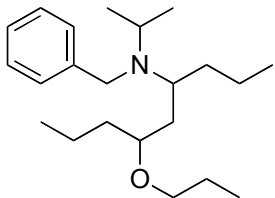


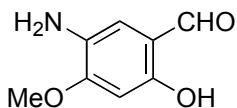
A. Nomenclature (4 points each; 8 total points)

Please provide an acceptable name for each of the following compounds, noting stereochemistry where appropriate.

1.

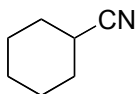


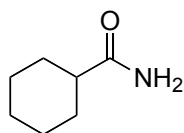
2.

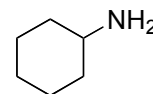


B. Facts (6 total points)

1. Rank the pK_a of the following molecules from lowest (1) to highest (3). (1 pt. each)



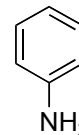




2. Rank the basicity of the following molecules from weakest (1) to strongest (3). (1 pt. each)



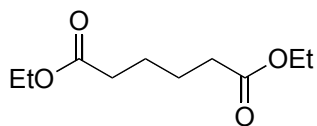




C. Reactions (9 points each; 36 total points)

Please provide the **major** product, or **necessary reagents**, or **starting material** in the **box** provided below. Be sure your drawing indicates stereochemistry if applicable.

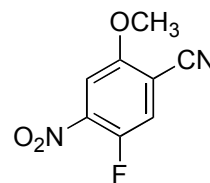
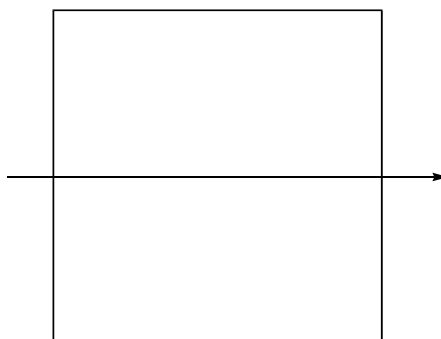
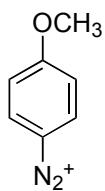
1.



1. NaOEt, EtOH
2. $\text{H}_3\text{O}^+ / \Delta$
3. $\text{HN}(\text{CH}_3)_2, \text{H}^+$
4. $\text{Na}(\text{CH}_3\text{COO})_3\text{BH}$

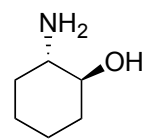
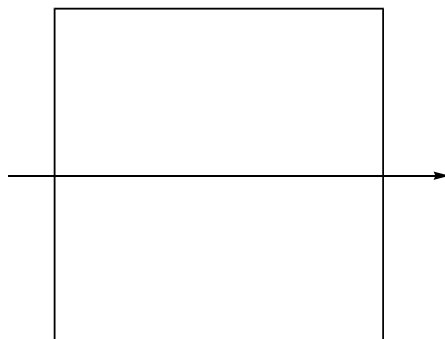
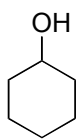


2.

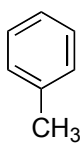


C. Reactions (continued)

3.



4.



1. HNO₃, H₂SO₄

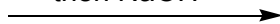
2. Fe, HCl,

then NaOH

3. 2 Br₂

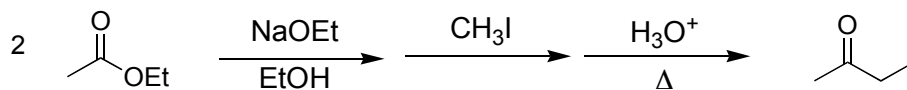
4. NaNO₂, HCl

5. H₃PO₂



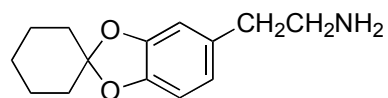
D. Mechanism: (20 points)

Provide a reasonable mechanism for the reaction below. Use curved arrows to indicate "electron flow". **Show all intermediates and all formal charges.** If there is more than one resonance structure, you must show the "best" (i.e., lowest energy) structure.



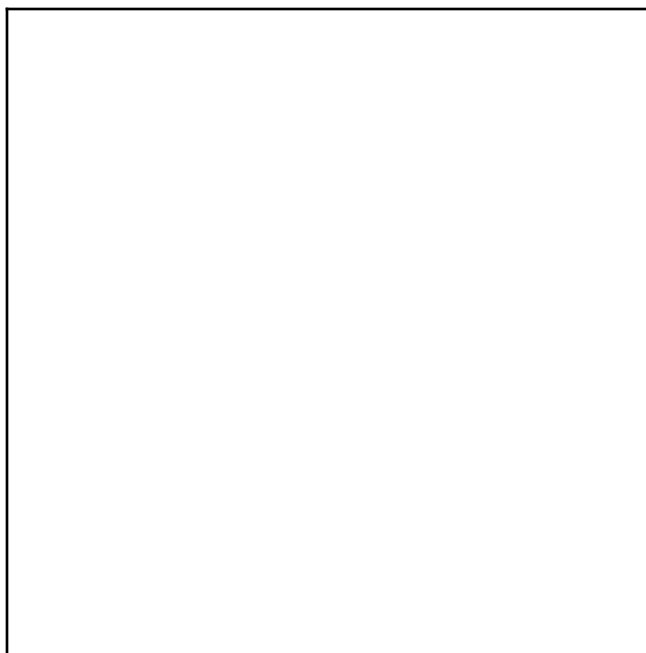
E. Synthesis: (20 points)

Synthesize the molecule below using any of the following reagents: alkanes, alkenes, or alkynes having **no more than two carbon atoms**, benzene, NaCN, CO, CO₂, any inorganic reagents, any oxidizing or reducing agents, and any peroxyacids.



F. Spectroscopy: (10 Points)

A compound with the formula $C_{14}H_{19}NO_2$ exhibits the IR, 1H NMR, and proton-decoupled ^{13}C NMR spectra shown on the following page. Please identify this compound and draw the structure in the box provided below.



MF C₁₄H₁₉NO₂

