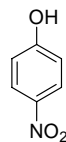
a.



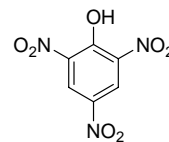
b.



c.



d.



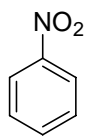
e.

1. Which of phenols is the strongest acid? **e**
2. Which of phenols is the weakest acid? **a**

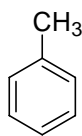
Consider the following monosubstituted benzenes.



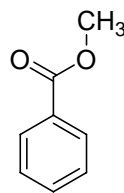
(a)



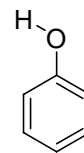
(b)



(c)



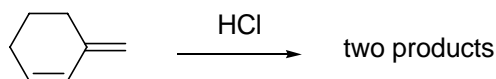
(d)



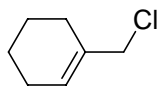
(e)

3. Which is the most activated with respect to bromination? **e**
4. Which is the most deactivated with respect to bromination? **b**

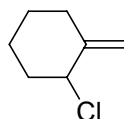
Consider the following addition reaction.



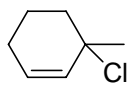
Here are some possible products. (Chiral products would include their enantiomer.)



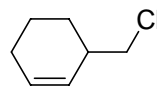
(a)



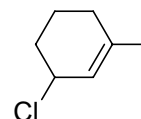
(b)



(c)



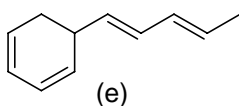
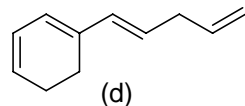
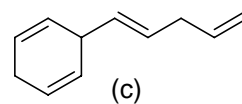
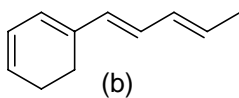
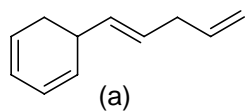
(d)



(e)

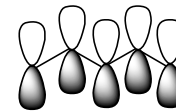
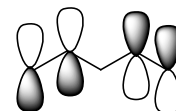
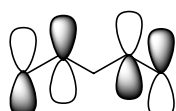
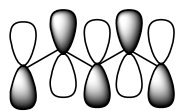
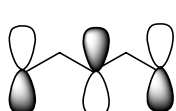
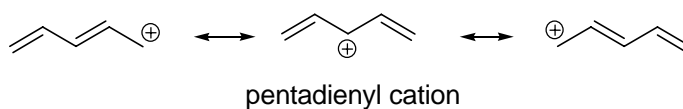
5. Which compound would be the predicted kinetic product? **c**
6. Which compound would be the predicted thermodynamic product? **e**

Consider the following isomeric alkenes.



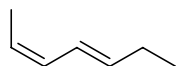
7. Which compound would have an absorption band at the longest wavelength? **b**
8. Which compound would release the most heat upon hydrogenation? (Which would have the most negative ΔH ?) **c**

Consider the π molecular orbitals of the pentadienyl cation.



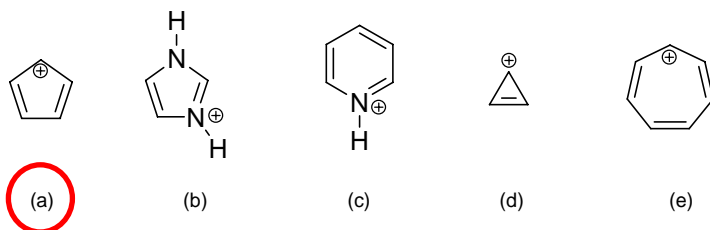
9. Which one of these orbitals is the HOMO of the pentadienyl cation? **d**
10. Which one of these orbitals is the LUMO of the pentadienyl cation? **a**

11. Choose the correct name for the following compound.

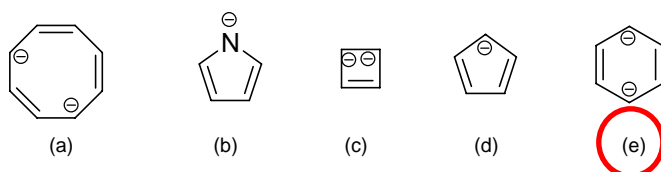


- a. (2Z,5Z)-hepta-2,5-diene
- b. (2E,4E)-hepta-2,4-diene
- c. (2Z,4E)-hepta-2,4-diene**
- d. (2E,5Z)-hepta-2,5-diene
- e. (2Z,4Z)-hepta-2,4-diene

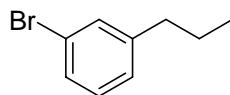
12. Which one of the following cations is antiaromatic?



