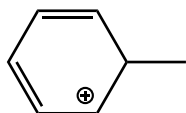


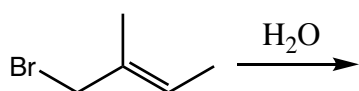
CHM 224
Test 1
Chapters 17, 18, 19

NAME:

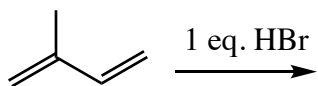
1. Draw all of the important resonance forms for the carbocation below (use proper arrow conventions):



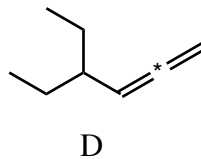
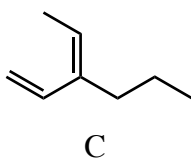
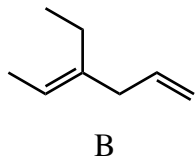
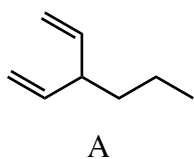
2. Draw the products expected from the following S_N1 reaction **and** indicate the major product:



3. Draw the mechanism for the following reaction and indicate the final products.



4. Which one of the following isomeric compounds is **most** stable and which is **least** stable?



most stable:

least stable:

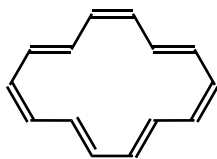
- 5, 6. Complete the following questions (2 pts each):

- A. Kekule arrived at the structure of benzene by envisioning this animal:
- B. Anti-aromatic molecules prefer to react with electrophiles by this type of reaction:
- C. Aromatic molecules have this type of ring current in NMR spectroscopy:
- D. To be aromatic, all atoms in a cyclic molecule must have this type of hybridization:
- E. An aromatic number of pi electrons fits this Huckel equation:

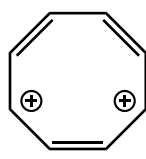
7. Which of the following statements are true (may be more than one)?

- A. aromatic molecules are more stable than would be predicted
- B. the heat of hydrogenation of anti-aromatic molecules is much higher than predicted
- C. aromatic molecules exhibit alternating bond lengths
- D. anti-aromatic molecules are planar

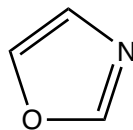
8. Which of the following molecules is expected to be aromatic?



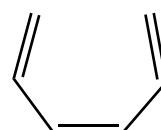
A



B

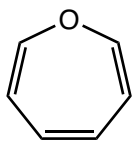


C



D

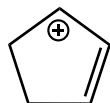
9. Will the oxygen atom in the molecule below adopt sp^2 or sp^3 hybridization? Briefly explain



10. Which one of the carbocations below is **most** stable and which is **least** stable?



A



B

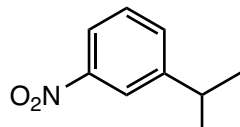


C

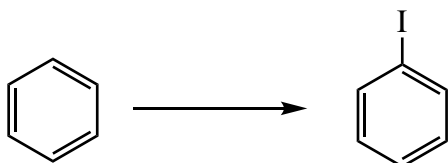
most stable:

least stable:

11. Provide an acceptable chemical name for the following compound:

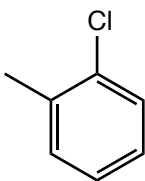


12. Which reagent should be chosen to complete the following reaction?



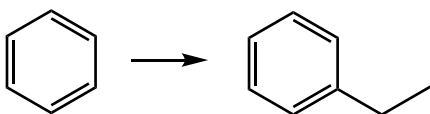
- A. HI, $KMnO_4$
- B. HI, FeI_3
- C. I, AlI_3
- D. I_2 , $CuCl_2$

13. Which one of the following are acceptable name(s) for the following molecule (may be more than one):

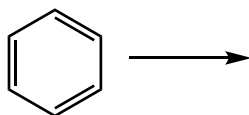
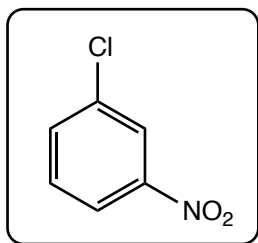


- A. 2-chlorotoluene
- B. 1-chloro-2-methylbenzene
- C. ortho-chloromethylbenzene
- D. ortho-chlorotoluene

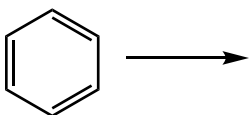
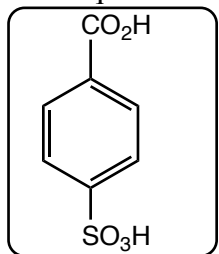
14. Provide the reagent(s) necessary to carry out the following reaction:



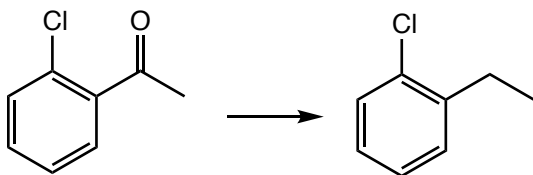
15. What sequence of reactions can be used to synthesize the following compound starting from benzene?



16. What sequence of reactions can be used to synthesize the following compound starting from benzene?

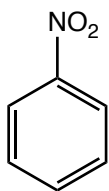


17. Which reagent should be chosen to complete the following reaction (may be more than one)?

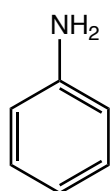


- A. KMnO_4
- B. $\text{AlCl}_3, \text{CH}_3\text{CH}_2\text{Cl}$
- C. $\text{Zn}(\text{Hg}), \text{HCl}$
- D. $\text{I}_2, \text{CuCl}_2$
- E. $\text{N}_2\text{H}_4, \text{KOH}$

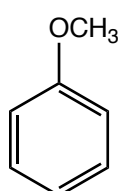
18. Order the following substituted benzenes according to their expected rate of reaction with an electrophile from most reactive >>>> least reactive:



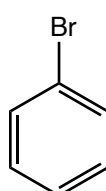
A



B

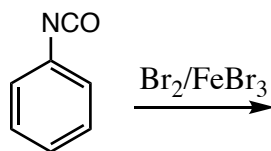
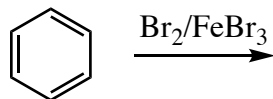


C



D

19. The rate of reaction of $\text{Br}_2/\text{FeBr}_3$ with benzene was compared with the reaction of the same reagent with a benzene ring substituted with the isocyanate ($-\text{N}=\text{C}=\text{O}$) group. The rate of reaction with the isocyanate-substituted ring was 1,000 x slower than that of benzene itself. Based on this data, is the isocyanate group an activating or deactivating group? Predict the major product(s) of reaction of $\text{Br}_2/\text{FeBr}_3$ with the isocyanate-substituted compound.



structure of major product(s)?

the isocyanate group is (circle one):

activating

deactivating

20. Which functional group is common to the structures of most explosives?

- A. $-\text{CH}_2\text{CH}_3$
- B. $-\text{NO}_2$
- C. $-\text{NH}_2$
- D. $-\text{OH}$

Bonus point! What is the name of the following compound?

