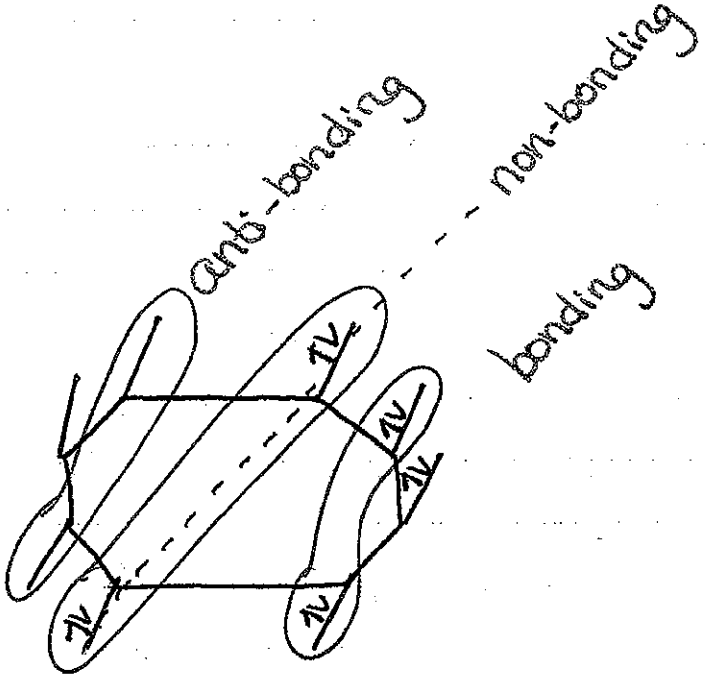
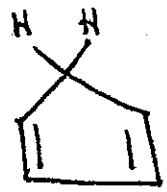
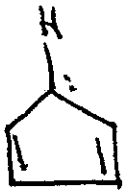
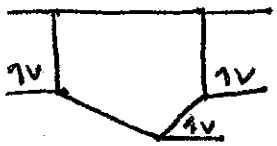
① 

② 

acid = donate H^+ ⟶





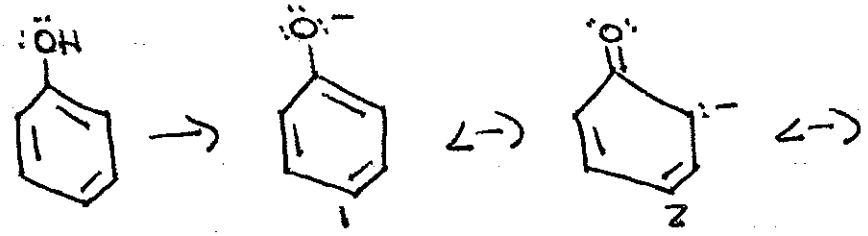
C. base is stabilized by aromaticity.

③

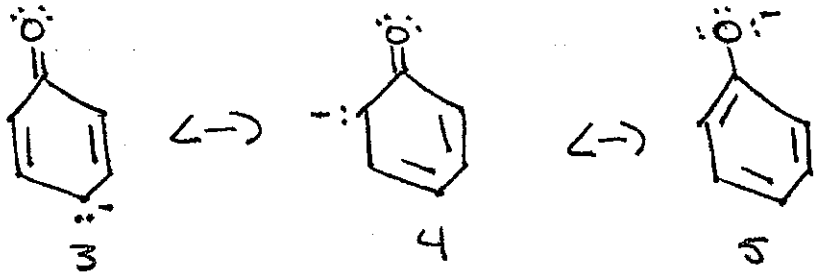
Pyridine Pyrrole

lone pair e⁻ on N in pyridine are in an sp^2 orbital + therefore, not part of aromaticity. They are free to be basic. lone pair e⁻ on N in pyrrole are in a p orbital + therefore, part of aromaticity. These are not free to be basic. If pyrrole were to behave as a base, aromaticity would be lost. Pyridine is more basic than pyrrole.

