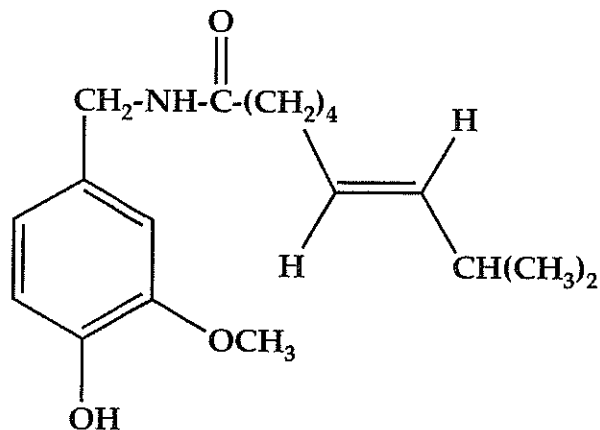


Chemistry 3331-100
Organic Chemistry / Dr. Barney Ellison
Tuesday: Dec 14th @ 7:30pm @ 10:00pm / FINAL Exam / (Chem 142)

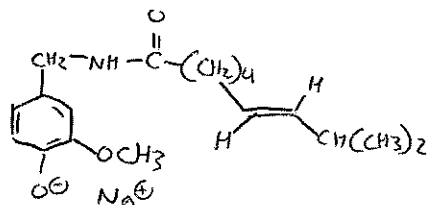
Name: KEY (please print)

1. (10 pts) Consider the molecule capsaicin.



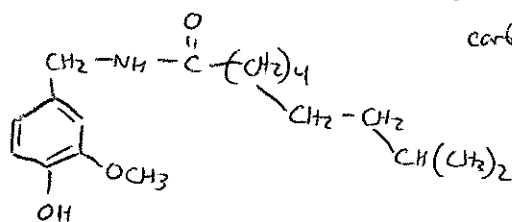
What are the products of the reaction of capsaicin with:

3pts a) dilute NaOH/H₂O

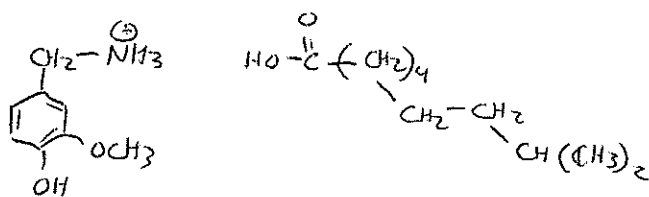


3pts b) 1 equivalent H_2/Ni catalyst

(Alkene is reduced more quickly than carbonyl)

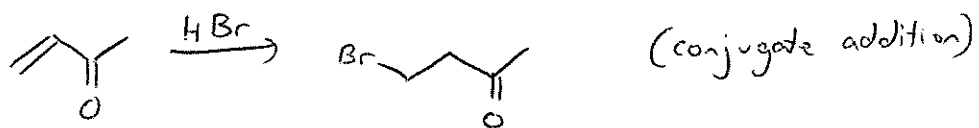


4pts c) product of b) + 6 M HCl + Δ (Amide hydrolysis)

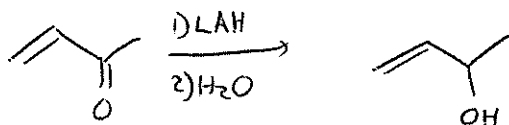


2. (20 pts) Give the products expected when $\text{CH}_2=\text{CH}-\text{CO}-\text{CH}_3$ (methyl vinyl ketone) reacts with the following:

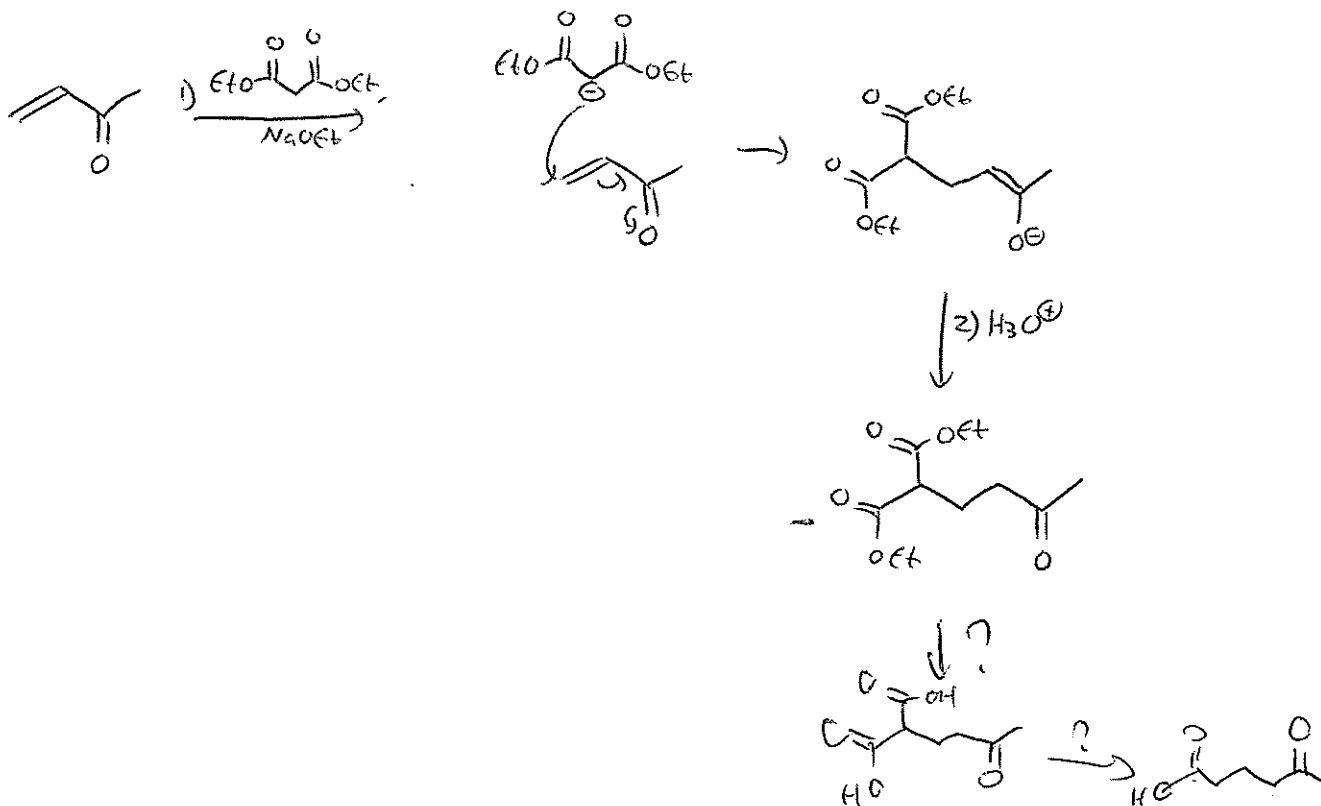
a) HBr



b) LiAlH_4 , then H_2O

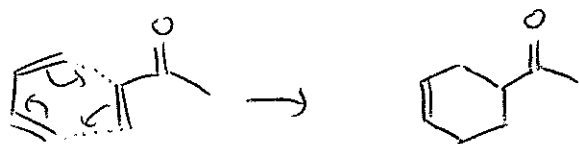


c) diethylmalonate/NaOEt, then H₃O⁺



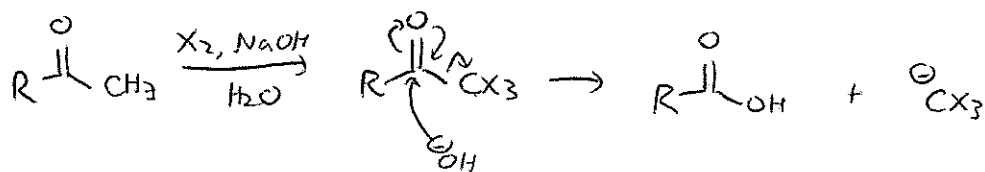
d) 1,3 butadiene

(Diels-Alder)

