Name:

Signature:

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1) __________________
2) __________________
3) __________________
4) __________________
5) __________________
6) __________________
7) __________________

Total __________________
1) [12 pts] Give the products for the following reactions (indicate major/minor):

- CH$_3$I excess
- Formaldehyde NH$_3$, HCl
- 1) CH$_3$I excess
- 2) Ag$_2$O $\Delta$
- 1) LDA
- 2) CH$_3$I

2) [12 pts] Give the reagents for the following reactions:

- 1) LiAlH$_4$
- 2) H$_2$O
- Formaldehyde NH$_3$, HCl
- 1) LDA
- 2) CH$_3$I

- COOH
- Cl
- H
- Cl
- Cl
- OH
- H
- COOH
- H
- CO
- Cl
- H
- CO
- Cl
3) [12 pts] Give the reactants for the following reactions:

\[
\text{HONO \ H}_2\text{O} \xrightarrow{} \text{phenol}
\]

\[
\text{Na \ OEt} \quad \text{1) Na \ OEt} \quad \text{2) H+ \ H}_2\text{O \Delta} \quad \text{cyclopentanone} \quad + \ CO_2
\]

\[
\text{HCO} \quad \text{cyclohexanone} \quad + \text{enantiomer}
\]

\[
\text{NaOH, Cl}_2 \quad \text{propyl amine}
\]

4) [10 pts] Propose a chemical structure consistent with the spectral data on the following pages.
5) [ 24 pts ] Propose a multi-step synthesis to get from the structure on the left to the structure on the right. Use any inorganic or standard reagents you need and any other carbon compound up to 4 carbons as additional materials.

A) 

B)
6) [12 pts] Draw
a. two substituted phenols, one more acidic than phenol, the other less acidic than phenol. Circle the more acidic one.

b. resonance forms of acetamide that support the stability of the amide functional group

c. a ketone of formula C_{5}H_{10}O and the main MS fragmentation products.
7) [20 pts] Propose detailed mechanisms to account for the following reactions (use curved-arrow notation to indicate electron flow).

A) ![Reaction A](image)

B) ![Reaction B](image)  

Hint: Hoffmann