④

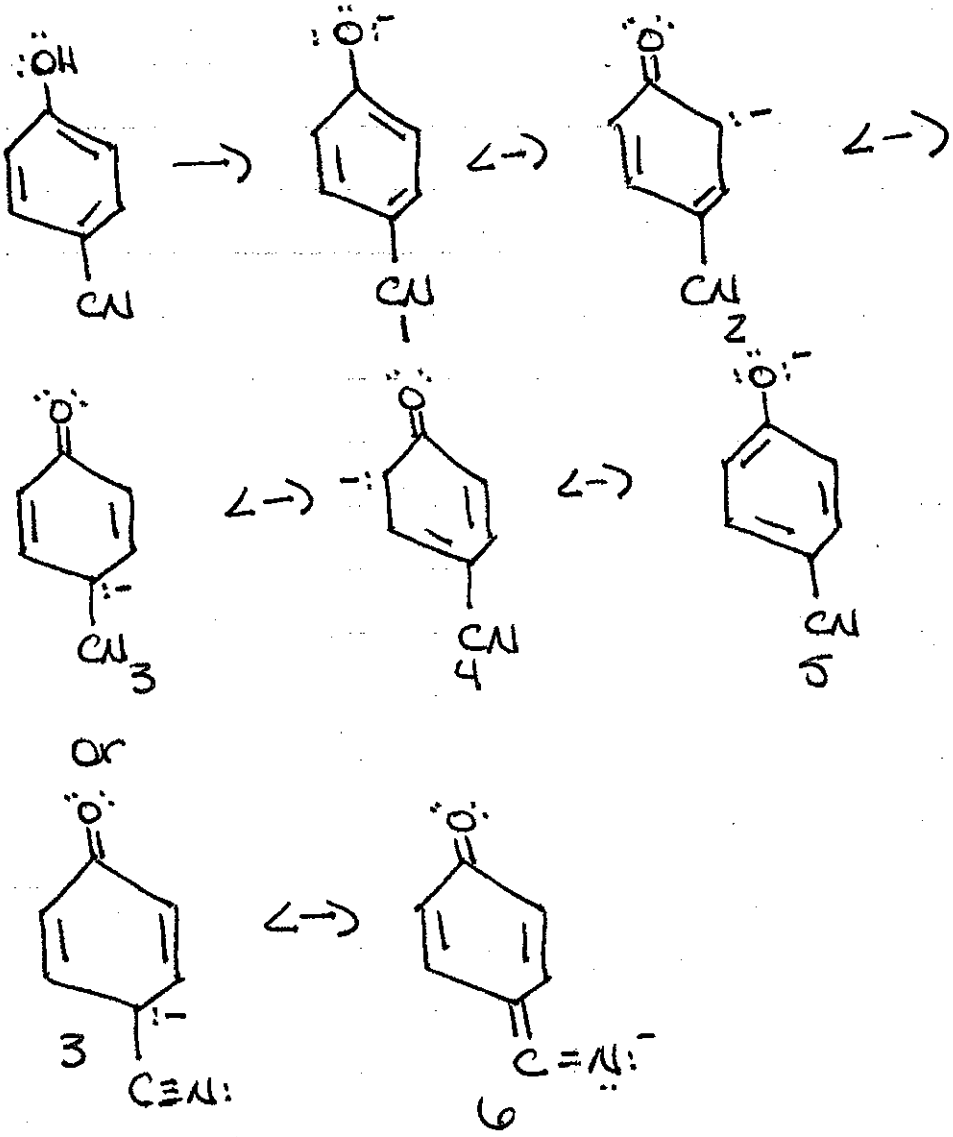


1 2

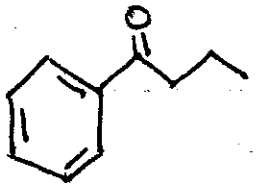
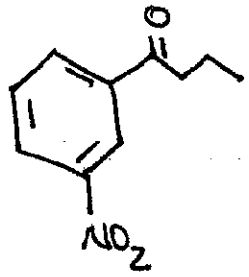


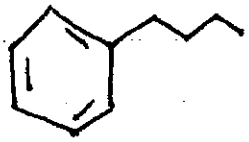
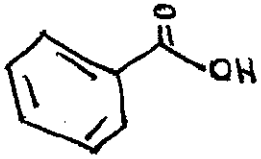
3 4 5

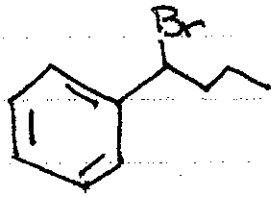
5 resonance structures: 3 w/ (-) on C:
2 w/ (-) on atom more EN than C

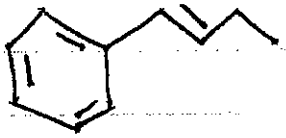


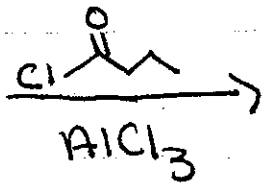
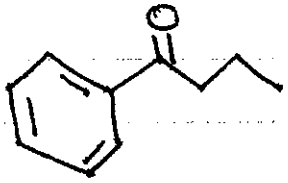
le resonance structures: 3 w/ (-) on C:
3 w/ (-) on atom more EN than C

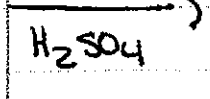
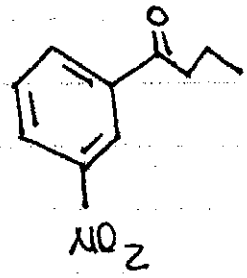
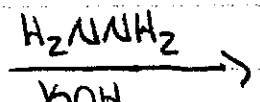
5. A)  B) 
NO2

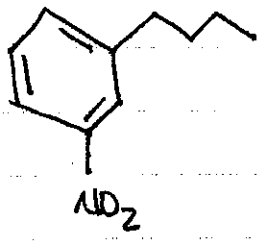
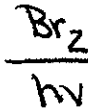
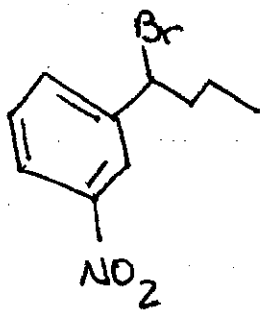
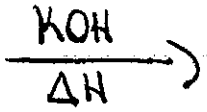
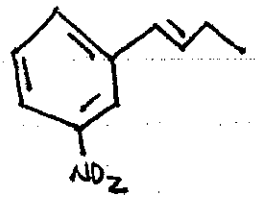
C)  D) 
OH

E) 
Br

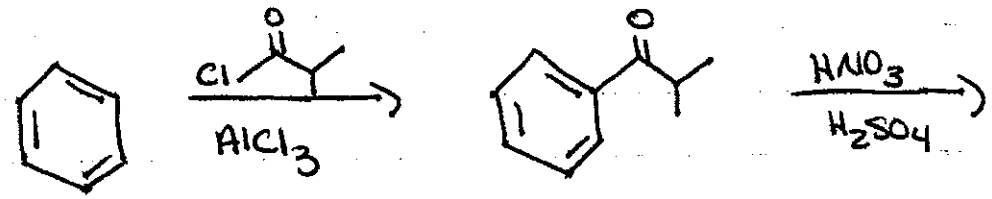
F) 

