

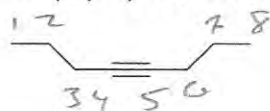
Chemistry 3331
Organic 2
Professor Eaton
Spring 2013

FINAL EXAM

1. (4 pts) Draw the structure of benzoic acid

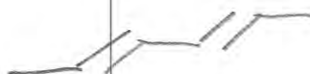


2. (4 pts) For the alkyne structure drawn below provide the IUPAC name

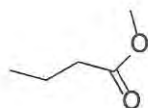


4-octyne

3. (4 pts) Draw the structure of *E,E*-2,4-hexadiene as the *s-trans* conformation

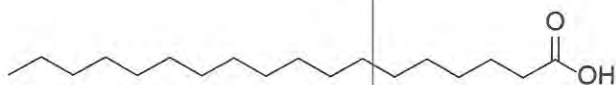


4. (4 pts) For the molecule drawn below provide the IUPAC name



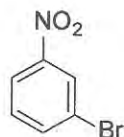
methyl butanoate

5. (4 pts) For the fatty acid drawn below provide the common name



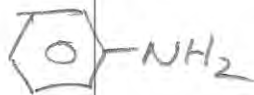
stearic acid

6. (4 pts) Name the aromatic compound drawn below according to IUPAC rules

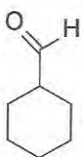


1-bromo-3-nitrobenzene

7. (4 pts) Draw the aromatic compound aniline

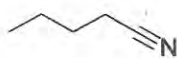


8. (4 pts) Name the aldehyde compound drawn below according to IUPAC rules



cyclohexanecarbaldehyde

9. (4 pts) Name the compound drawn below according to IUPAC rules



pentanenitrile

10. (4 pts) Draw the structure of maleic acid



11. (4 pts) Name the compound drawn below according to IUPAC rules

Free points

12. (4 pts) Name the compound drawn below as its common name



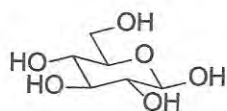
piperidine

13. (4 pts) Name the compound drawn below as its common or IUPAC name



ethanoyl chloride

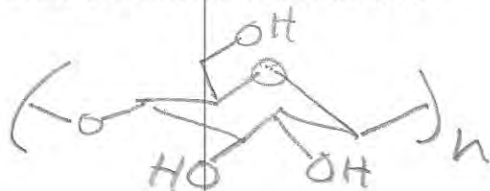
14. (8 pts) Name the sugar drawn below. Is this an aldose or ketose? Is this a furanose or pyranose?



glucose

β -D-glucose

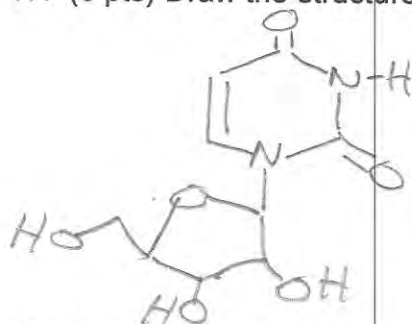
15. (4 pts) Draw the structure of Cellulose



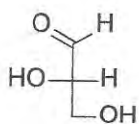
16. (4 pts) Draw the Fischer projection of D-Ribose



17. (6 pts) Draw the structure of the nucleoside uridine. Is this a purine nucleoside? \Rightarrow NO

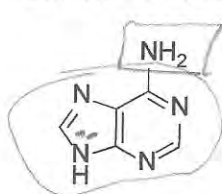


18. (4 pts) Name the compound drawn below as a Fischer projection.



L-glyceraldehyde

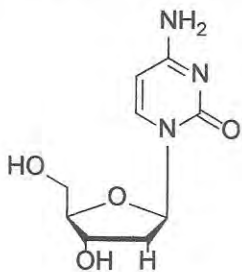
19. (8 pts) Label the nitrogens of the nucleobase drawn below as sp, sp² or sp³. Using the $4n + 2$ rule is the compound drawn below aromatic?