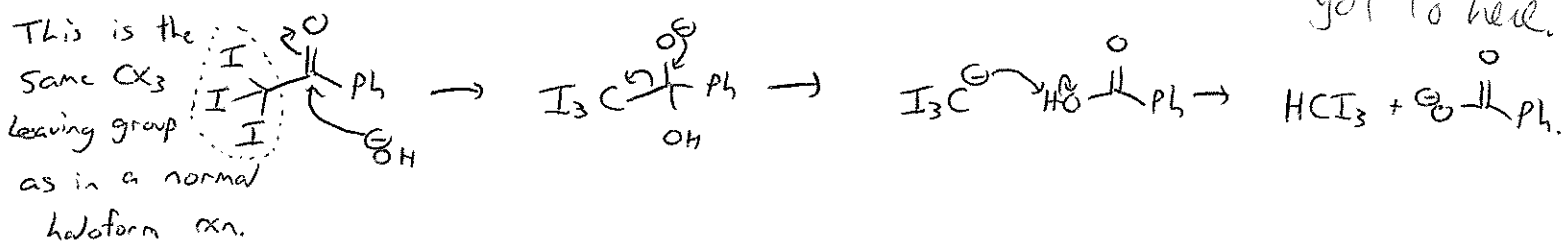
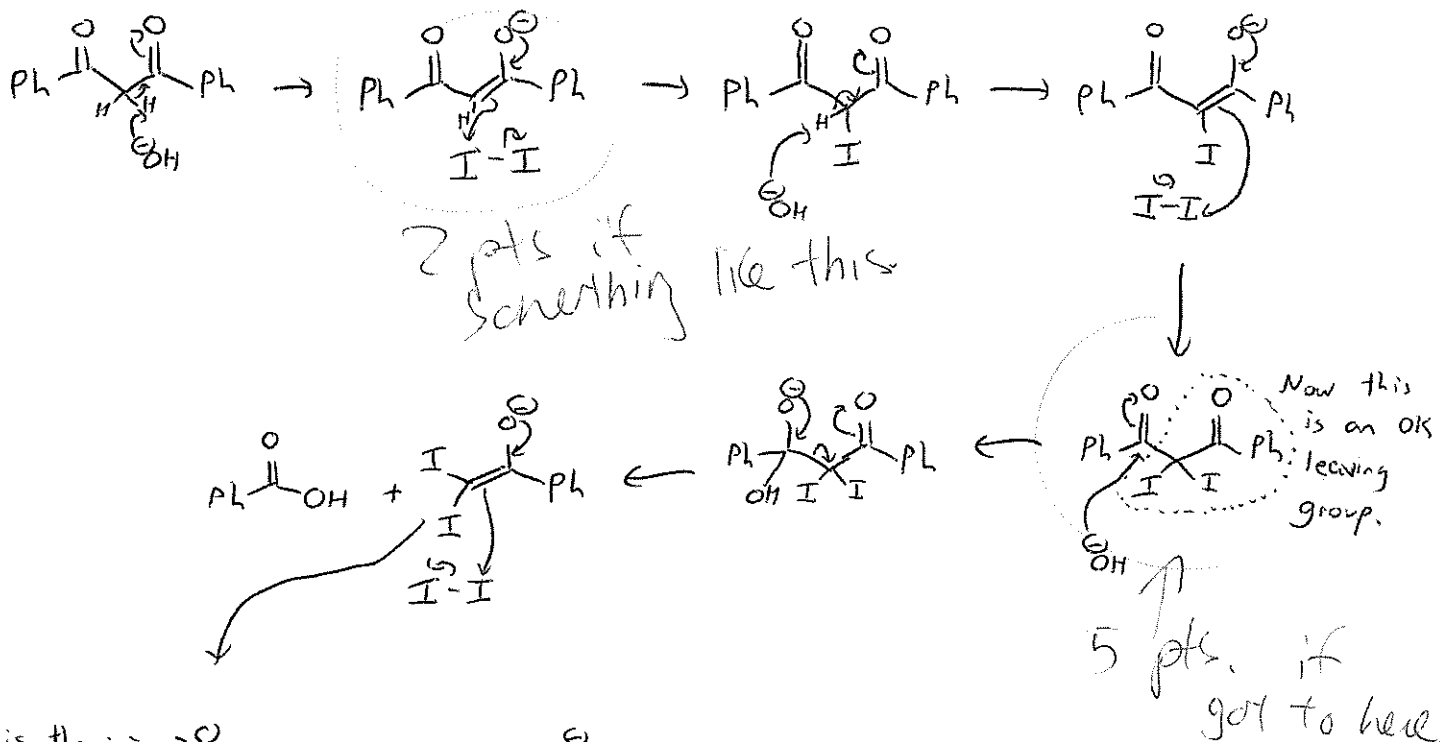


3. (10 pts) Account for the fact that treatment of 1,3 diphenyl-1,3-propanedione (Ph-CO-CH₂-CO-Ph) with I₂ + NaOH gives a precipitate of HCl₃ even though it is not a methyl ketone. Besides iodoform, the other product of the reaction (following acidification) is 2 equivalents of benzoic acid.