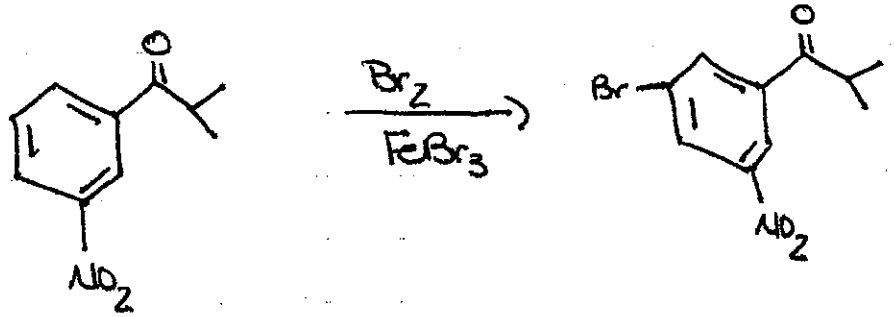
6.  
Cl
AlCl3



HNO3
H2SO4

NO2

H2NNH2
KOH

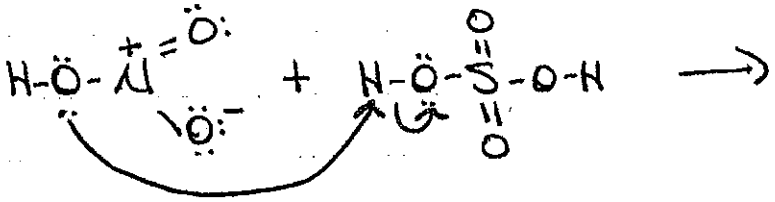

NO2

Br2
hv

Br
NO2

KOH
ΔH

NO2

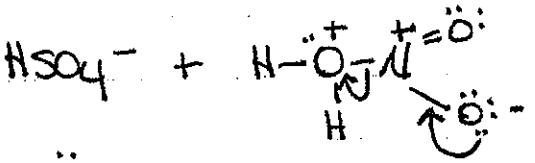
7.

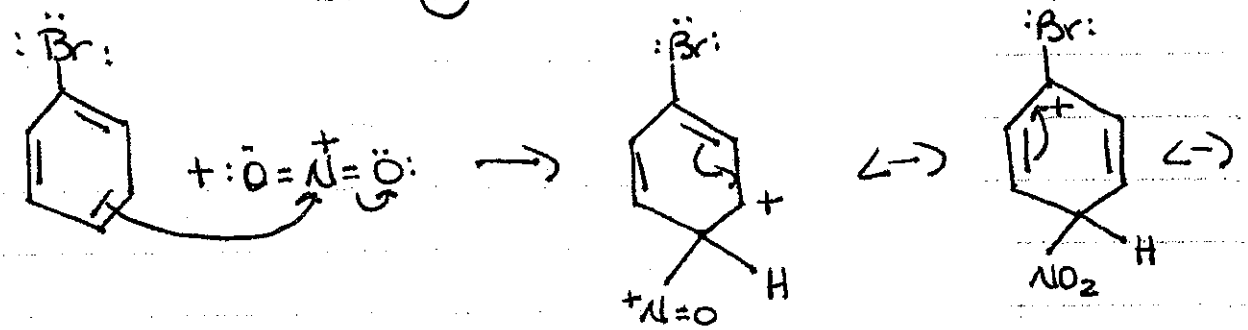

Cl
AlCl3
HNO3
H2SO4


Br2
FeBr3
Br
NO2
NO2

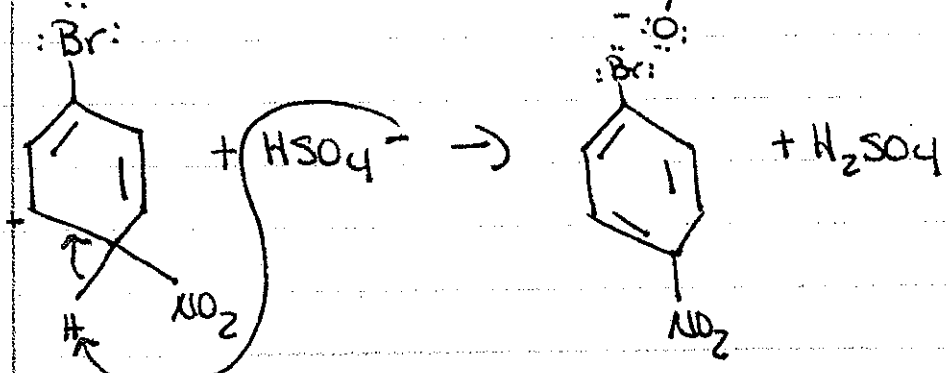
8.