\sim sp³
 \sim All sp²

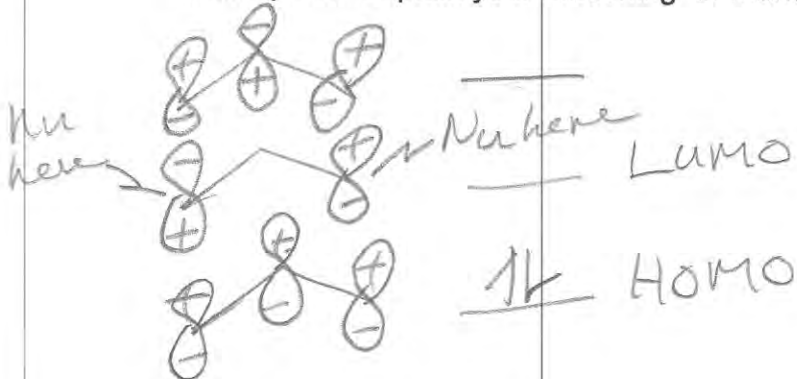
10 π electrons $4n+2, n=2$
yes it is aromatic

20. (6 pts) Name the nucleoside drawn below. Is the compound drawn below a pyrimidine nucleoside? \Rightarrow yes

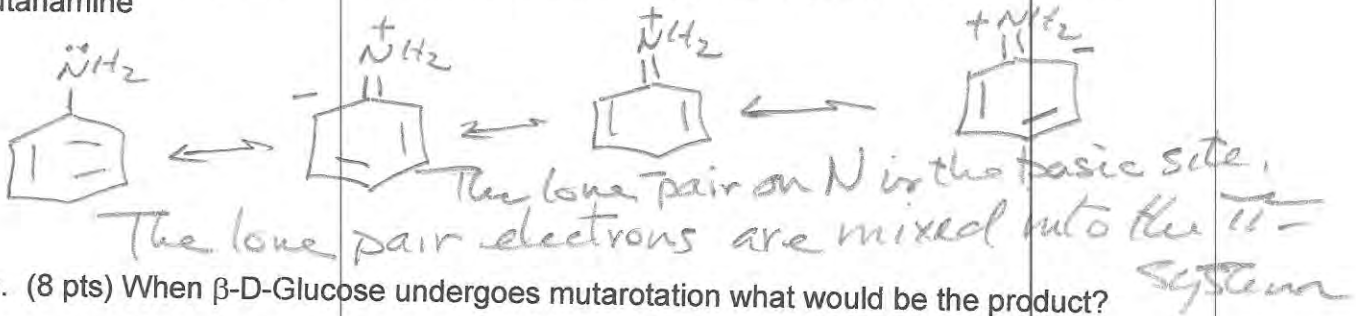


cytidine

21. (8 points) Draw the molecular orbital diagram for allyl cation labeling the HOMO and LUMO. On your drawing mark all carbons that can react to form a bond with a nucleophile. Explain your reasoning for marking the carbons you marked as reactive.



22. (5 pts) Using resonance structures for aniline explain why it is less basic than butanamine



23. (8 pts) When β -D-Glucose undergoes mutarotation what would be the product?

α -D-glucose

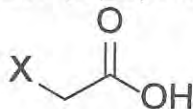
24. (5 points) The ligand on Pd used in the Heck reaction is a triphenylphosphine. This ligand is an example of:

- a. pi-donor ligand with sigma acceptor response
- b. Lewis acid ligand
- c. Sigma donor ligand
- d. a. and c
- e. a and b

25. (8 pts) The DNA helix can be B-form or A-form depending on the solution. For A-form DNA helix:

- a. The nucleobases are in the syn conformation and the deoxyribose is in the C2'-endo conformation
- b. The nucleobases are in the anti conformation and the deoxyribose is in the C2'-endo conformation
- c. The nucleobases are in the anti conformation and the deoxyribose is in the C3'-endo conformation
- d. The phosphodiester bond determines the number of nucleobases per helix turn and the ribose can be in either the C2'-endo or C3'-endo conformation

26. (5 pts) For the carboxylic acid drawn below the pKa is:



