Chemistry 3B
Fall, 1992

First Midterm
1 October 1992

Paul A. Bartlett

Your Name: _____

**PLEASE CIRCLE YOUR SECTION NUMBER/NAME OF TA**

| | |
|---|---|
| 101/Matthew Marx | 301/Whitney Smith |
| 102/Bruce Ellsworth | 311/Adam Matzger |
| 111/Jim Krom | 312/Drew Thompson |
| 112/Jason Martin | 411/Stephen Mills |
| 211/Corey Liu | 412/Sun Yeoul Lee |
| 212/Chad Peterson | 511/Traci Hopkins |

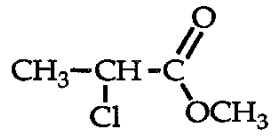
*AT THE BEGINNING:*

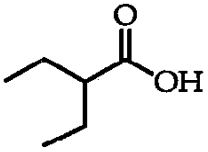
This exam has SEVEN pages;
**make sure that you have them all.**
Please write your answers in the boxes provided.
We will only grade the answers that are in the boxes; please do your scratch work on the backs of the pages.

| | | |
|---|---|---|
| I | (20 pts) | _____ |
| II | (15 pts) | _____ |
| III | (25 pts) | _____ |
| IV | (30 pts) | _____ |
| V | (20 pts) | _____ |
| VI | (40 pts) | _____ |
| VII | (50 pts) | _____ |
| **Total** | **(200 pts)** | _____ |

I. (20 points)

A. Provide systematic names for the following compounds:



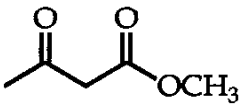


B. Draw the structures that correspond to the following names:

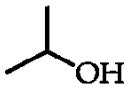
| N,N-Dimethylacetamide | Propanoic anhydride |
|---|---|
| | |

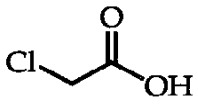
II. (15 points)

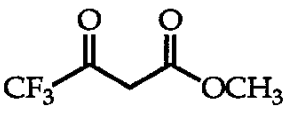
Rank the following compounds in order of **DECREASING** acidity.

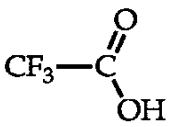
**A:** 

**B:** 

**C:** 

**D:** 

**E:** 

**F:** 

MOST ACIDIC

_____

_____

_____

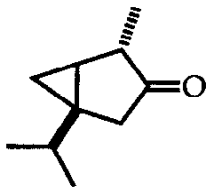
_____

LEAST ACIDIC

III. (25 points)

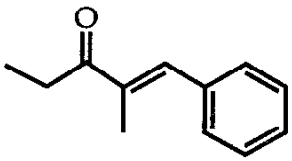
A. On the following molecules, show how many hydrogens can be exchanged for deuterium in NaOD, $D_2O$ by drawing in the deuteriums that would be incorporated.

**1.**



**Thujone**: a toxic component of absinthe

**2.**

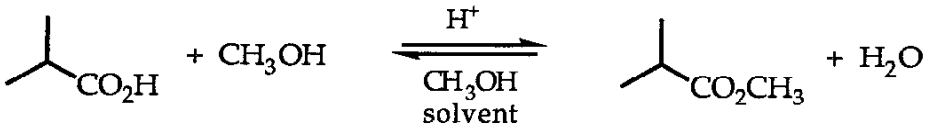


B. For <u>each</u> type of exchangeable hydrogen in the two compounds, draw the structure of the enolate that accounts for the exchange. (***NOTE:*** there may be more than one for each starting material)

| **1.** | **2.** |
|---|---|

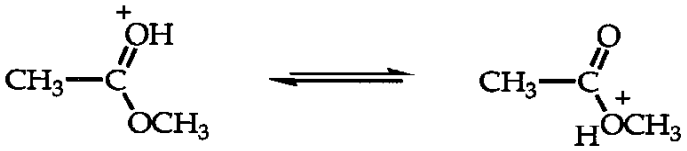
IV. (30 points)

For each of the equilibrium reactions depicted below, predict which side is favored ("left" or "right"), and provide a brief explanation for your choice.




