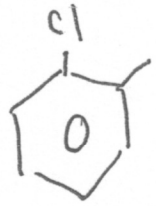
Name: _____

CHM 228 Exam 2 Fall 2018

Short Answer

1. Draw all possible isomers of methylchlorobenzene.



2-METHYL

O

3-METHYL

M

4-METHYL

P

2. Devise a synthesis of these compounds from benzene. Show all necessary reagents and reaction conditions.

p-nitrobenzoic acid

1) $CH_3Cl/AlCl_3$
2) HNO_3 H_2SO_4
3) $KMnO_4$

o-dibromobenzene

1) $Br_2 / FeBr_3$
2) $Br_2 / FeBr_3$

m-bromoaniline

1) HNO_3 / H_2SO_4
2) $Br_2 / FeBr_3$
3) $Zn(Hg) / HCl$

p-di-n-propylbenzene

1) $CH_3CH_2\overset{O}{\overset{\|}{C}}-Cl / AlCl_3$
2) $Zn(Hg) / HCl$
3) $CH_3CH_2\overset{O}{\overset{\|}{C}}Cl / AlCl_3$
4) $Zn(Hg) / HCl$

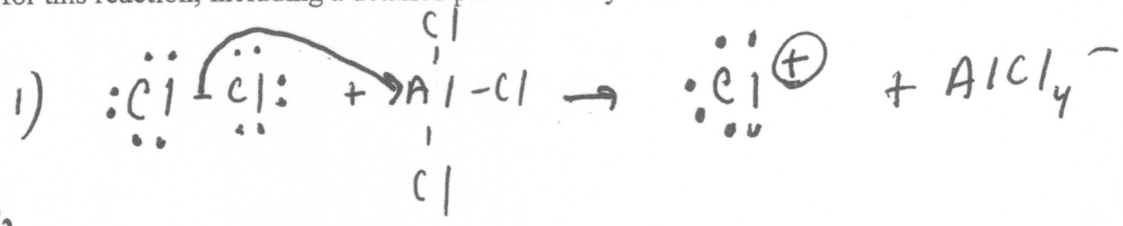
3. Benzene reacts with optically pure (R)-2-chlorobutane and $AlCl_3$. Is the product R? S? Racemic? Explain mechanistically.

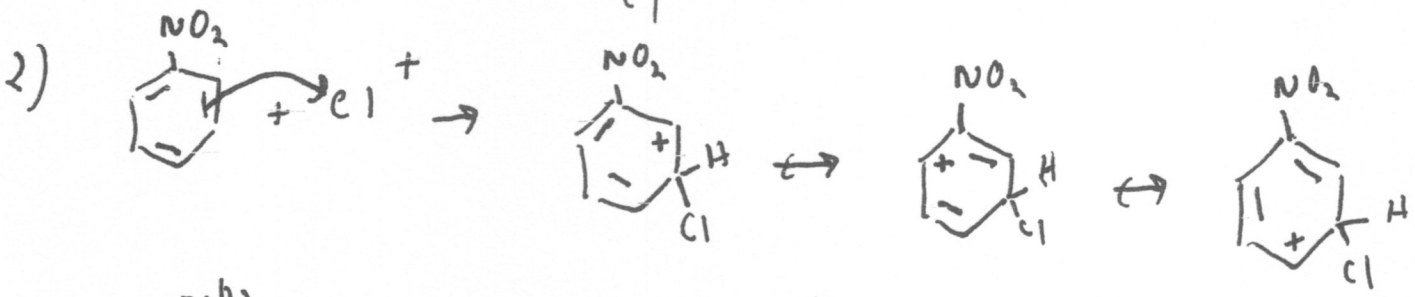
THE CATION THAT SUBSTITUTES THE RING IS $CH_3\overset{\oplus}{C}HCH_2CH_3$

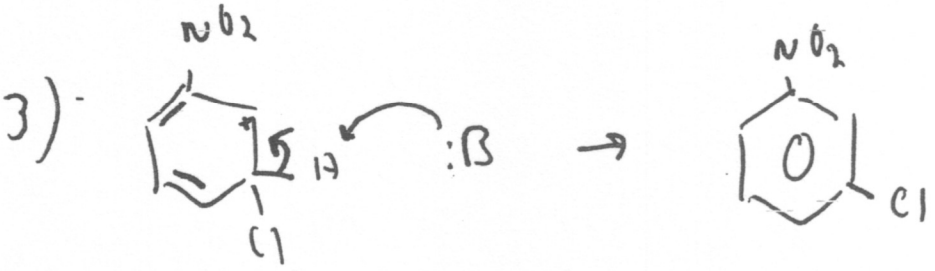
IT IS sp^2, TRIGONAL PLANAR

SO A RACEMATE IS PRODUCED

4. When nitrobenzene is treated with Cl_2 and $AlCl_3$ the major product is 3-chloronitrobenzene. Show a complete mechanism for this reaction, including a detailed picture of any intermediates.