- a. Approximately 4.7 when X = H
- b. Approximately 2.7 when X = F
- c. Of the same order of magnitude as aniline when X = H
- d. All of the above

27. (5 pts) In an electrophilic aromatic substitution reaction:

- a. The aromatic pi-system is the electrophile
- b. The aromatic pi-system is the nucleophile
- c. Both a. and b. are possible
- d. Only radical intermediates are involved

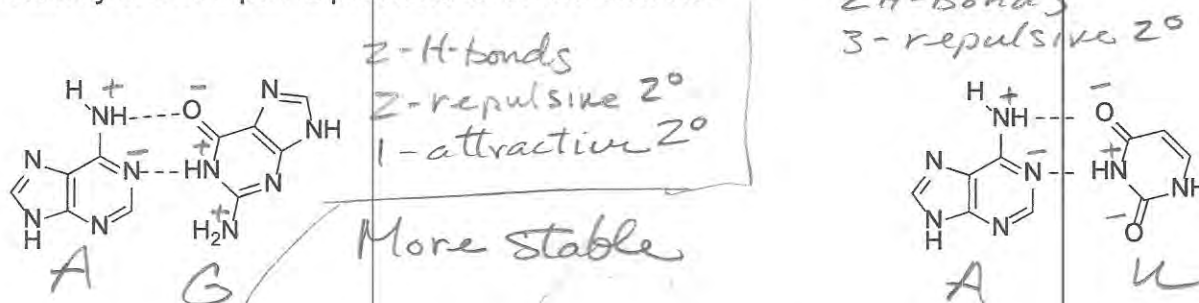
28. (5 pts) Glucose and Fructose can be interconverted by:

- a. Base catalyzed mutarotation
- b. Acid catalyzed enolization
- c. Nucleophilic substitution
- d. Radical elimination plus addition
- e. None of the above

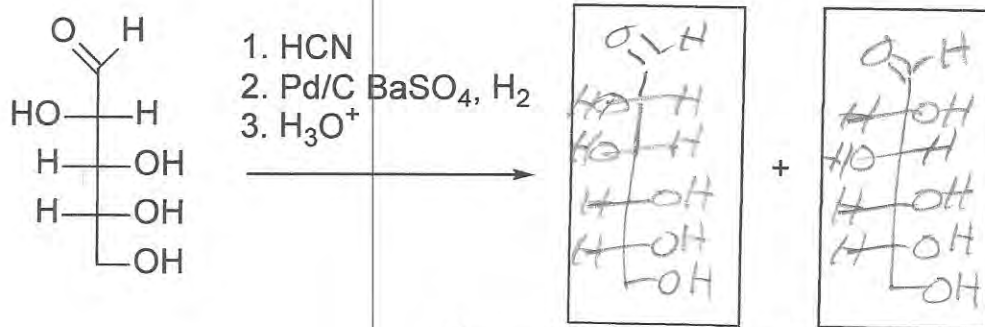
29. (5 pts) The nitrogen in butanamine is:

- a. Sp² hybridized
- b. Sp hybridized
- c. Sp³ hybridized
- d. None of the above

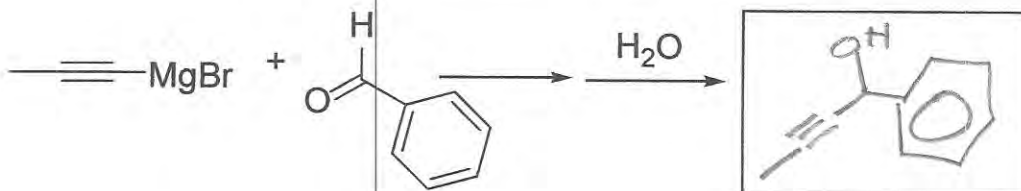
30. (10 pts) For the base pairs drawn below label the nucleobases from the choices A, C, G, or U. For these two hydrogen bonded base pairs explain if they are of the same stability or if one pair is predicted to be more stable.