| Favored side: | Why? |
|---|---|
| | |

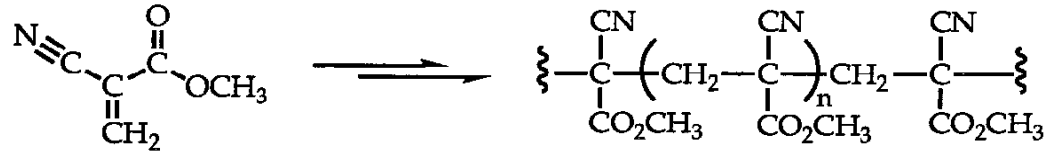

| Favored side: | Why? |
|---|---|
| | |




| Favored side: | Why? |
|---|---|
| | |

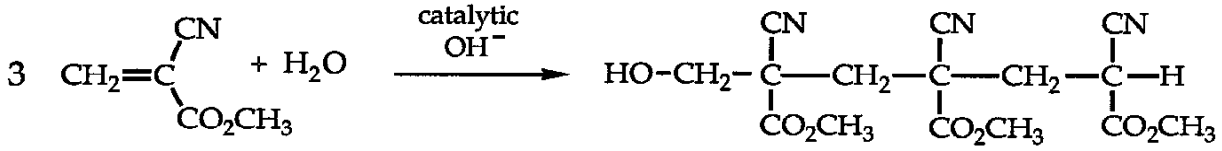
V. (20 points)

The major component of "Super-Glue" is methyl α-cyanoacrylate. When it is exposed to air (moisture), this material polymerizes rapidly to give the long chain structure shown.



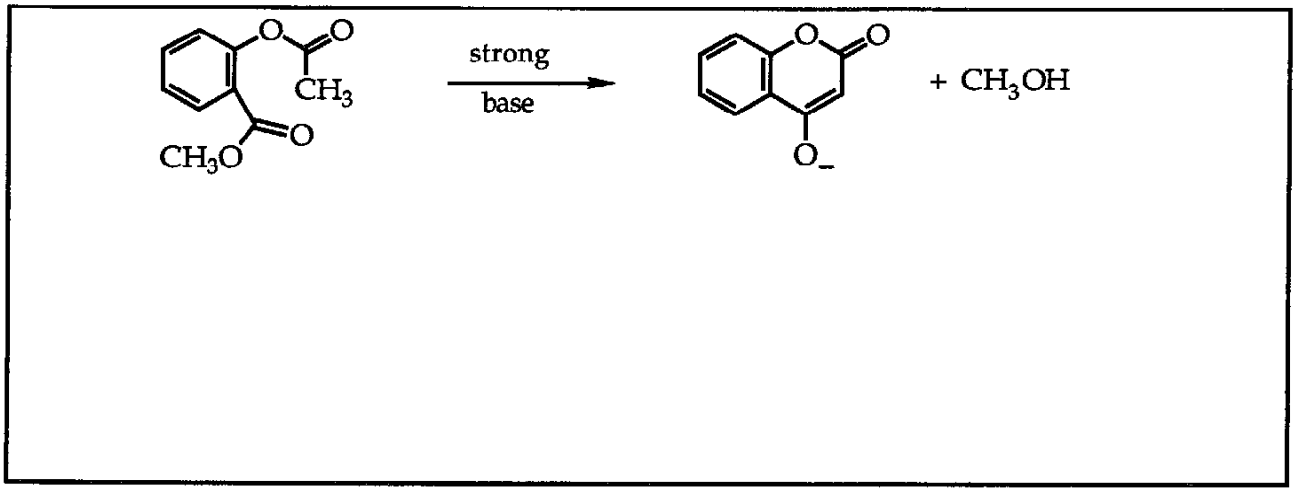
methyl α-cyanoacrylate

To illustrate how this polymerization can start and propagate, show the mechanism for the reaction of three molecules of methyl α-cyanoacrylate to give the trimer illustrated below. For the purpose of the problem, assume there is a catalytic amount of $^{-}OH$.