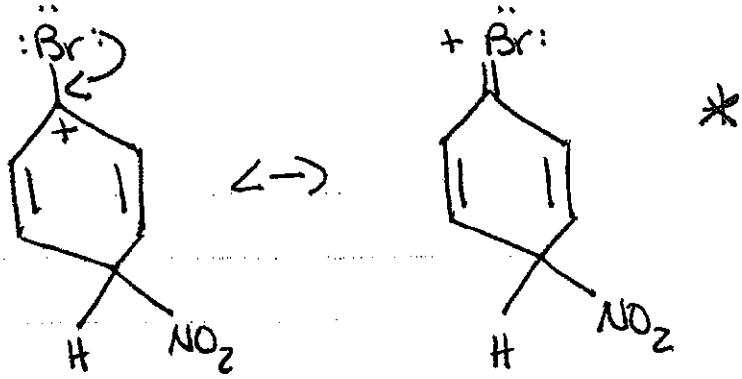



HSO4−
HSO4−


:Br:
:Br:
:Br:
H
H
NO2

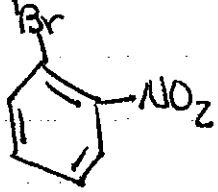
Or


:Br:
HSO4−
NO2
H
:Br:
NO2
+ H2SO4

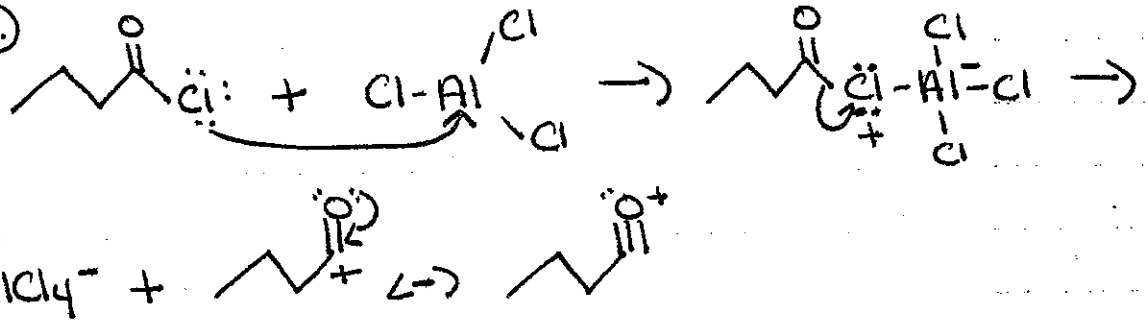


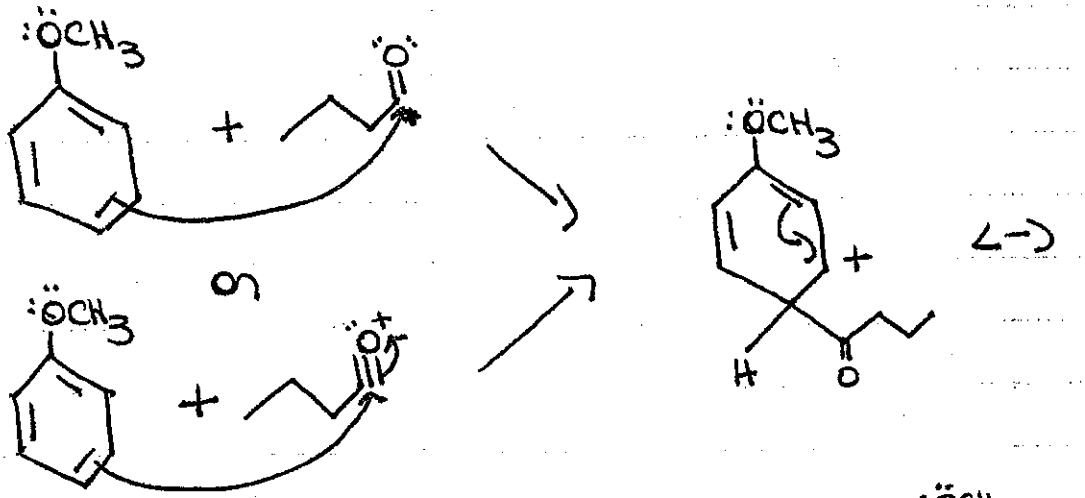
* Res. Structure that demonstrates why halogens are ortho/para directors. An extra res. structure is gained where all atoms have an octet.

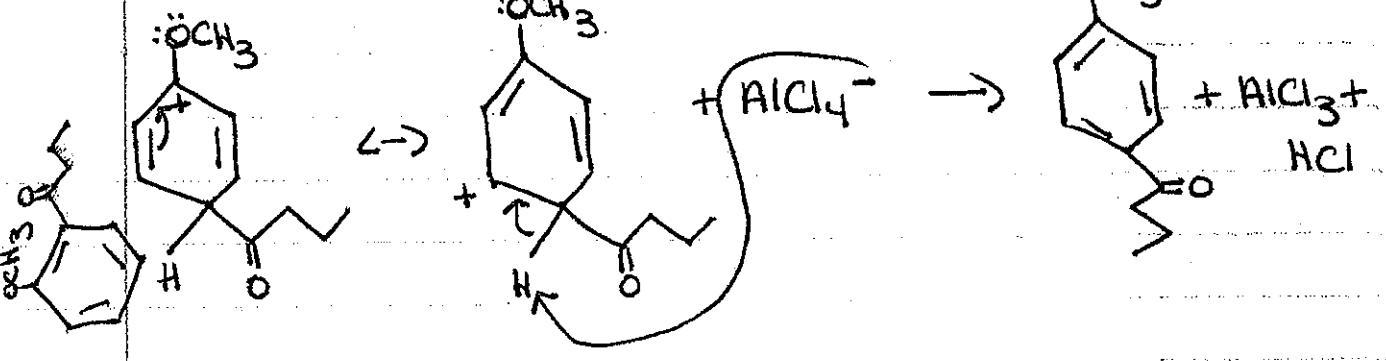
ortho product could have been formed as well

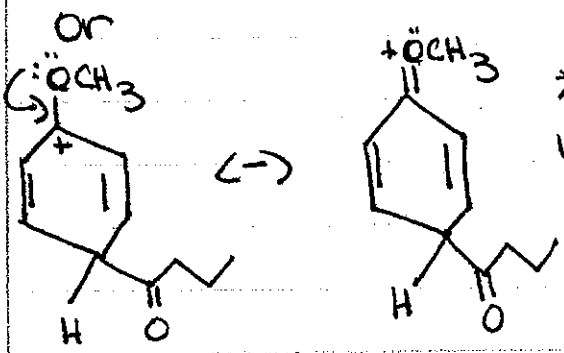


(9.)