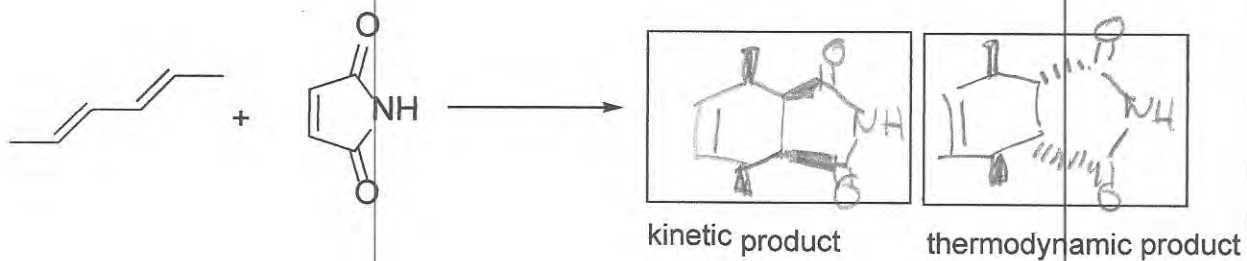
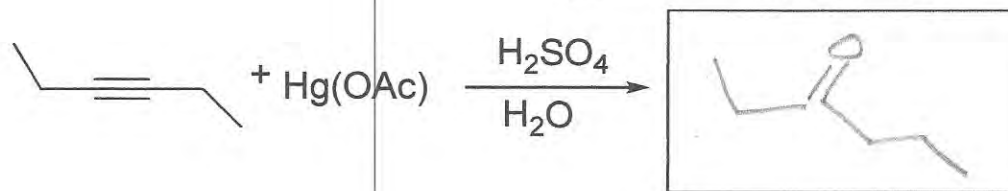
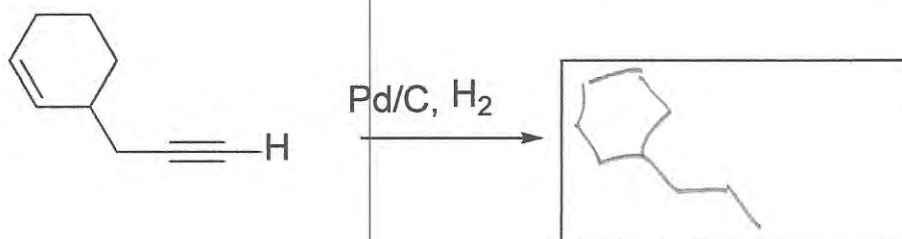
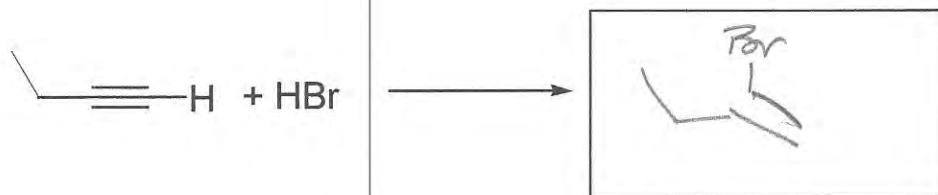
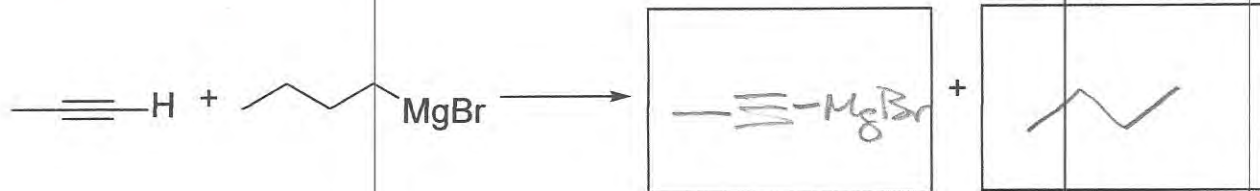


