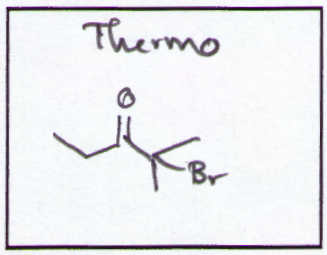
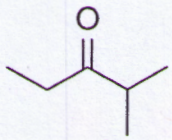
1) (6 pts) Complete the reaction sequence. LDA: Lithium diisopropylamide

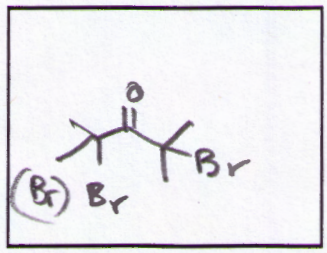


MAJOR

$H_3O^{\oplus}$ ← Br_2, 50° C



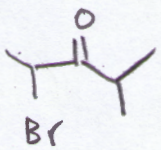
$K^{\oplus}\ ^{\ominus}OH$ → 2 mol Br_2, 50° C



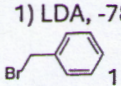
MAJOR

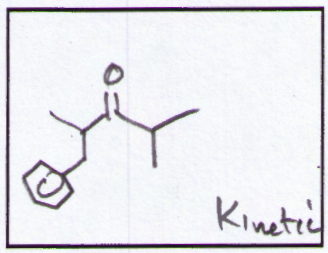
ok if 3 Br added

-1



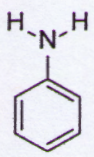
1) LDA, -78° C

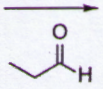
2)  1 equiv

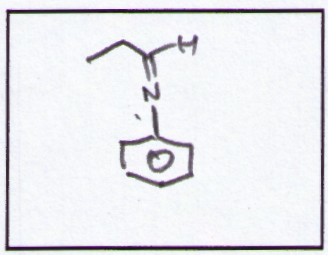


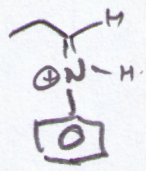
MAJOR

2) (2 pts) Complete the reaction sequences. **cat. is catalytic**

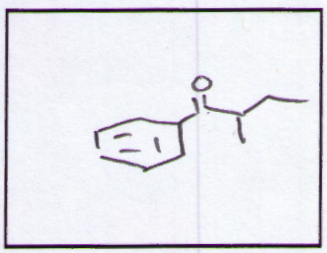


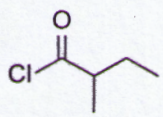
cat. 



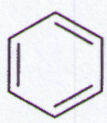
or 

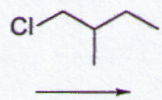
3) (6 pts) Complete the sequences to produce the monosubstituted benzenes **A** and **B** (**A ≠ B**). **NOTE** the reaction arrow directions.



