Consider the cyclopentadienyl carbocation.

a. What is its structure?

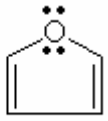
b. Explain if it is aromatic or not. You must explain all factors (there are FOUR) that affect aromaticity clearly.

c. Draw the Molecular Orbital Diagram for this molecule. All orbitals must be labeled. Explain briefly what the diagram shows in terms of aromaticity.

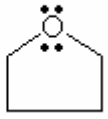
Which of the following is the Most Acidic and EXPLAIN WHY CLEARLY. Your explanation must show that you know what a strong acid is.

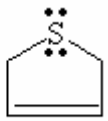
Cycloheptadtriene Cycloheptatrienyl Carbocation Cycloheptatrienyl Carbanion

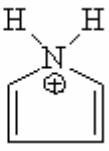
For each structure below, label as Aromatic or Anti–Aromatic AND you MUST Briefly INDICATE WHY OR WHY NOT for your choice.

I. 

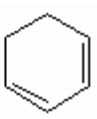
II. 

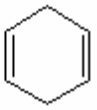
III. 

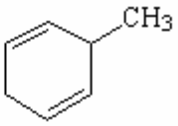
IV. 

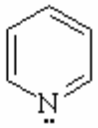
V. 

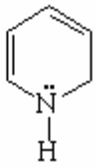
A) I B) II C) III D) IV E) V

I. 

II. 

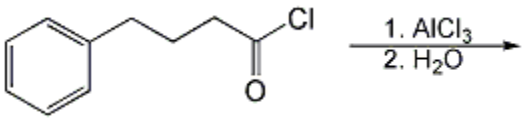
III. 

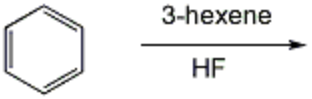
IV. 

V. 

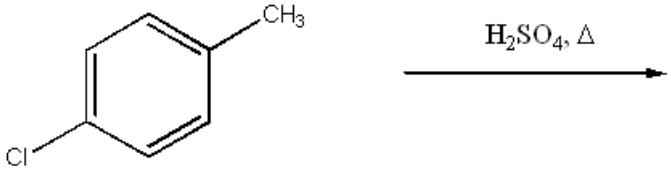
A) I B) II C) III D) IV E) V

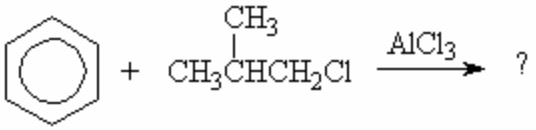
Provide the MAJOR organic product of the reactions shown below.





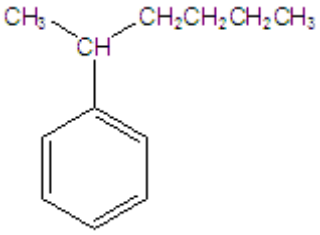
Provide the structure of the major organic product of the following reaction.





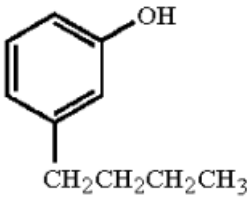
A) I B) II C) III D) IV E) V

Name the following compound.



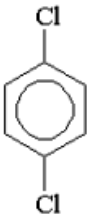
A) 2–phenylhexane
B) isohexylbenzene
C) 3–phenylhexane
D) *tert*–hexylbenzene
E) *sec*–hexylbenzene

What is the common name of the compound below (you may not use any numbers)?



A) *m*–butylphenol
B) *o*–butylhydroxybenzene
C) ethyl phenyl ether
D) *m*–butylhydroxybenzene
E) 1–phenoxyethane

What is the name of the following compound (you may not use any numbers)?



A) *p*–dichlorobenzene
B) 1,4–dichlorobenzene
C) phenyldichloride
D) A and B
E) B and C

Which of the following substituents acts as a moderate activator and o/p director in electrophilic aromatic substitution reactions?

A) $-SO_3H$ B) –NHCOR C) –Br D) –CHO E) $-CO_2H$

a. Answer_____

b. Explain why the word "moderate" is used above.

c. Show through resonance structures why it is an o/p director AND EXPLAIN what your resonance structures mean exactly.

Show the MECHANISM for the Major Product formed during the monobromination of ethylbenzene using $FeBr_3$.

Explain why direct nitration of aniline yields, among other products, *m*–nitroaniline.

What is the best method for the preparation 100% *p*–chlorotoluene in high yield, (no ortho can form!)? Show your synthesis steps clearly and Neatly! You do not have to show the mechanism but you do need to map out each step and the appropriate reagents used.

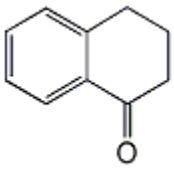
A) start with benzene; chlorinate; methylate
B) start with toluene; chlorinate
C) start with chlorobenzene; methylate
D) start with *p*–aminotoluene; $NaNO_2$/HCl, 0°C; CuCl
E) start with benzene; methylate; chlorinate

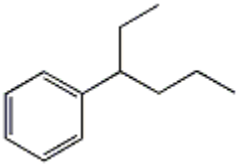
What are the two major requirements for a Nucleophilic Aromatic Substition? List them.

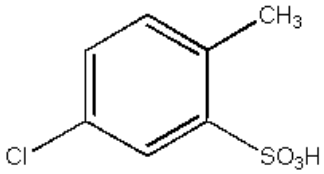
What nucleophile does not have to meet those exact requirements of SNAr?

Show the product(s) that result from the reaction of ortho–chlorotoluene and the nucleophile above.

No, it is not aromatic since the molecule is not a conjugated system.
A
D







C
A
A
D
B

In acidic media, the basic amino group forms a protonated ammonium ion which is a meta director.
D