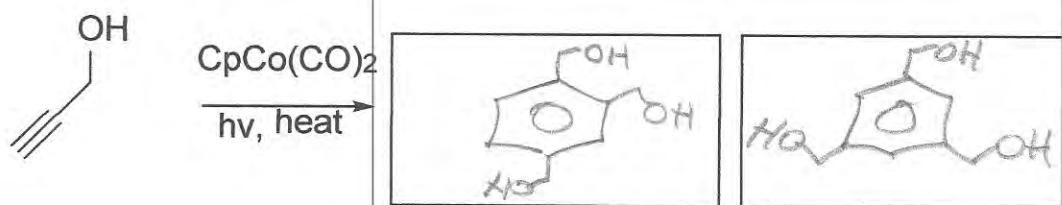
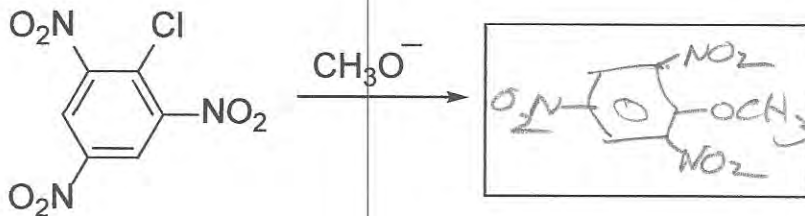
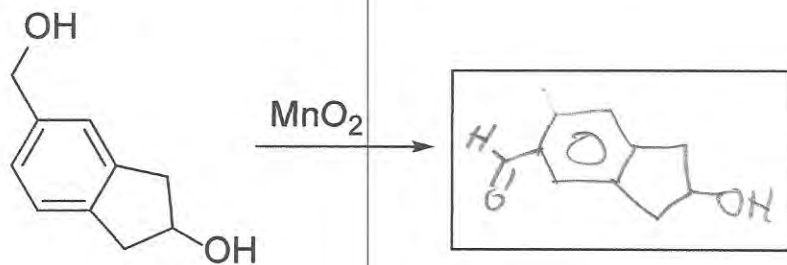
31. (144 pts) For the reactions shown below fill in the box to complete the chemical equation. In equations where there are inorganic by-products you can ignore these in your answer.



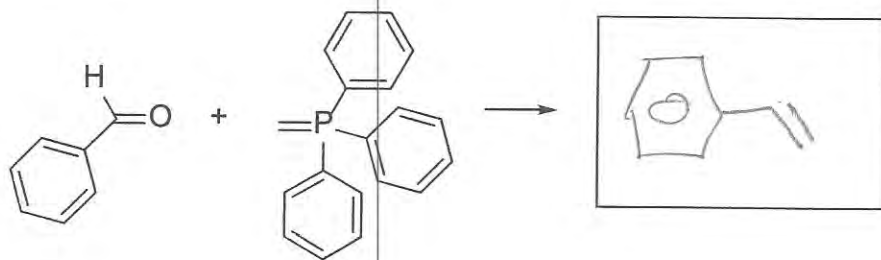
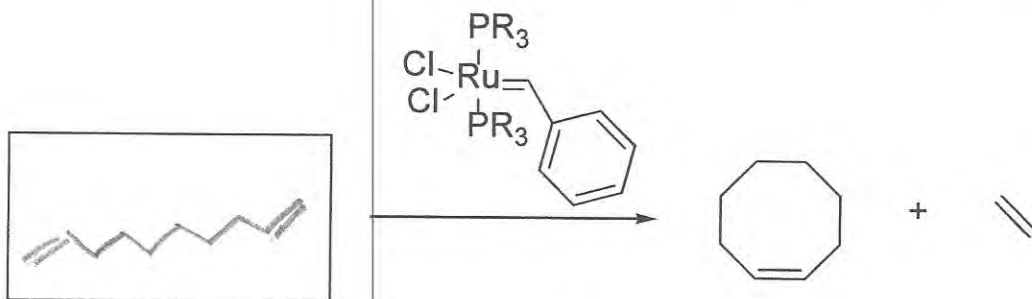
Draw the products as Fischer projections

