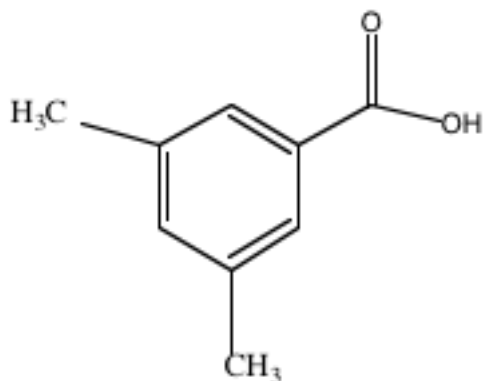
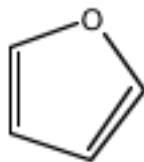
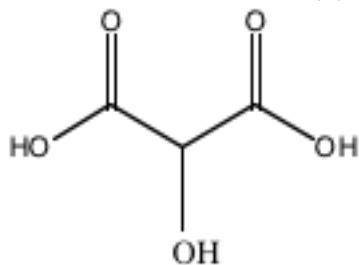


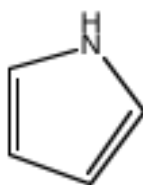
Exam 1 (Experiments 2, 3, NMR and 4)

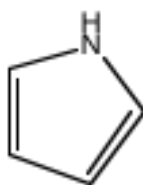
Closed textbook, open lab notebook, no collaboration; you have 50 minutes to complete the exam

1. a. (10 points) Order the following substances from most soluble in water (1) to least soluble in water (3).



b. (5 points) Explain the order you chose; your answer must include the phrase "hydrogen bonding".



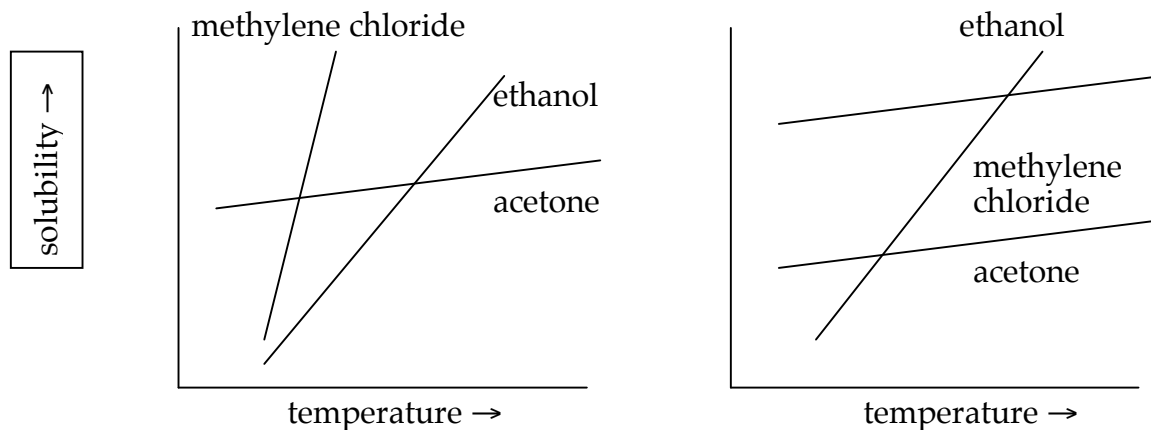
2. (10 points) Pyrrole has a structural formula . The following information is from the Merck Index; explain each of the following solubility behaviors:

a. "Sparingly sol in water"

b. "freely sol in alcohol, benzene, ether"

c. "Insol in aq alkalies. Sol in dil acids"

3. (10 points) Below are the graphs of solubility of benzophenone and m-toluic acid in various solvents. For each one, state which solvent would be the best to use, and give a reason why you think so.



a) benzophenone

b) m-toluic acid

4. (2 points each) A. What **filtration device** would be most appropriate for isolating 0.2 g of crystals from about 5 mL of solution after performing a crystallization?

a. filtering pipet

b. Hirsch funnel with vacuum

c. fluted filter paper using gravity filtration

d. centrifugation

B. The Merck Index has the following information for a solvent you're using "cinnamon odor, b.p. 233°C. $d_4^{20} = 1.33$. miscible with alcohol." Suppose you extracted this solvent with water; would the aqueous layer be **below** the organic layer?