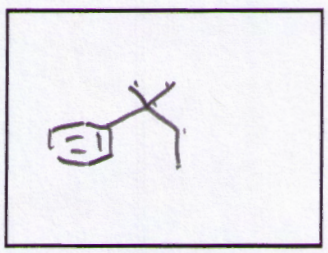


$AlCl_3$



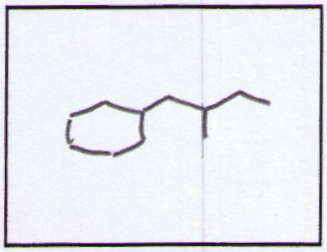


$AlCl_3$



B

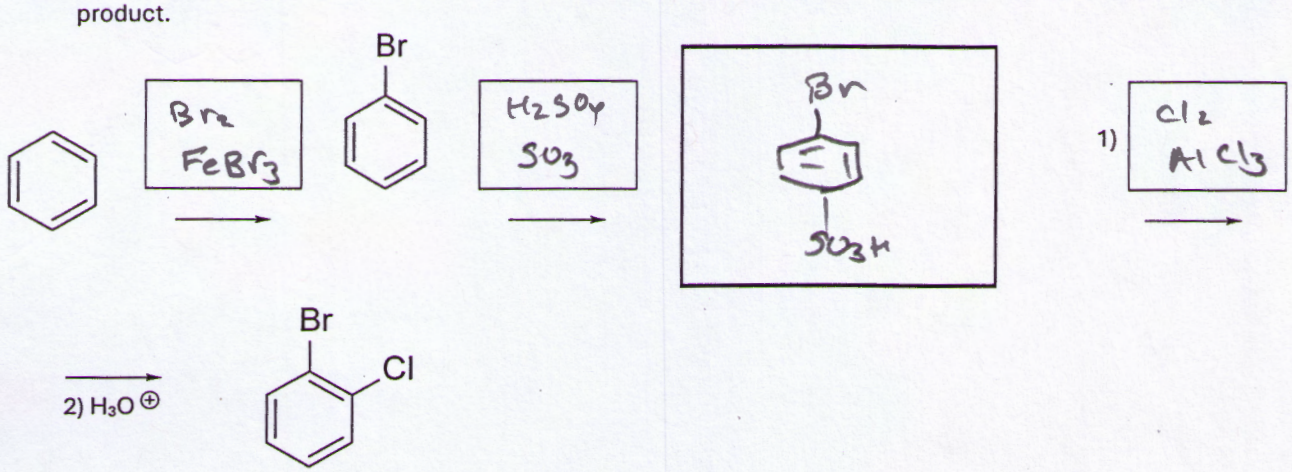
$Zn(Hg)$, HCl, Δ



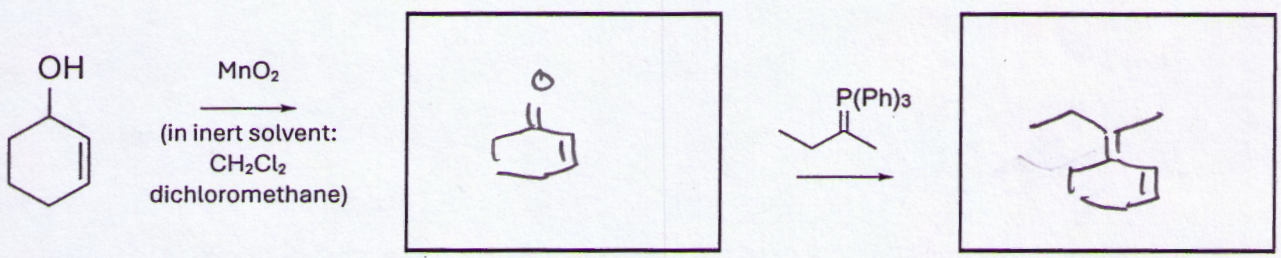
A

4) (5 pts) Starting from benzene, complete the reaction sequences in the number of steps indicated.

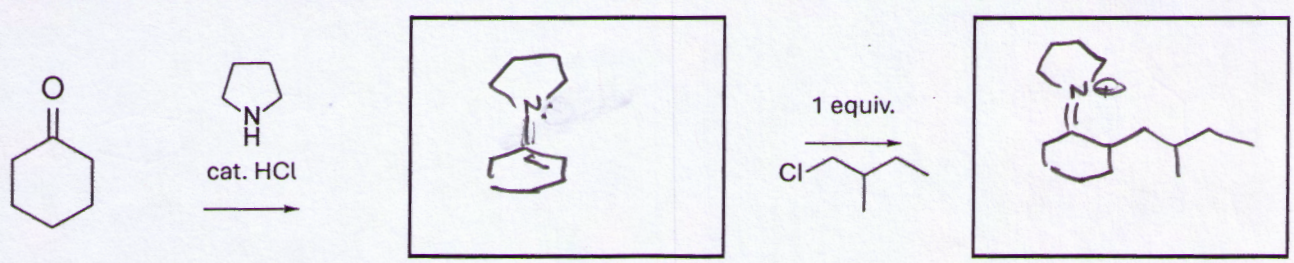
- If numbers (1, 2, 3,...) appear above/below arrows that indicates a sequence of reactants are added stepwise to yield the product.
- If no numbers appear, then assume a single reactant or a mixture of reactants is added in one step to yield the product.



5) (4 pts) Draw the intermediates, products or the reagents needed to conduct the following transformations.
cat. is catalytic



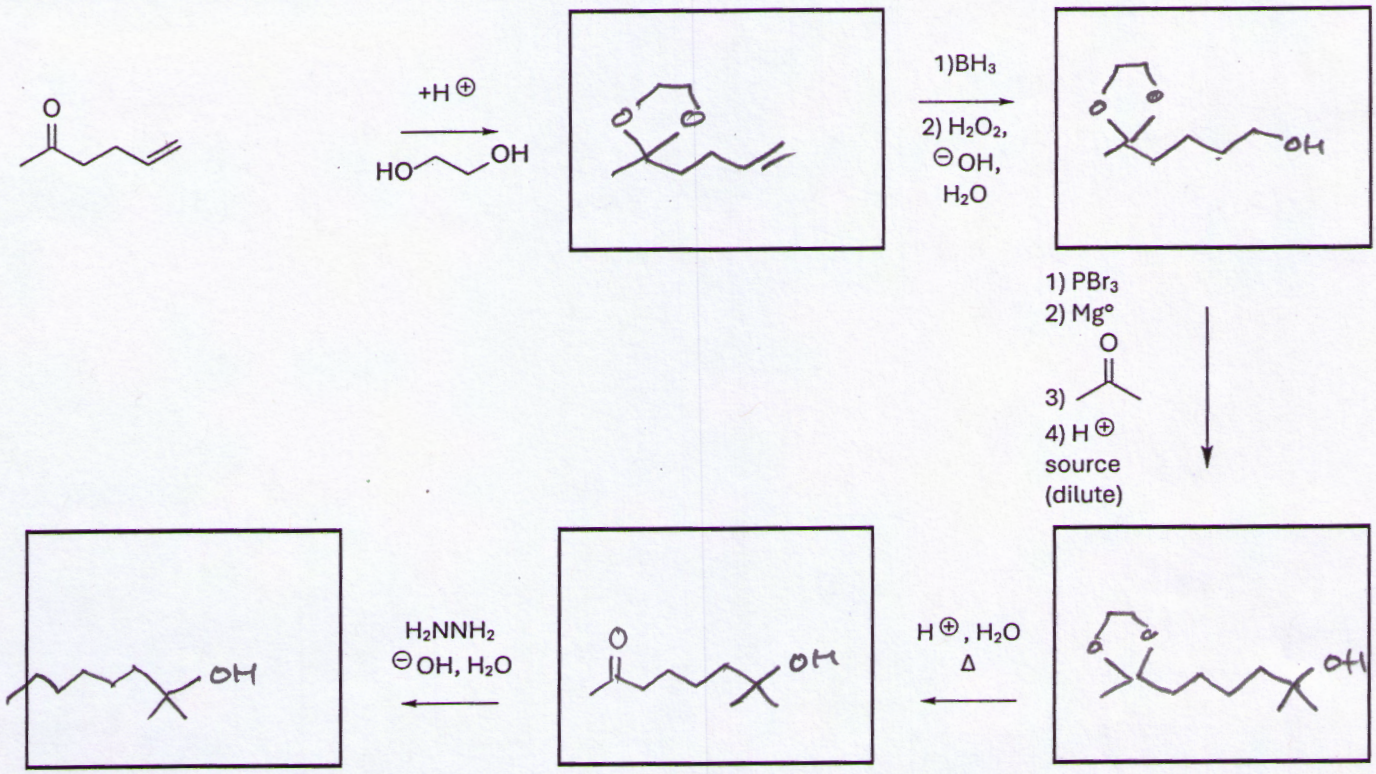
6) (4 pts) Draw the intermediates, products or the reagents needed to conduct the following transformations.



