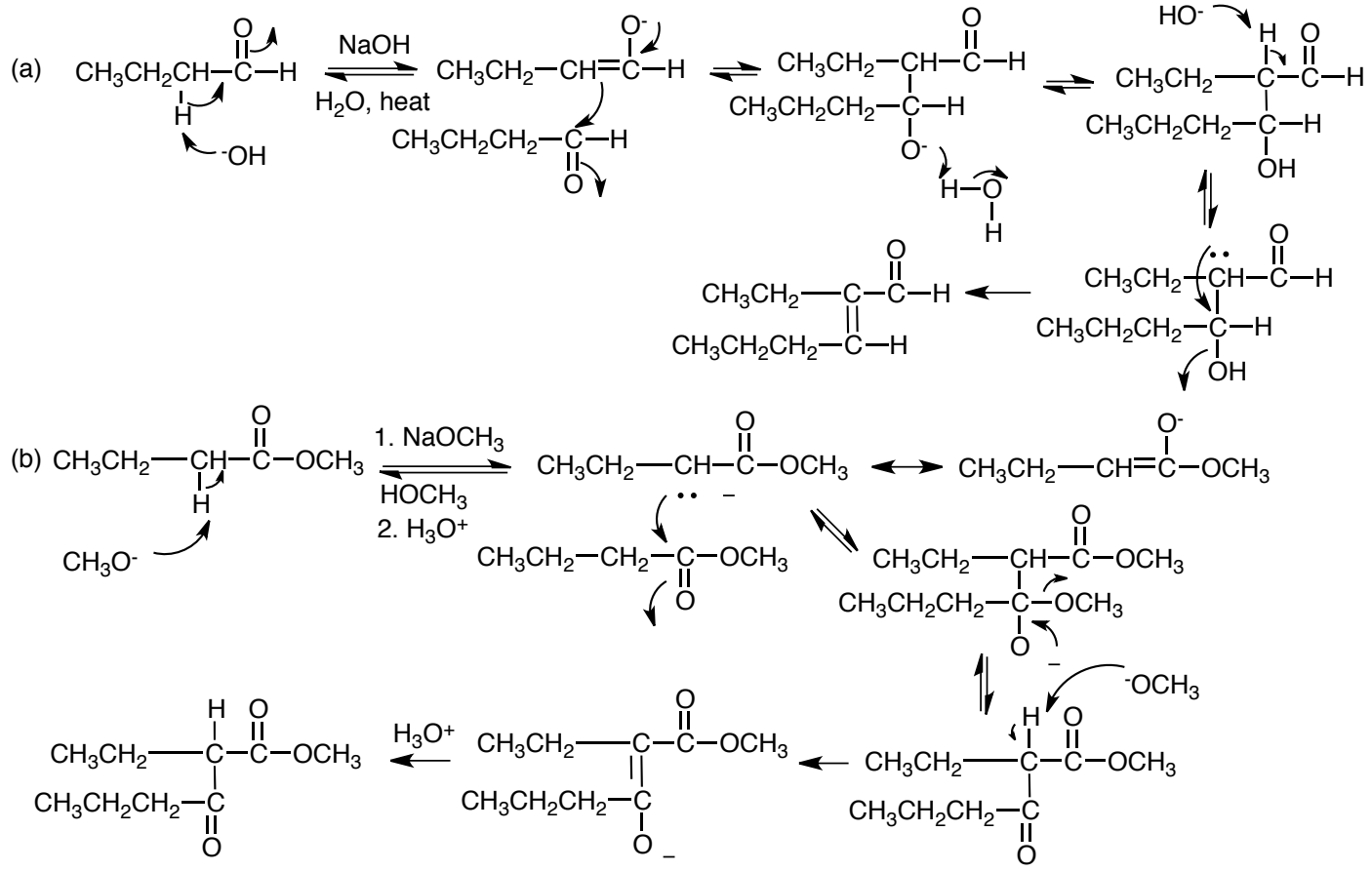
Name .....

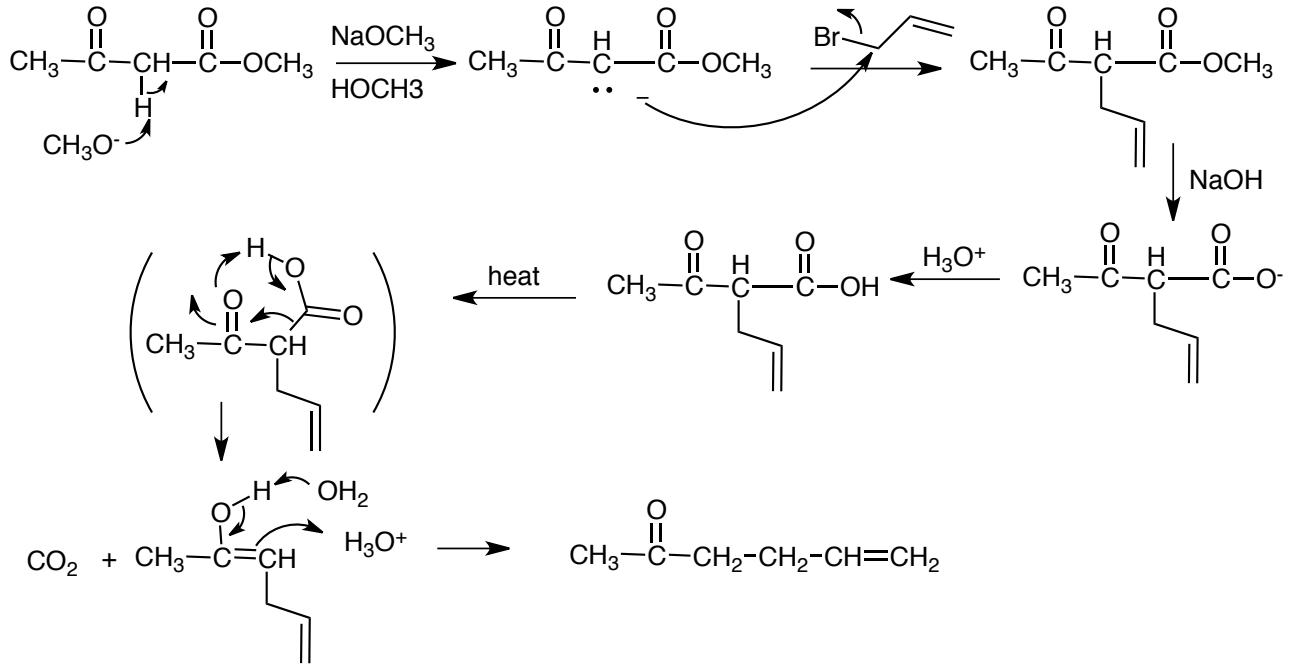
L.I.U.