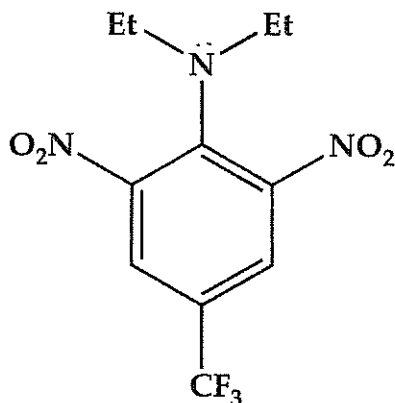
In the haloform reaction, CH₃ gets turned into a leaving group.



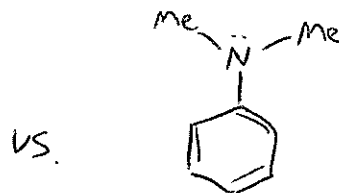
We can't do this right away but we can still make a decent LG.



4. (10 pts) How would the basicity of trifluralin compare with that of N,N-dimethylaniline: much greater, same, or less? Explain.

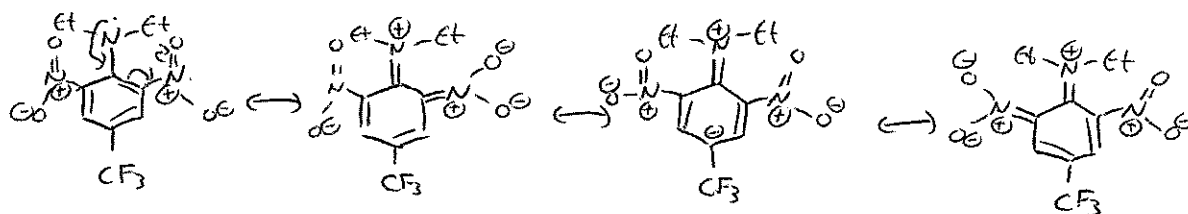


trifluralin



N,N-dimethyl aniline.

Trifluralin is much less basic because the N's lone pairs are tied up in the ring, due to all the electron withdrawing groups.

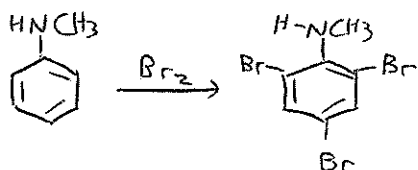


- 5 pts. for right answer.
- other pts. assigned how good reasoning is.
- Electroneg. ~~4~~ Full Pts.
- Resonance.

5. (20 pts) Give the principal organic product expected when N-methylaniline ($C_6H_5NHCH_3$) reacts with the following:

a) Br_2

5 pts each



Brominate N = 1 pt

Brominate CH_3 = 1 pt

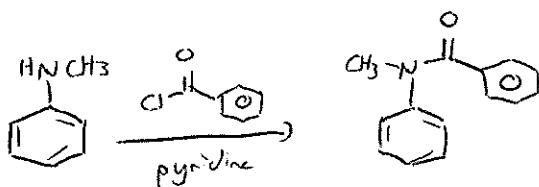
" " $3 \times = \emptyset$ pt

Brominate ring 1x = 3 pt

" " $2 \times = 4$ pt

" " $2 \times$ meta = 2 pt

b) benzoyl chloride/pyridine

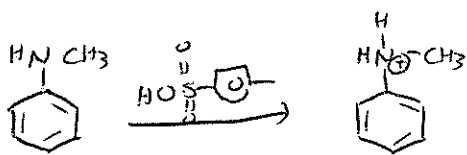


Acylate the CH_3 : \emptyset

Acylate the ring: $o/p = 3$ pts

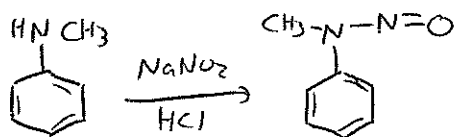
$m = 1$ pt

c) *p*-toluenesulfonic acid



Tosylate $N = \emptyset$

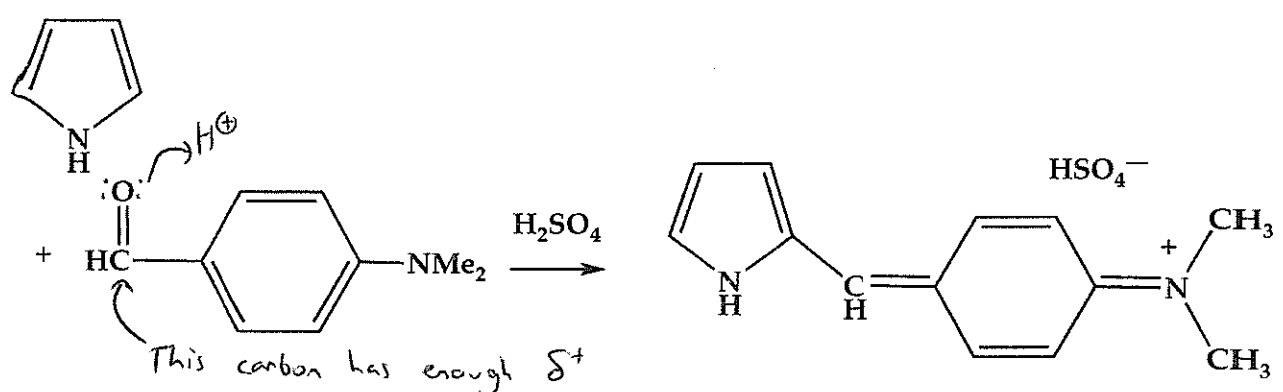