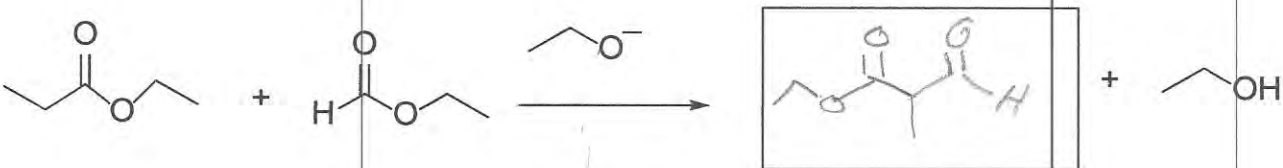
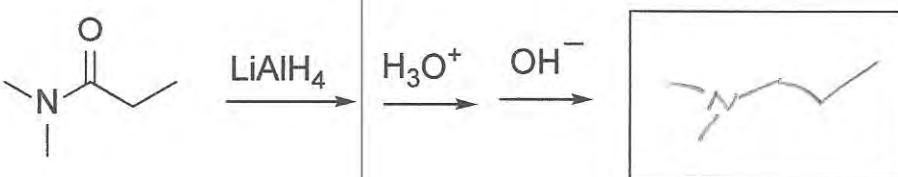
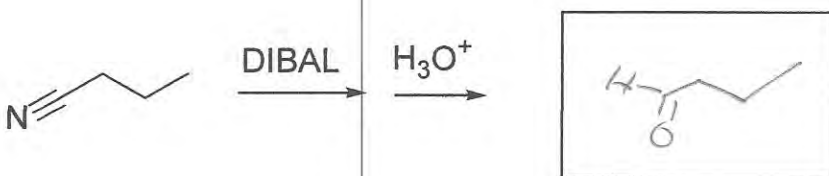
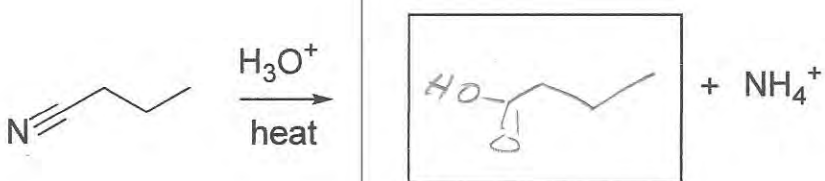
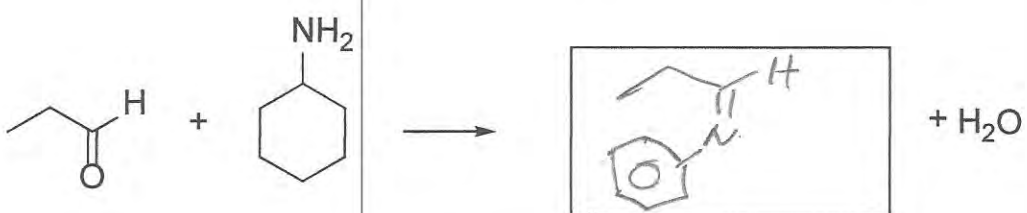
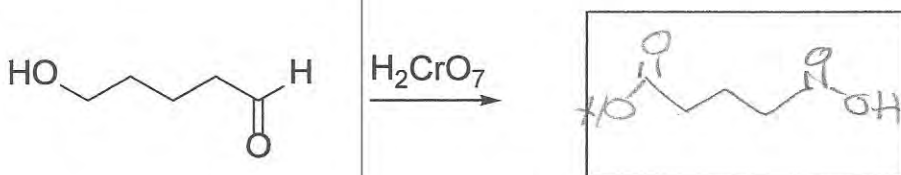
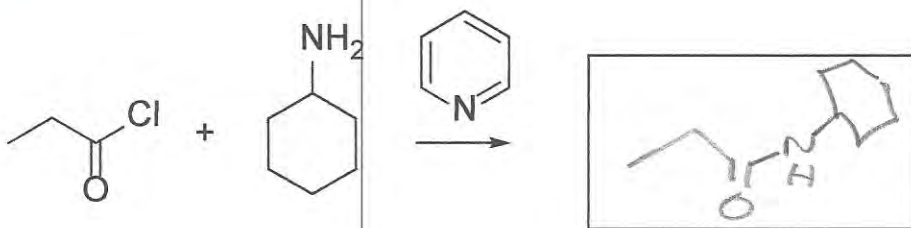






