

Student Name (first, last):

Student Number:

CHEMISTRY 3371
FIRST MIDTERM EXAMINATION

Josef Michl
February 15, 2007

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

- Carboxylic acids RCOOH react with lithium aluminum hydride (LAH) to yield primary alcohols RCH₂OH after workup.
- Heating of ammonium salts of carboxylic acids produces carboxamides.
- Hunsdieker reaction converts a silver salt of a carboxylic acid RCOOAg into a nitrile RCN.
- Rosenmund reduction converts an acyl chloride RCOCl into an aldehyde RCHO.
- CO₂ reacts with vinylmagnesium bromide to yield acrolein, CH₂=CHCHO.
- Allylmagnesium bromide reacts with alkyl halide RX to yield the hydrocarbon CH₂=CHCH₂-R.
- Acid hydrolysis of nitriles yields carboxylic acids.
- Colloidal solutions were first discovered by Micelle, a 19th-century French TV star.
- Enolization of aldehydes can be catalyzed by acid or by base.
- Monobromination of ketones by reaction with Br₂ is best done under basic conditions.
- Propanoic acid reacts with diazomethane to produce methyl propanoate.
- Lithium diethylcuprate reacts with propanoyl chloride to yield diethyl ketone.
- Lithium diethylcuprate reacts with methyl vinyl ketone to yield ethyl vinyl ketone.
- Methyl acetate reacts with ammonia to yield acetamide in good yield.
- Acetamide reacts with methanol to yield methyl acetate in good yield.
- The allene, C₂H₅C=C=CHCH₃, is not chiral.
- In solution, carboxylic acids form dimers by hydrogen bonding.
- The reaction of butanoic acid with bromine and a catalytic amount of red phosphorus yields 3-bromobutanoic acid.
- Trifluoroacetic acid has a higher pK_a than acetic acid.
- Acetic acid reacts with thionyl chloride to yield acetyl chloride.

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-ethylhexyl bromide 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).

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.