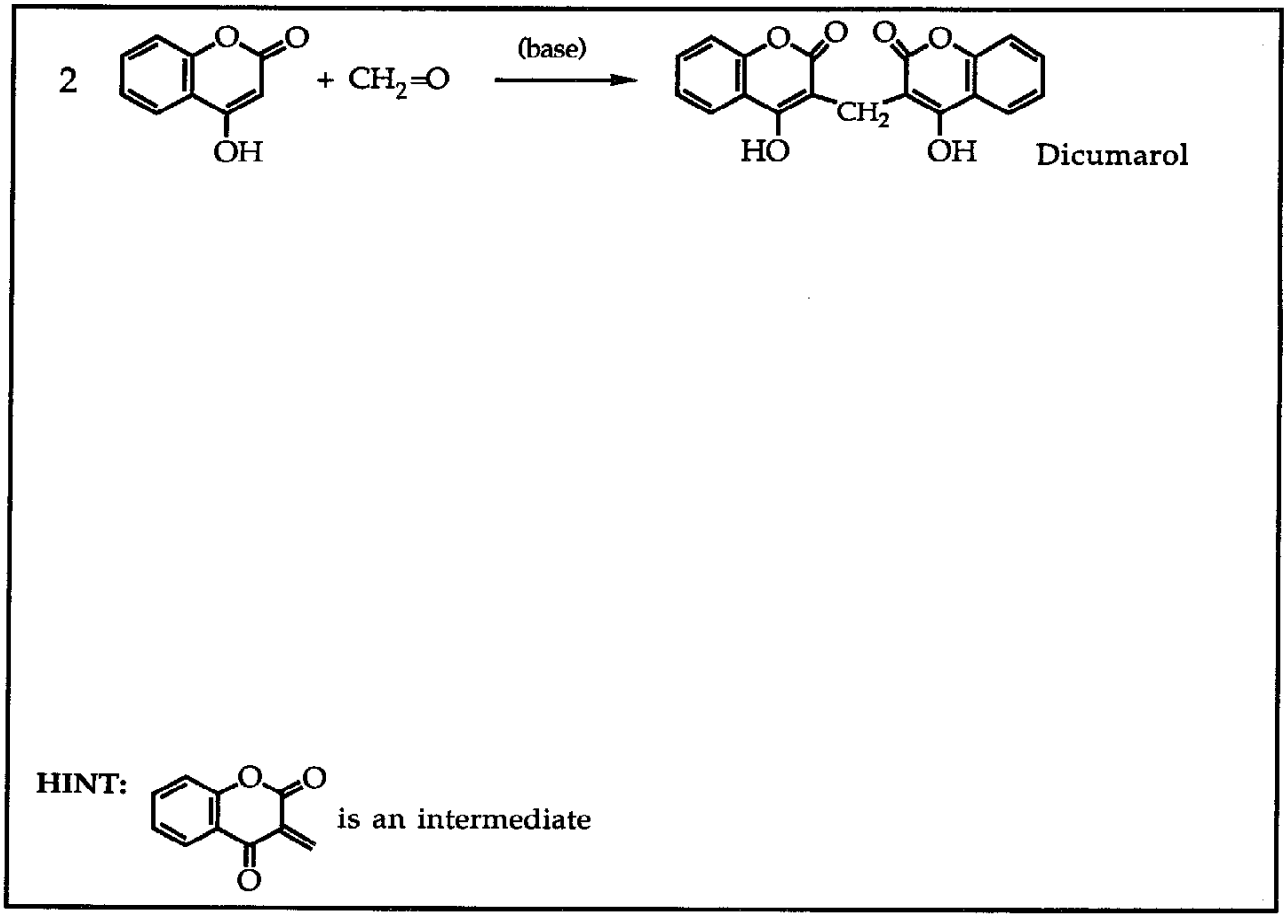


VI. (40 points)

Dicumarol (illustrated below) is an anticoagulant used in the treatment of heart disease and (in relatively higher doses....) in rat poison. The synthesis of dicumarol starts with methyl acetyl salicylate and a strong base. Write a step-by-step mechanism for this Claisen-like condensation.

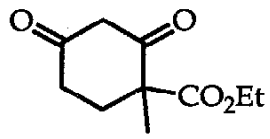


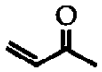

The product of the above reaction adds to formaldehyde in 2:1 stoichiometry to give dicumarol. Write a step-by-step mechanism for this aldol condensation and Michael addition.



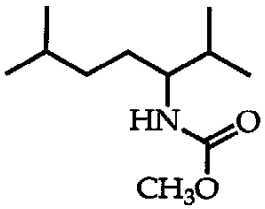
VII. (50 points)

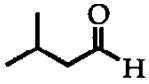
Show how to synthesize the following compounds from the indicated starting materials.



from diethyl malonate,  , $CH_3I$, and any acidic or basic reagents

HINT: begin by analyzing which carbons in the product come from each of the starting materials



from  and any reagents with one carbon or less