d) NaNO_2/HCl



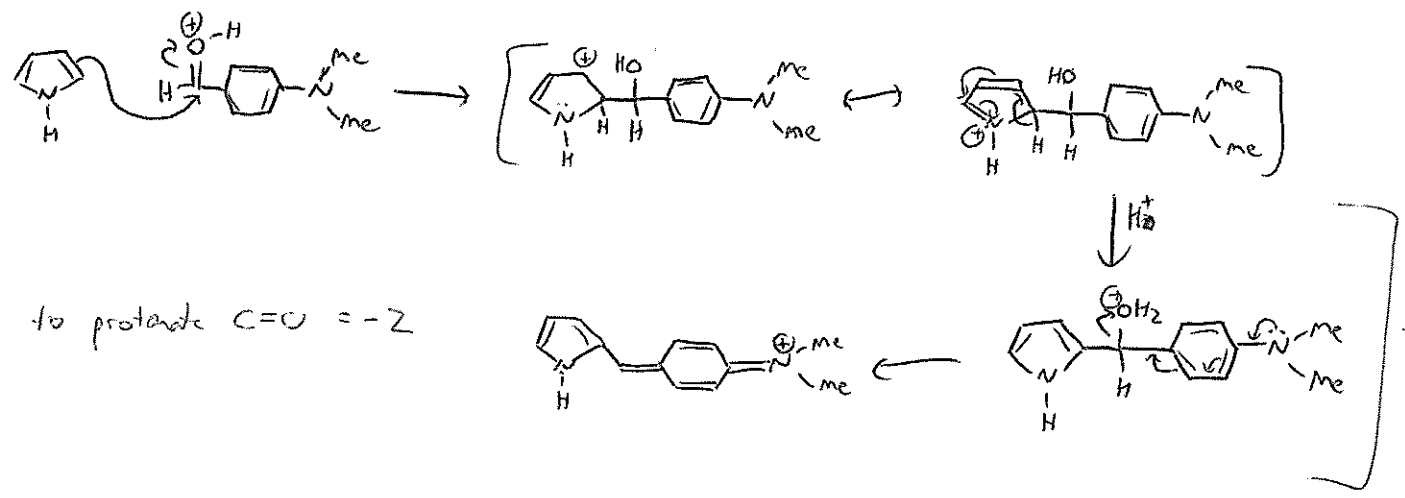
Nitrate the ring = \emptyset

Diazonium = +2

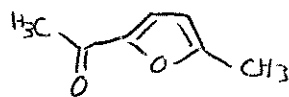
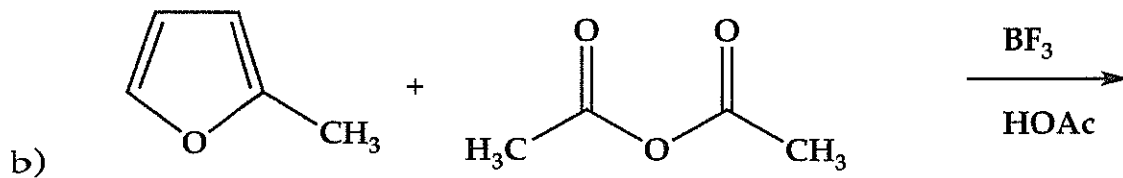
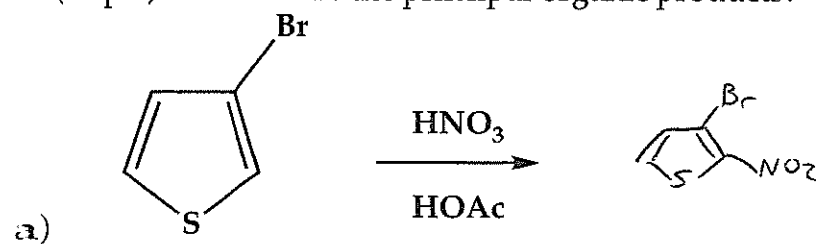
6. (10 pts) Write a mechanism for the following reaction:

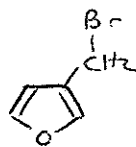
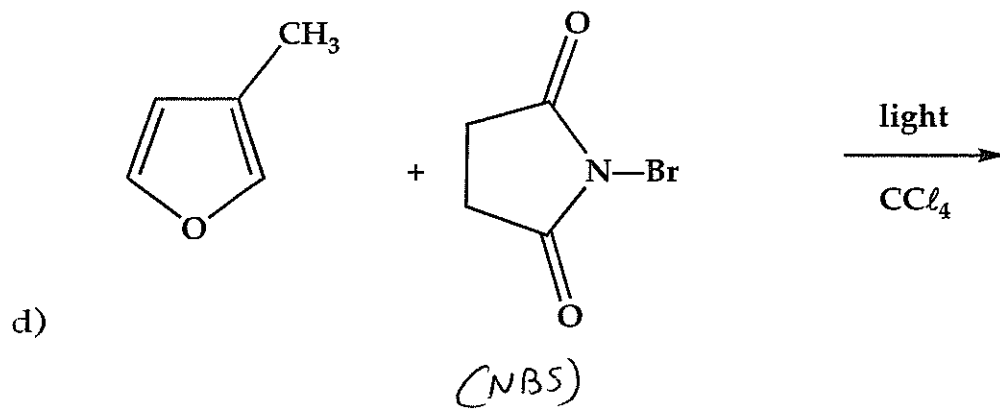
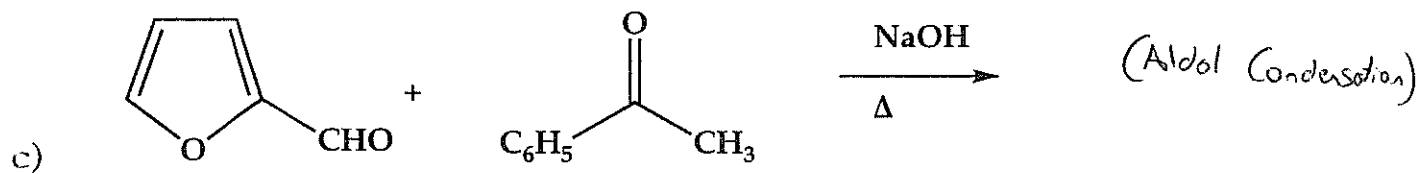


This carbon has enough δ^+ to act as an electrophile in EAS, once it's protonated.

