

HIGH 93
LOW 16

AVE 60

1

Student Name (first, last):

KEY

Student Number:

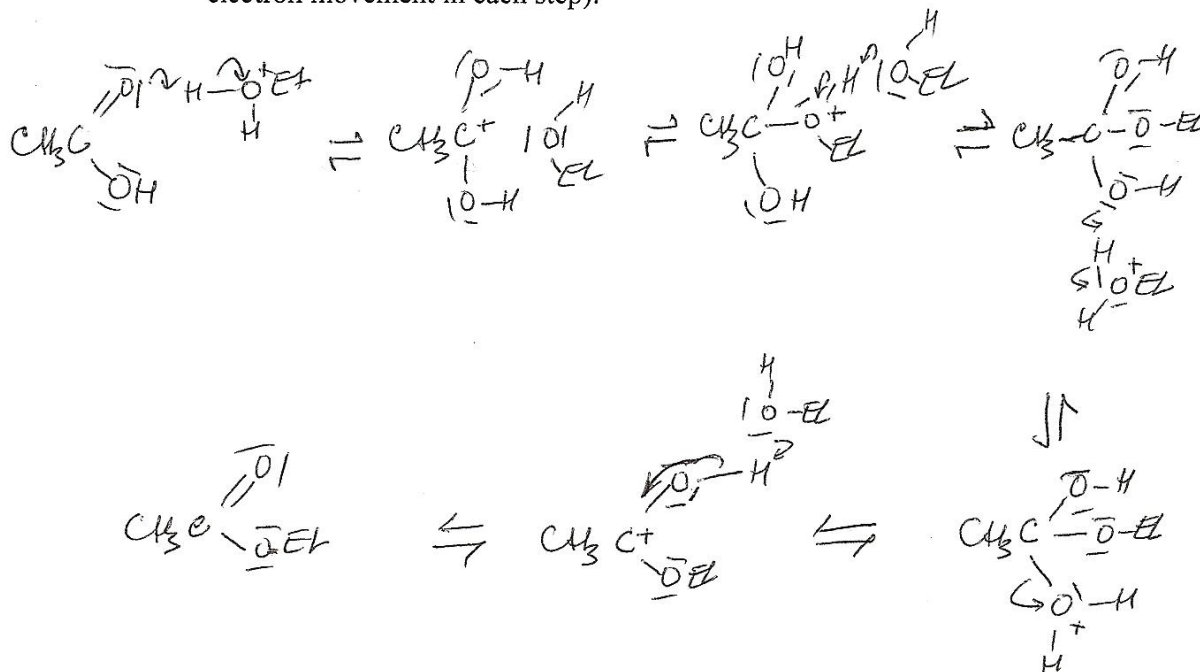
CHEMISTRY 3371
FIRST MIDTERM EXAMINATION

Josef Michl
February 12, 2009

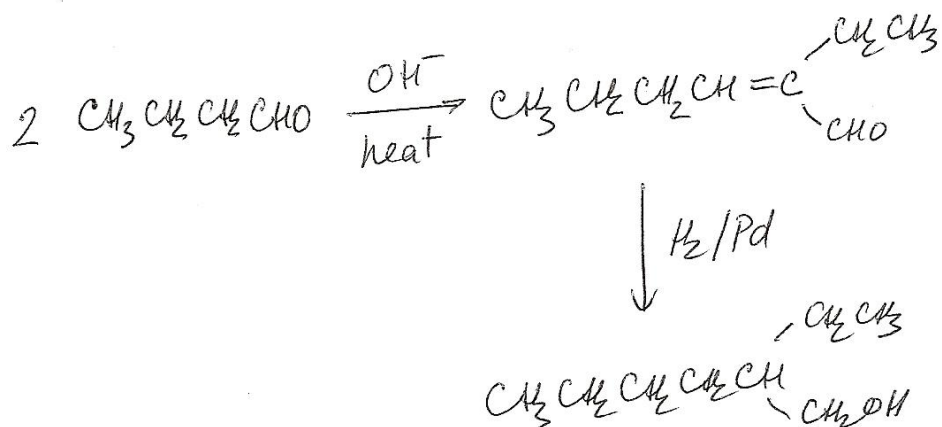
1. (20 points) Check the correct statements only:

- In the ground electronic state, the π orbitals of 1,3-butadiene contain six electrons.
- Carboxylic acids RCOOH react with lithium aluminum hydride (LAH) to yield primary alcohols RCH₂OH after workup.
- Rosenmund reduction converts an acyl chloride RCOCl into an aldehyde RCHO.
- CO₂ reacts with vinylmagnesium bromide to yield acrolein, CH₂=CHCHO.
- Butyric acid reacts with diazomethane to produce methyl pentanoate.
- Fluoroacetic acid has a higher pK_a than acetic acid.
- Pivalic acid reacts with thionyl chloride to yield pivaloyl chloride.
- Allylmagnesium bromide reacts with ethyl bromide to yield 1-pentene.
- Basic hydrolysis of nitriles yields salts of carboxylic acids.
- The allene, CH₃CH=C=CHCH₃, is chiral.
- In solution, carboxylic acids form dimers by hydrogen bonding.
- A concentrated solution of soap in water is colloidal and contains micelles.
- Methyl propionate can be converted into its enolate by reaction with lithium diisopropylamide.
- Lithium diethylcuprate reacts with acetyl chloride to yield diethyl ketone.
- Lithium diethylcuprate reacts with cyclohexen-2-one to yield cyclohexanone.
- Methyl acetate does not react with ammonia.
- Chloroacetic acid reacts with thionyl chloride to yield chloroacetyl chloride.
- Hunsdieker reaction converts a silver salt of propanoic acid into methyl bromide.
- Acetamide reacts with methanol to yield methyl acetate in good yield.
- Monobromination of a carboxylic acid in position α i is best done by reaction with bromine and red phosphorus.

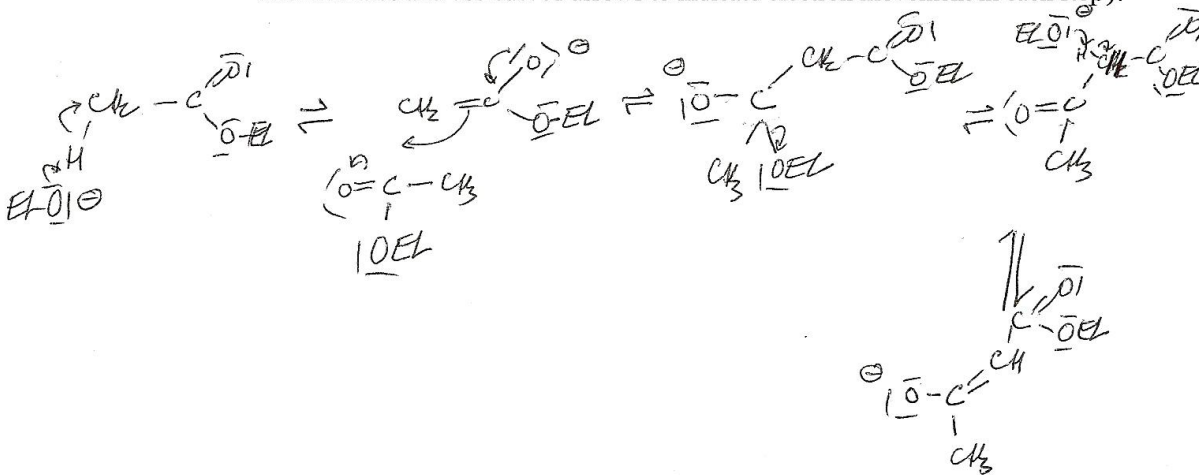
2. (20 pts) Write a plausible mechanism for the acid-catalyzed esterification of acetic acid with ethanol (include all steps and intermediates and use curved arrows to indicate electron movement in each step).



3. (20 pts) Propose a reaction sequence for the synthesis of 2-ethylhexan-1-ol from compounds whose molecule contains no more than five carbons, and inorganic reagents. Show all steps and all reagents (no mechanisms, no curved arrows, no solvents).



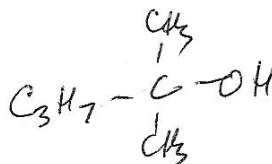
4. (20 pts) Write a plausible mechanism for the Claisen condensation of ethyl acetate in the presence of one full equivalent of sodium ethoxide in ethanol (include all steps and intermediates and use curved arrows to indicate electron movement in each step).



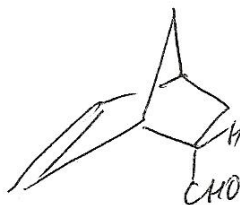
During aqueous workup, the product is converted into $\text{CH}_3\text{COCH}_2\text{CO}_2\text{Et}$
 this product accumulates

5. (20 pts) Write the structures of **all** principal organic products of the following reactions. You do not need to show solvents, mechanisms, or curved arrows.

(a) $C_3H_7-CO-OCH_3 + 1. CH_3MgI$ (excess), $2. H^+ \rightarrow$



(b) cyclopentadiene + acrolein ($CH_2=CHCHO$) \rightarrow



(c) $C_7H_{15}CONH_2 + SOCl_2$ (heat) \rightarrow



(d) $CH_2=CHCH=CH_2 + Br_2$ (1 equiv., $60^\circ C$) \rightarrow



(e) 2-cyclohexenone + KCN , acetic acid \rightarrow