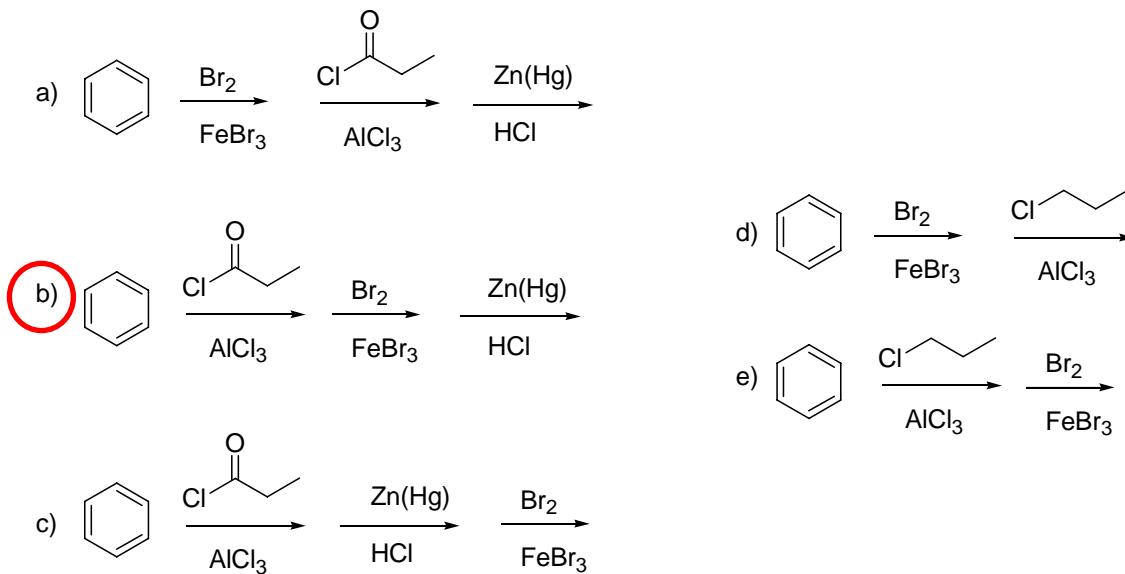
13. Which one of the following anions is antiaromatic?



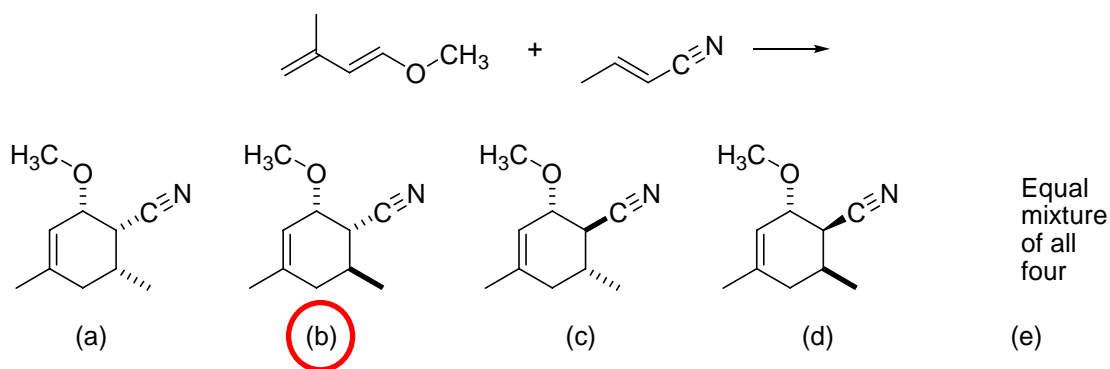
14. Which of the following reaction sequences would be the best for synthesizing the compound, 1-bromo-3-propylbenzene.