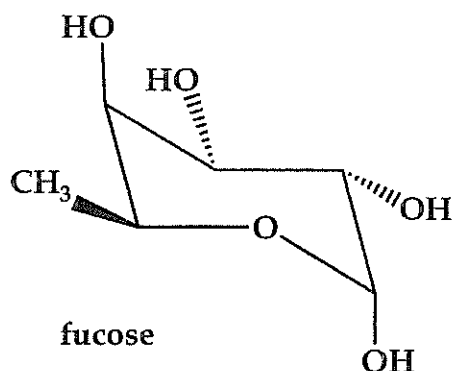


7. (20 pts) What are the principal organic products?

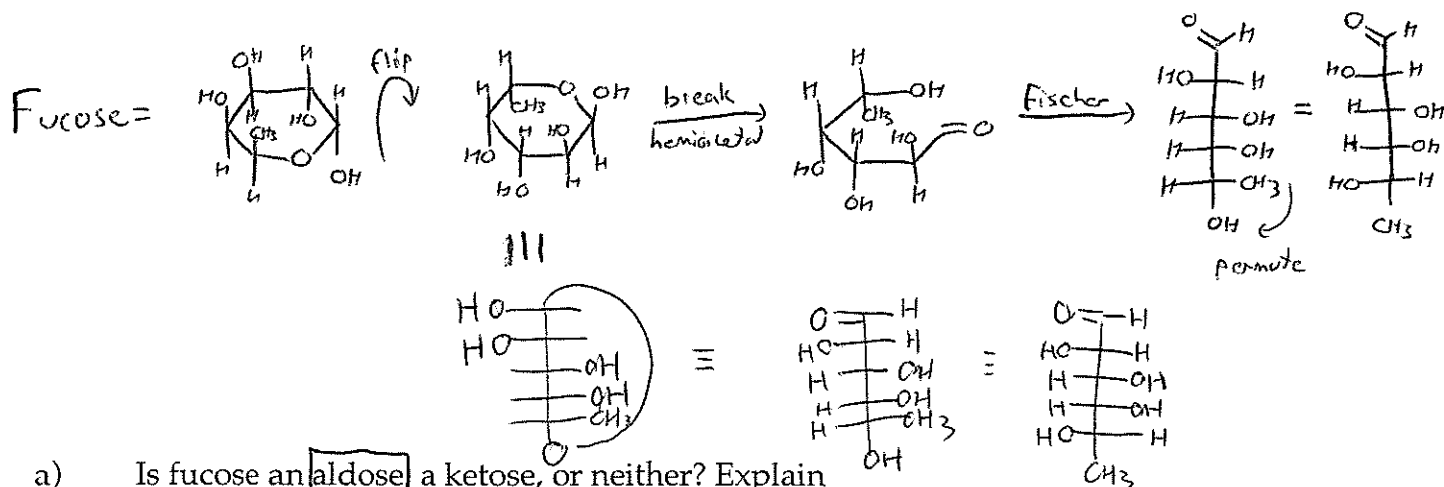
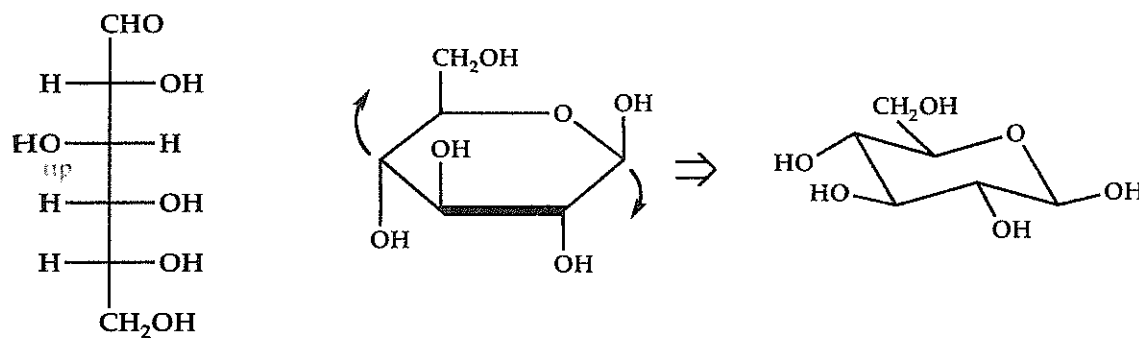




8. (20 pts) 24.42 Fucose, a carbohydrate with the following structure, is important in immunology.