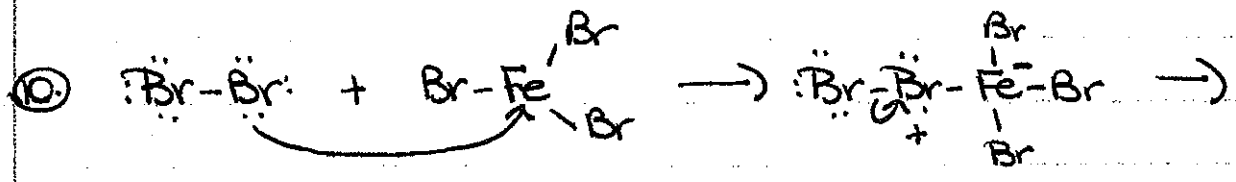




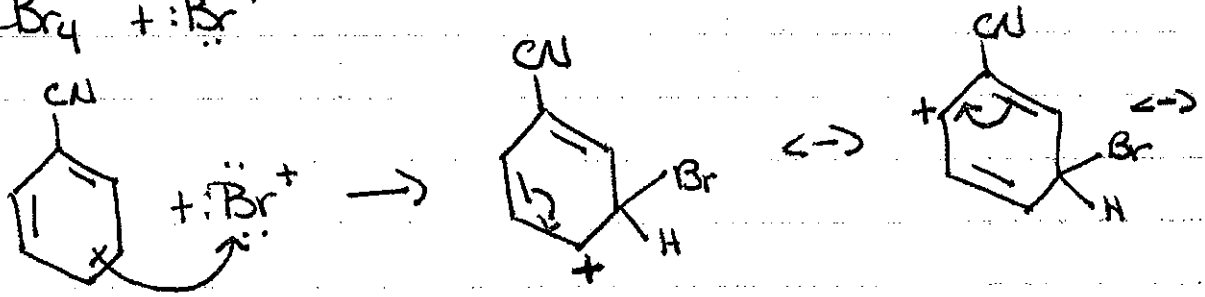


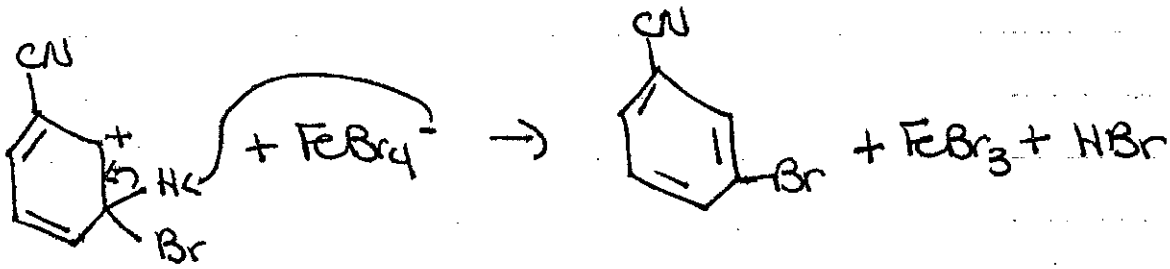
* Res. structure that explains why +R groups are ortho/para directors. Extra res. structure where all atoms have an octet.

Ortho could also be made.

⑩ 

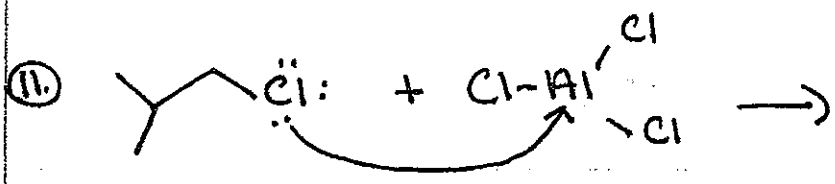
$FeBr_4^- + :\ddot{Br}^+$

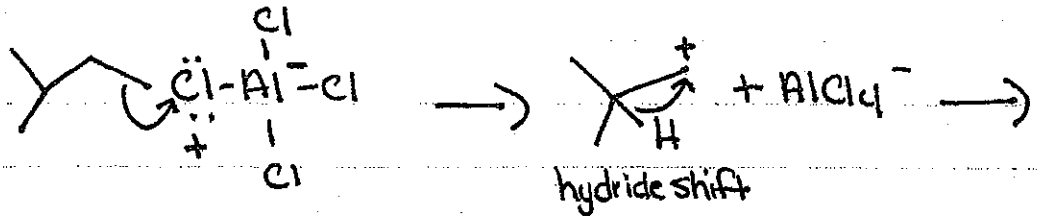


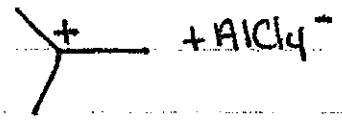


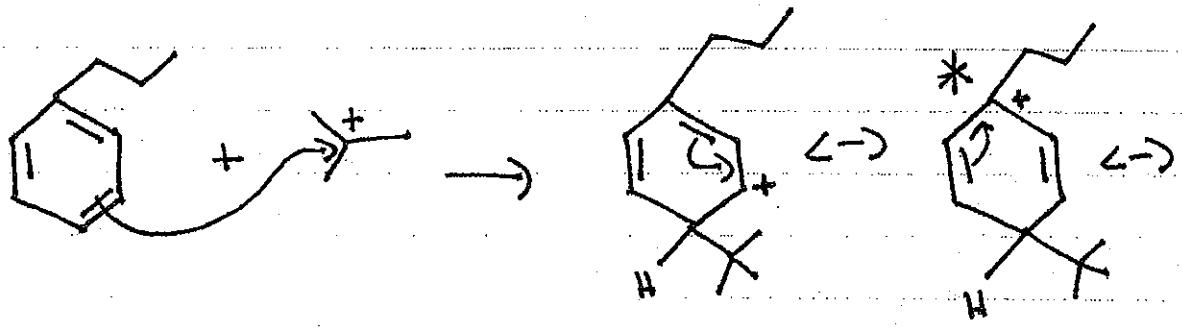
No destabilized res. structure where -R group is pulling e^- density from C^+ when -R directs meta.