Chem. 122, Sect 007, Quiz 4, 50 pts, Spring, 2011

1. Give the product of the following reactions and show all steps in the reaction mechanism. (20 pts)

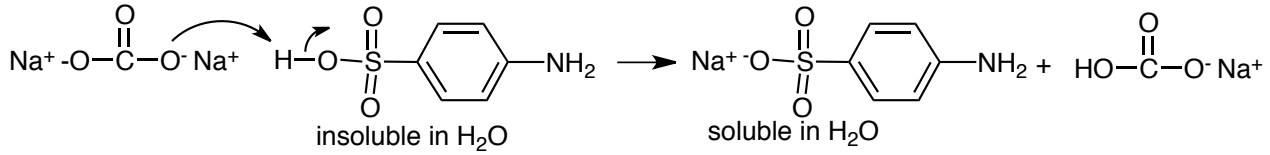


2. Synthesize the molecule on the right from the starting material shown on the left. (10 pts)



3. In the preparation of methyl orange from sulfanilic acid ($HOSO_2C_6H_4NH_2$) and N,N-dimethylaniline [$(CH_3)_2NC_6H_5$] in the presence of sodium nitrite ($NaNO_2$), sodium carbonate (Na_2CO_3) and sodium hydroxide (a) show the reaction that occurs between sulfanilic acid and sodium carbonate and briefly explain the purpose of this step. (b) How many mL of a 1.0 M solution of sodium carbonate would be needed to deliver 0.02 moles of sodium carbonate? (c) What is the purpose of adding the sodium nitrite and HCl to the sulfanilic acid solution? (d) Show the reaction that occurs between the N,N-dimethylaniline and acetic acid (CH_3CO_2H) and explain the purpose of mixing these two reagents together. (e) In the final step, after adding the sodium hydroxide solution, the reaction mixture was heated to boiling until the solution became clear. What was the purpose of doing this? (15 pts)

(a)

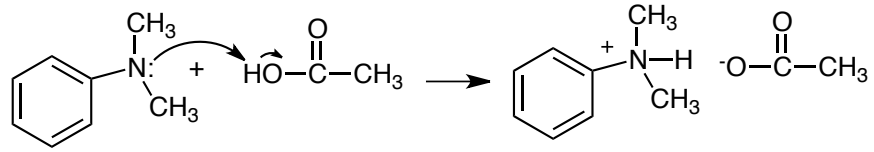


So the purpose of this step is to dissolve the sulfanilic acid by making the anion.

(b) $\frac{0.02}{1.0} \times 1000 \text{ mL} = 20 \text{ mL}$

(c) The purpose of adding the sodium nitrite and the HCl is to form the diazonium salt. The sodium nitrite is the source of the second nitrogen of the diazonium salt.

(d)



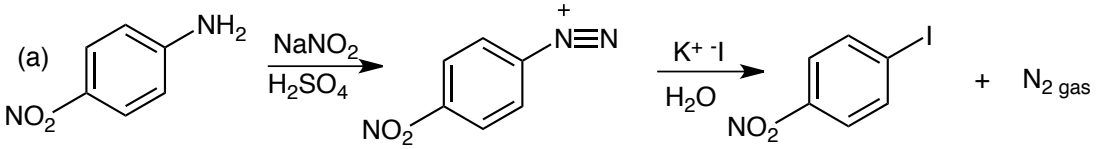
isoluble in water

Soluble in water and also it is non-nucleophiic.

(e) The purpose of this final step was to recrystallized the product from water. Ideally we should have filtered the methyl orange before recrystallizing it but the filtration process is quite slow and so we simply reused the original water to save time.

4. In the preparation of p-iodonitrobenzene from *p*-nitroaniline and sodium nitrite and potassium iodide (a) show the overall reaction, showing all intermediates, though you do not need to write a detailed mechanism. (b) A lot of foaming occurred when the diazonium salt was added to the potassium iodide solution. What was the cause of this foaming? Explain briefly. (5 pts)

(a)



(b) The foaming was due to the release of the N_2 gas that was formed from the diazonium salt.