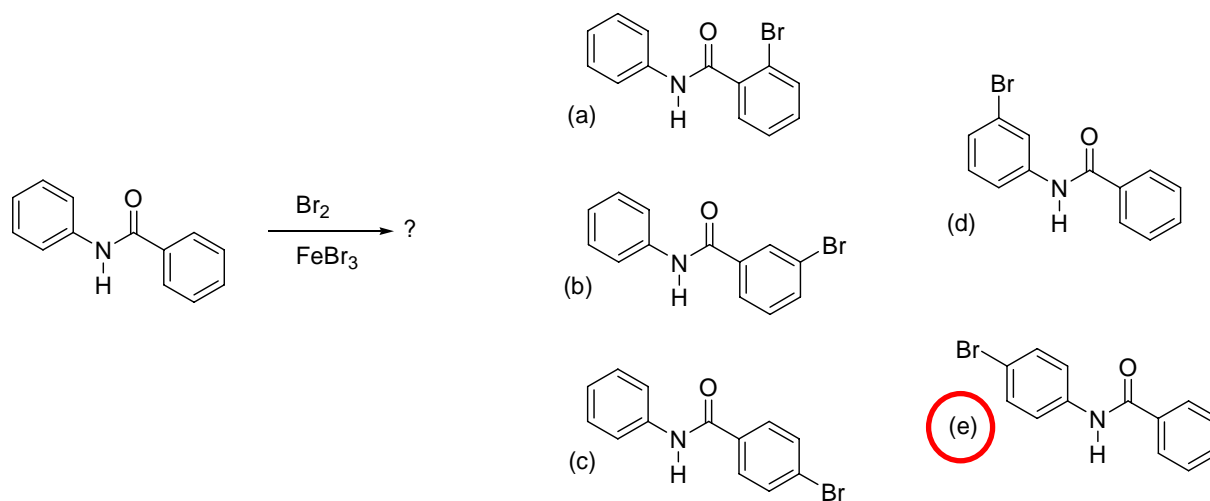
1-Bromo-3-propylbenzene



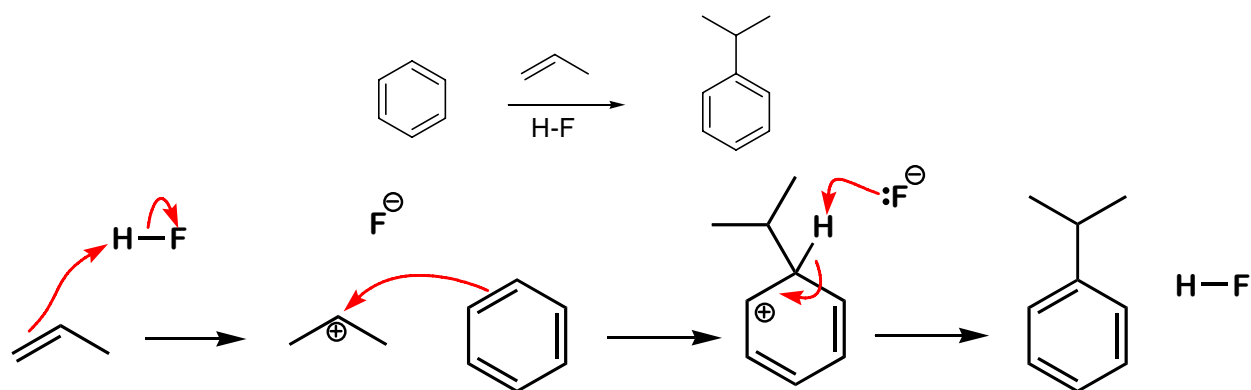
15. Predict the product of the following Diels Alder reaction.



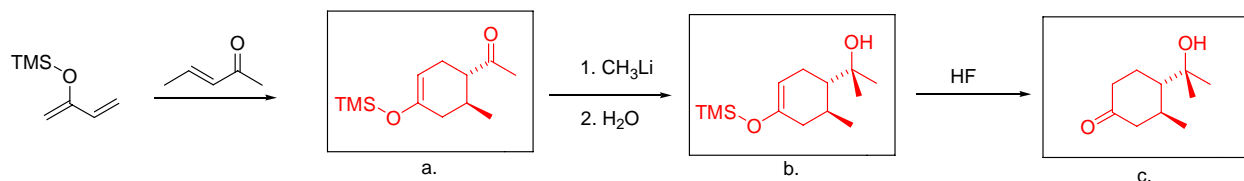
16. Predict the monobromination product obtained from the following reaction.