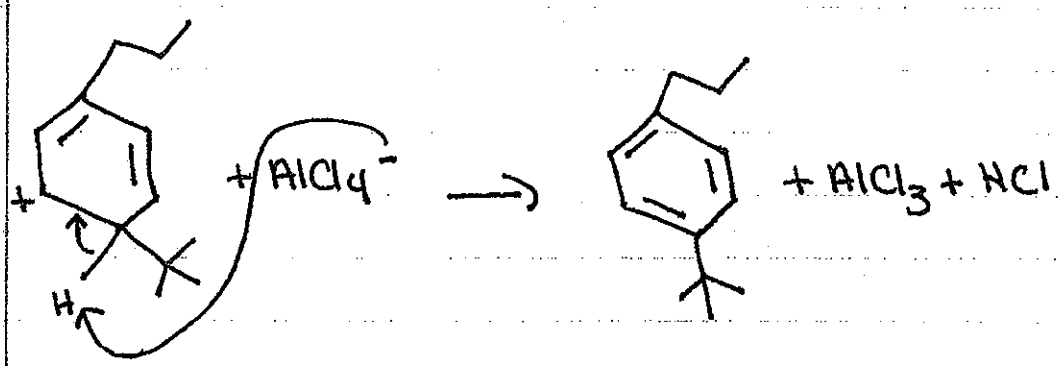
11.



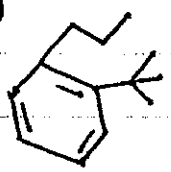




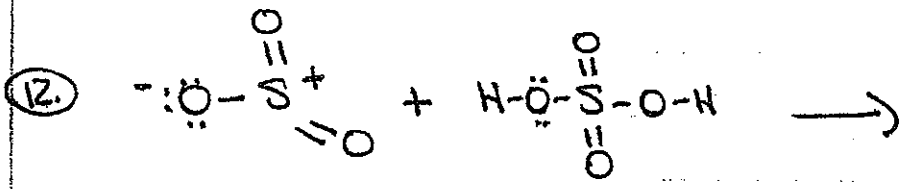


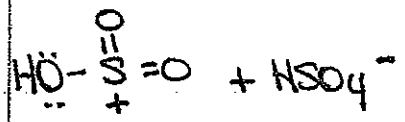


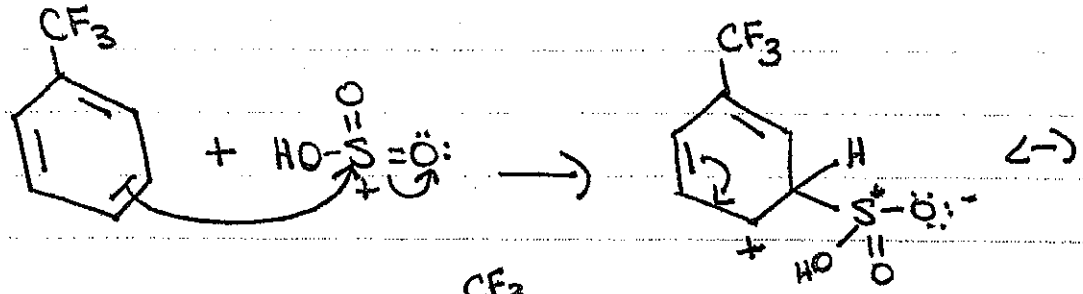
* = Res. Structure that accounts for why +I groups direct ortho/para. +I groups can shift e⁻ density to C⁺ if they direct ortho/para.

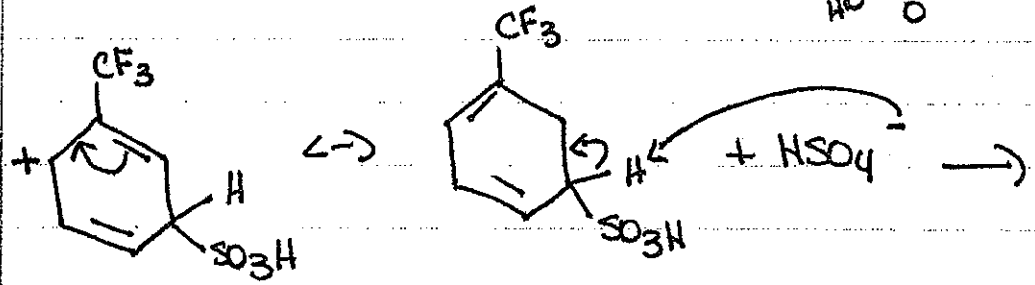


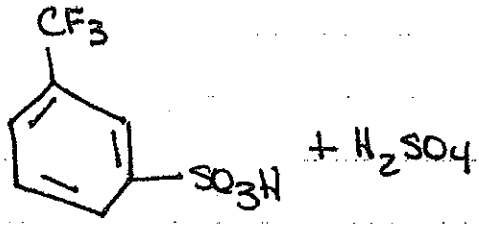
ortho could have also been made

(12.) 