C. What is the preferred **heating device** for refluxing an organic solvent with a 133°C boiling point?

a. hot water bath

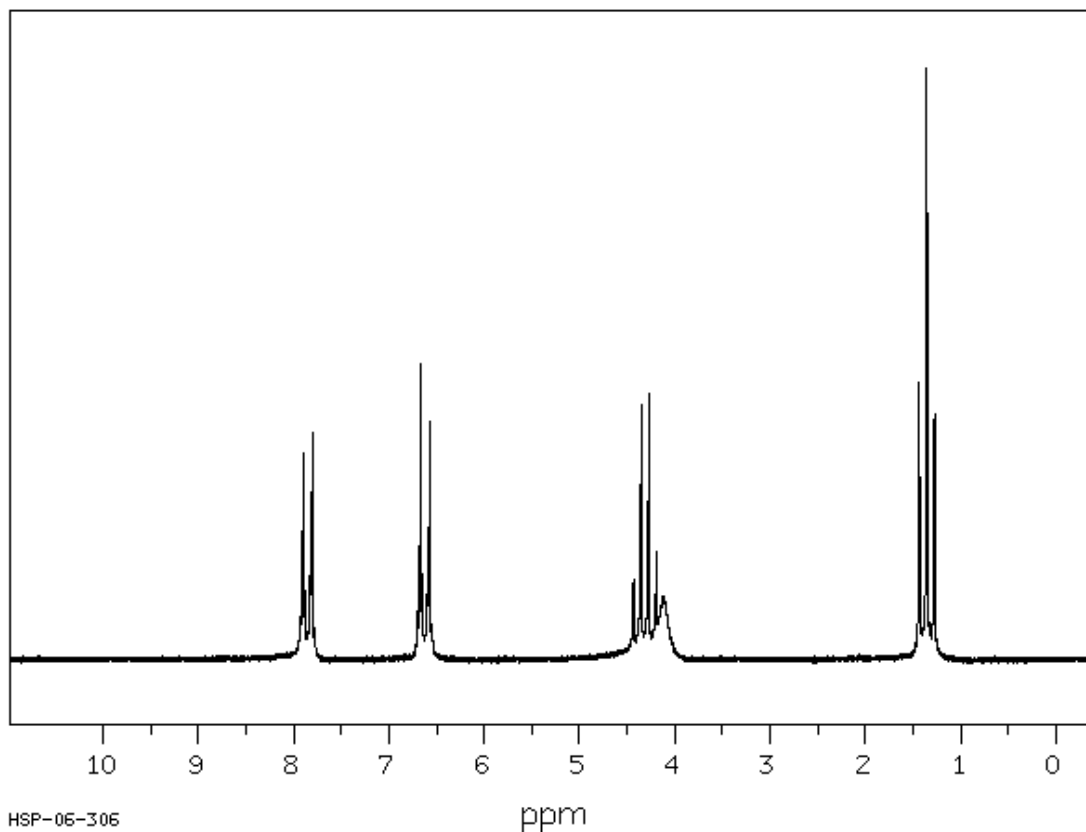
b. aluminum block with a hot plate

c. Bunsen burner

d. Ice-water bath with NaCl added

D. When a reported melting point range is given as "133 — 134.5°C", what happens at 133°C (in other words, how do the solid crystals appear?)?

(10 points) The H-NMR spectrum for ethyl 4-aminobenzoate is shown below:



How would the H-NMR spectrum of 4-(N,N-dimethyl) benzoic acid (shown below) differ from the H-NMR spectrum for ethyl 4-aminobenzoate? In addition to changes in the **chemical shifts** of various peaks, don't forget to describe any differences in **splitting** and **integration** as well.