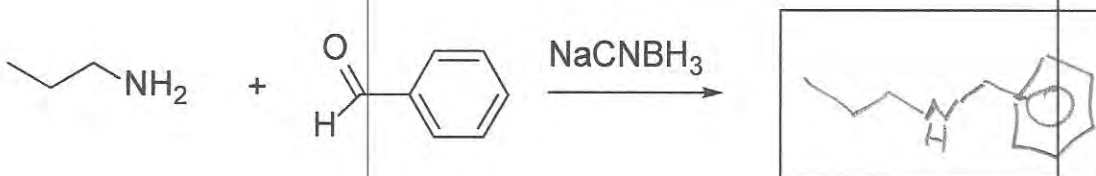
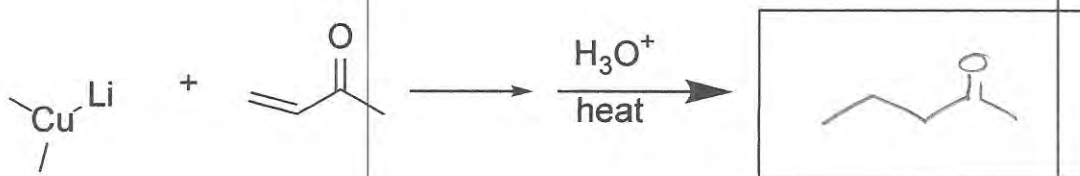
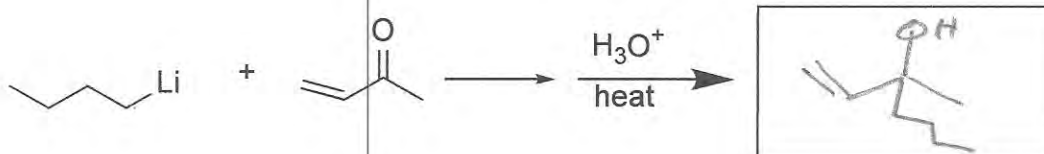
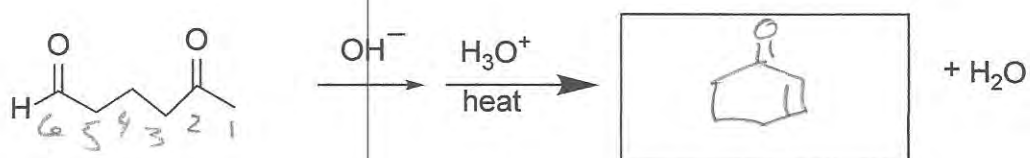
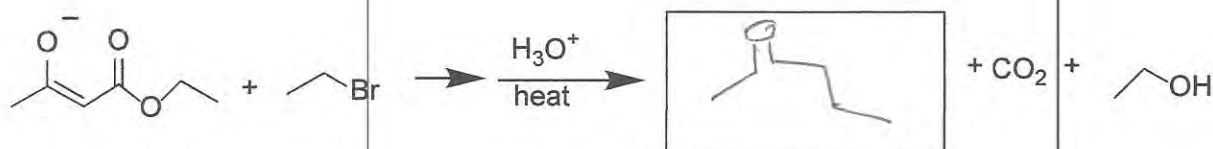
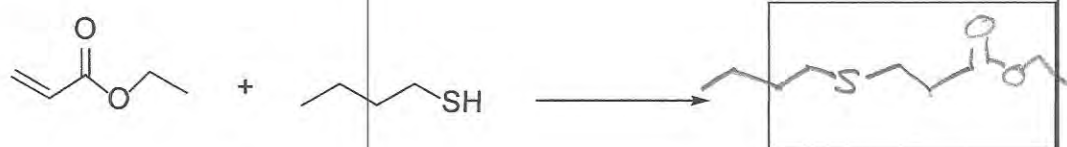
Both are substituted benzenes





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