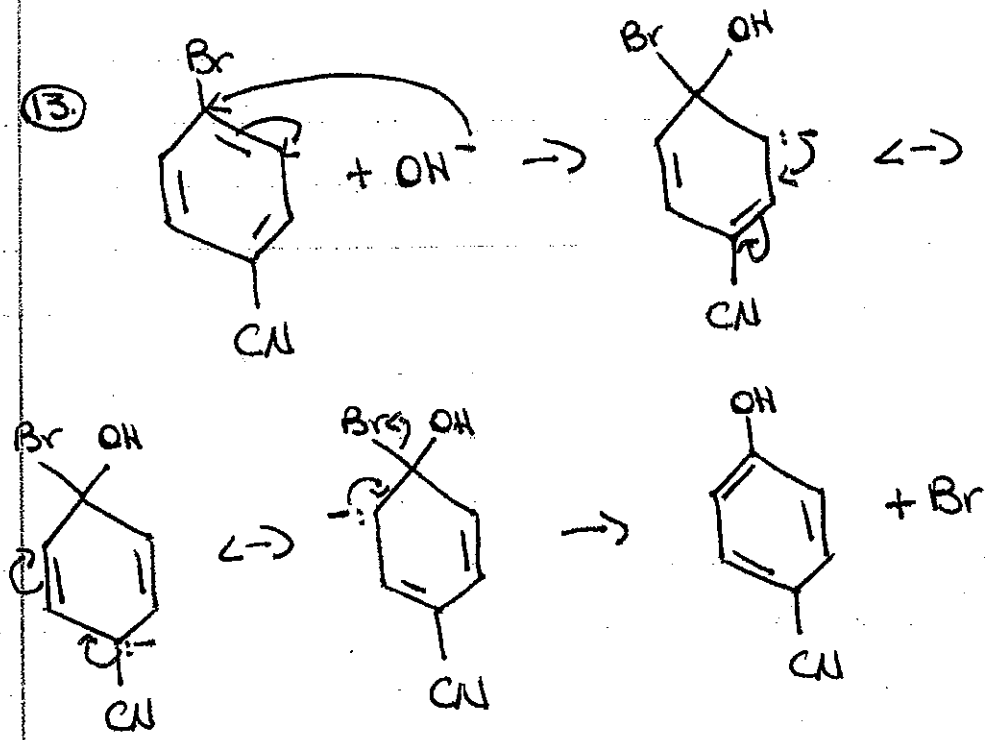




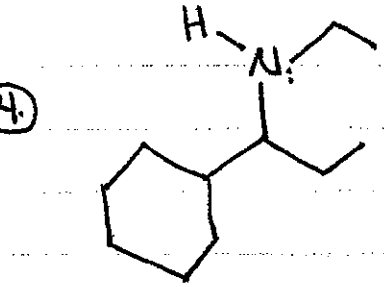


No destabilized resonance structure where
-I group w/draws e⁻ density from C^+ if
-I group directs meta.

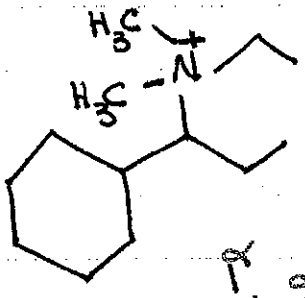
(13.)



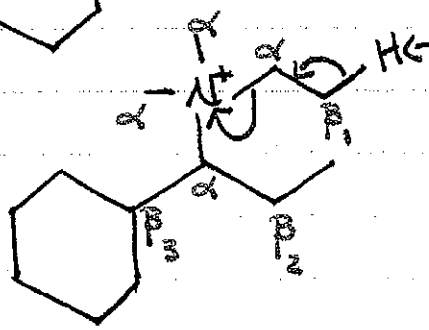
(14.)



CH_3I →



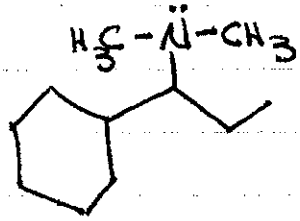
I^- → (Ag_2O, H_2O)



$+ OH^-$ → ΔH

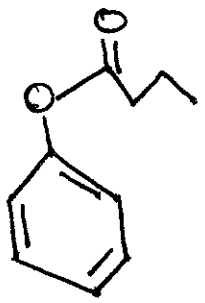
$\beta_1 = 1^\circ$ $\beta_2 = 2^\circ$ $\beta_3 = 3^\circ$

$H_2C = CH_2 +$

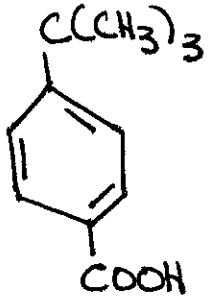


15.

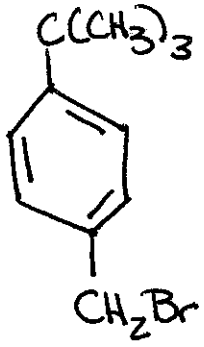
a.)



b.)



c.)



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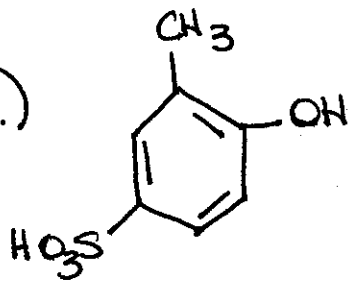
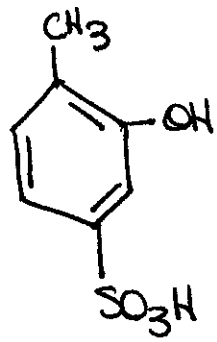


major



minor

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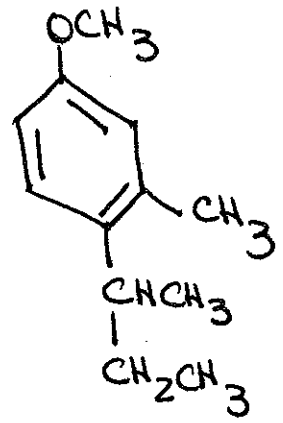
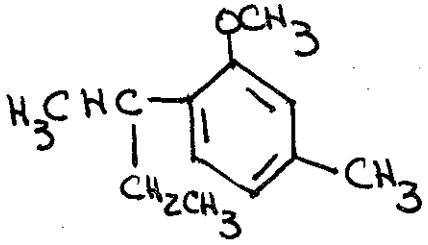
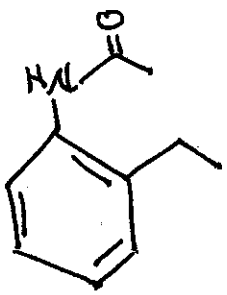