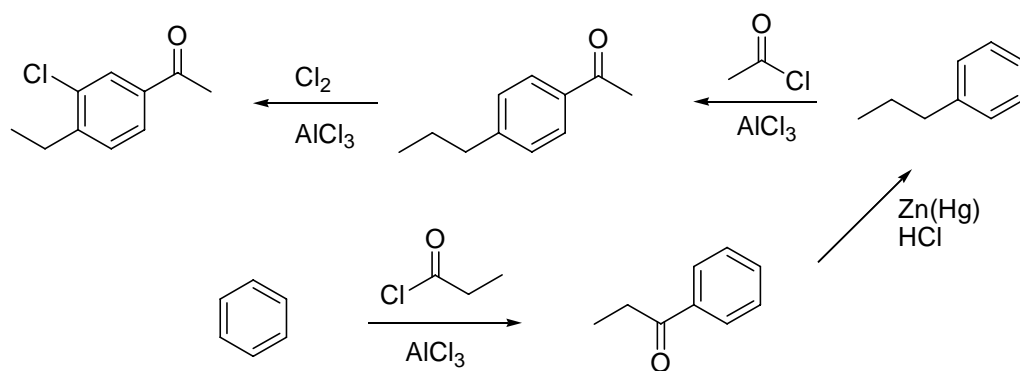
17. Draw a curved arrow mechanism for the following reaction.



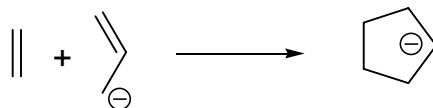
18. Complete the following synthetic roadmap. Give structures for compounds (a), (b) and (c).
Be sure to show all stereochemistry clearly.



19. Propose a synthesis of the compound shown below. Your starting materials can include benzene and any other compounds containing no more than four carbon atoms.

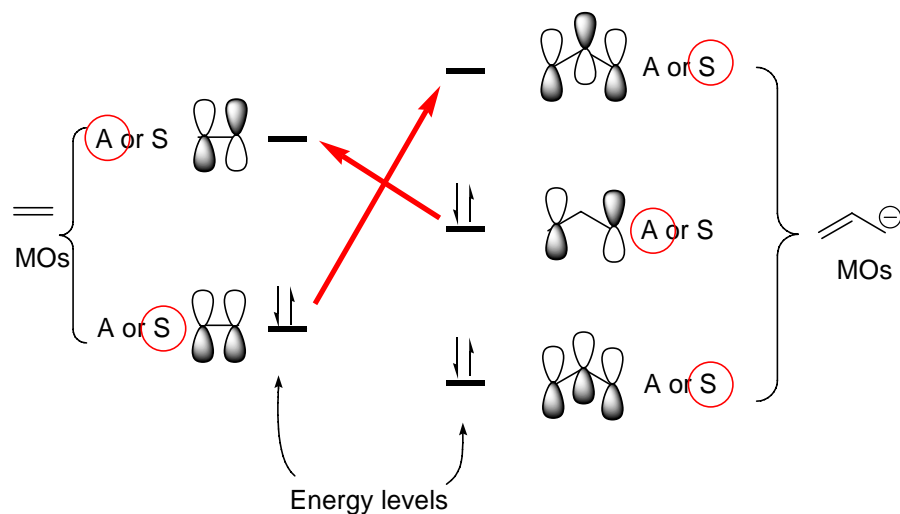


20. The Diels Alder reaction is an example of a cycloaddition reaction. Another possible cycloaddition reaction is the reaction of an alkene with an allyl anion. Complete the MO energy level interaction diagram shown below and determine if the reaction is allowed or forbidden.



Complete the following steps:

- Draw the MOs, ethene on the left, the allyl anion on the right.
- Indicate which levels are occupied with electrons.
- Label each MO as symmetric or antisymmetric by circling (S) or (A) for each MO.
- Indicate if the reaction is allowed or forbidden.



Check one: Allowed Forbidden

Challenge Problem. This question is not part of the regular test. Do not take time to work it until you have completed the rest of your exam.

The compound β -bisabolene is a terpene which has been identified as a trail pheromone of wood termites, *reticulitermes lucifugus*.



reticulitermes lucifugus

Propose a synthesis of racemic β -bisabolene. Your starting materials can have no more than five (5) carbon atoms.