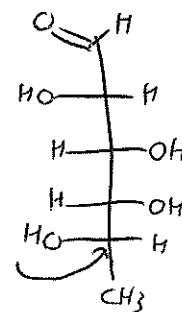
A helpful hint is to convert fucose into a Haworth structure to track down the stereochemistry; remember glucose



a) Is fucose an aldose, a ketose, or neither? Explain

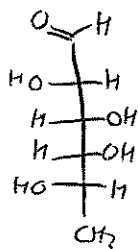
b) Is this the D- or L- enantiomer? Explain

The OH on the lowest stereocenter points left when all carbons are in a vertical line.

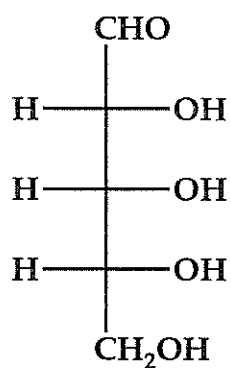


c) Is this the α - or β - anomer?

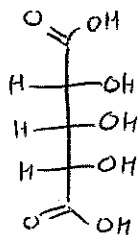
d) Draw a Fischer projection of the carbonyl form of this carbohydrate.



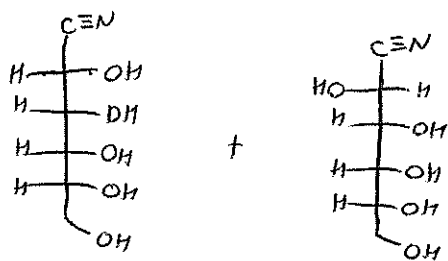
9. (20 pts) Give the products expected when D-ribose reacts with each of the following.



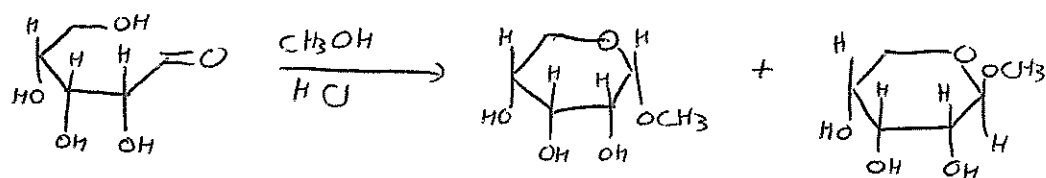
a) dilute HNO_3



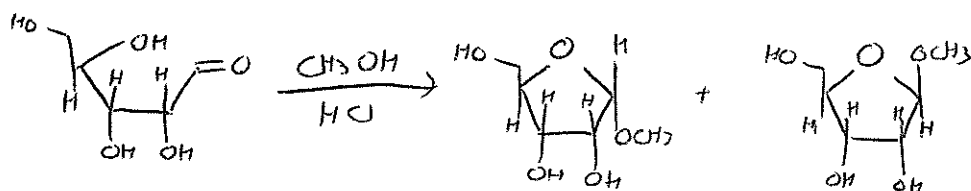
b) $\text{Na}^+\text{CN}^-/\text{H}_2\text{O}$



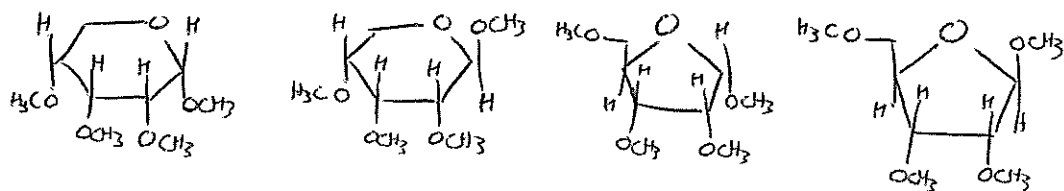
c) $\text{CH}_3\text{OH}/\text{HCl}$ (total of 4 products; 2 pyranosides + 2 furanosides)



rotate
bottom end



d) products of part (c) + excess $(\text{CH}_3)_2\text{SO}_4 + \text{NaOH}$



10. (10 pts) Vanillin (the naturally vanilla flavoring) occurs in nature as a β -glycoside of glucose. Suggest a structure for this glycoside.