OCH3
CH3
CHCH3
CH2CH3

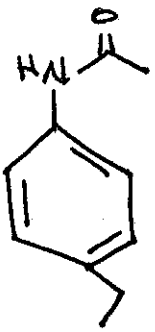
+


OCH3
H3CHC
CH2CH3
CH3

f.)


HN
O

+


HN
O

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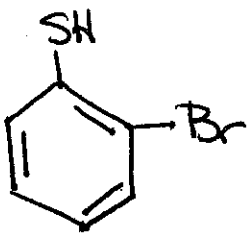
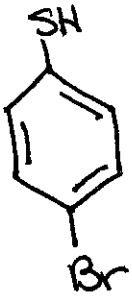
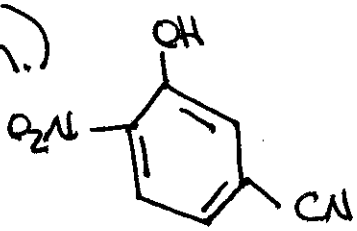

SH
Br

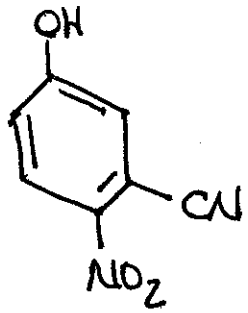
+


SH
Br

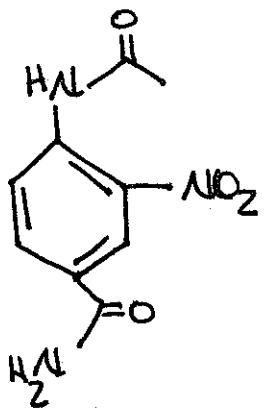
h.)


OH
O2N
CN

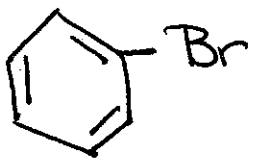
+

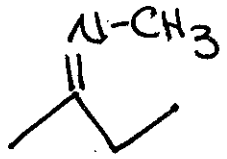

OH
CN
NO2

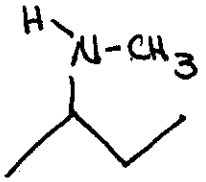
i.) No Rxn

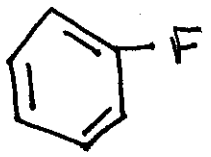
j.) 

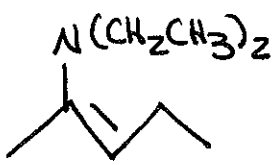
k.) $^{+}N(CH_2CH_2CH_2CH_3)_4$
Br^-

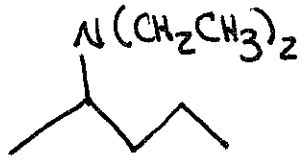
l.) 

m.) 



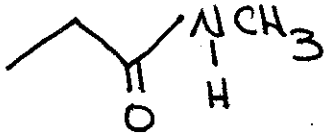
n.) 

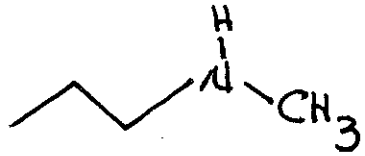
o.) 

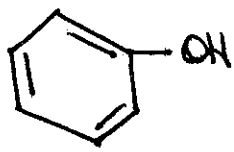


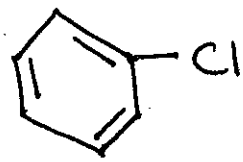
p.) 

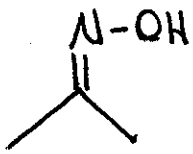
q.) 

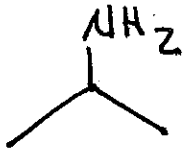
r.) 



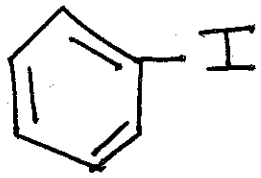
s.) 

t.) 

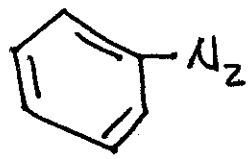
u.) 

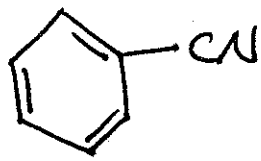


v.)

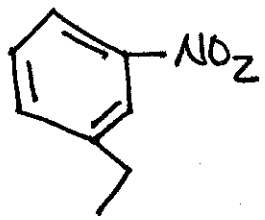


w.)

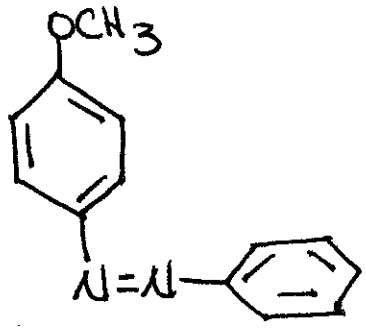




x.)



y.)



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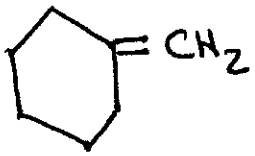

+ $(CH_3)_2N$-OH