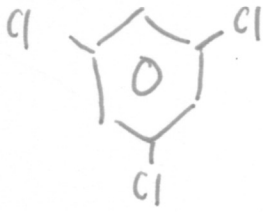
5. An unknown compound has the formula $C_6H_3Cl_3$. The proton NMR spectrum consists of one peak only. Deduce the structure of the unknown.

RECALL THAT Cl = H FOR D.U.

CALCULATION

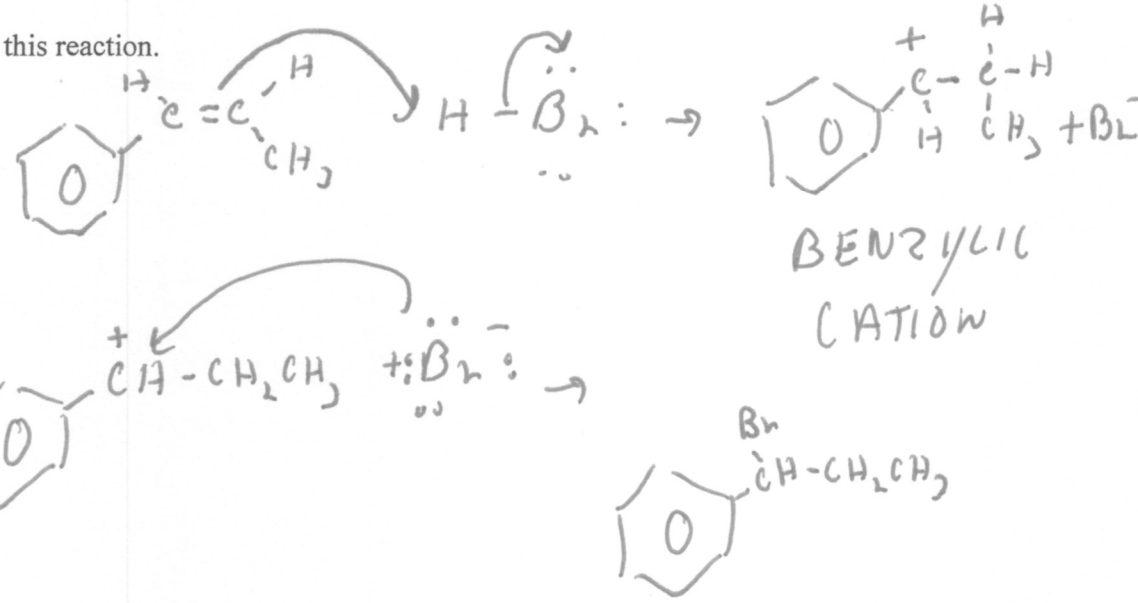
$C_6H_3Cl_3$ = 4 D.U. = 

1 SIGNAL ONLY MEANS SYMMETRICAL



6. Based on what you know about the relative stability of alkyl cations and benzylic cations, predict the product of addition of HBr to 1-phenylpropene.

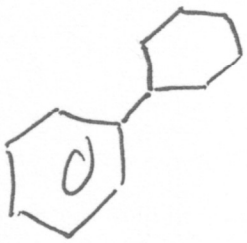
Draw a mechanism for this reaction.



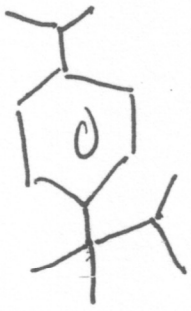
BENZYLIC CATION

7. Draw the structure of the product(s) for the following $AlCl_3$ catalyzed reactions;

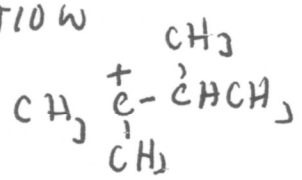
benzene + chlorocyclohexane



3-chloro-2,2-dimethlbutane + isopropylbenzene



VIA REARRANGED CATION



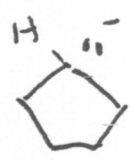
8. Why does phenol react 10,000 times faster than benzene ? Draw a (one) structure for the reactive intermediate that explains this fact.

REACTIVE INTERMEDIATE

9. Rank these in terms of acidity (1 = most acidic, 3 = least acidic)

cyclopentane, cyclopentadiene, cyclohepta-1,3,5-triene

ACIDITY MEANS STABILITY OF THE ANION



NON AROMATIC

AROMATIC

ANTI AROMATIC