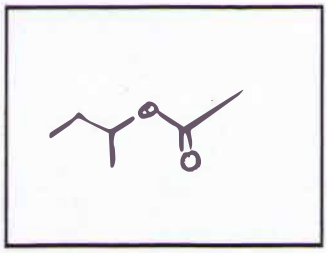
preferred neutral product

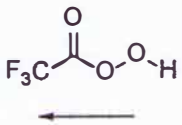
stabilized cationic product

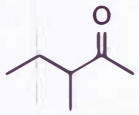
7) (10 pts) Complete the reaction sequences.



8) (14 pts) Complete the reaction sequences. **NOTE** the reaction arrow directions.

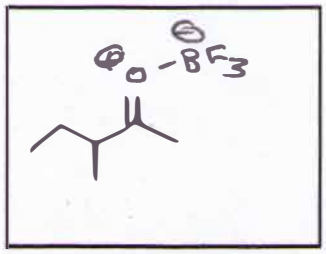




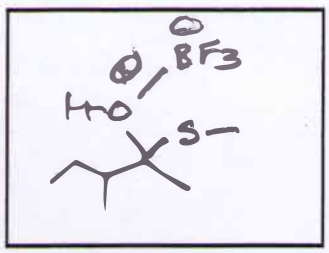


BF_3

(Hint: Lewis Acid)

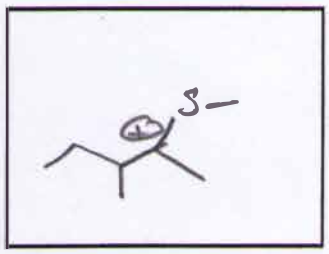


1 equiv $H\text{-}S\text{-}CH_3$



Neutral (0 net charge)

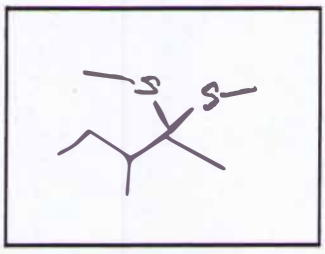
$- HOBF_3$



a cation

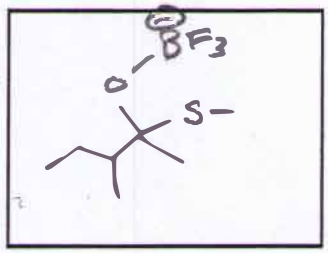
1) 1 equiv $H\text{-}S\text{-}CH_3$

2) $-H^{\oplus}$



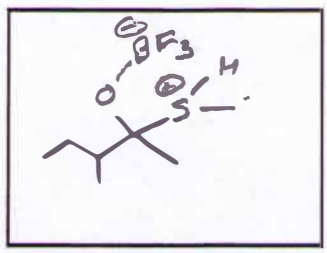
$C_8H_{18}S_2$

$+H^{\oplus}$



an anion

$-H^{\oplus}$



Honors Question (FOR HONORS STUDENTS ONLY; NOT EXTRA CREDIT FOR NON-HONORS STUDENTS) (6 pts)

Honors 1) Careful dropwise addition of ethylene glycol (B) under acidic contains at 0° C provides selective protection of 3-oxobutanal (A) that enables the researcher to obtain the final product after several familiar transformation steps. Determine the final structure (D).

NOTE: Structure C must be correct for grader to continue.