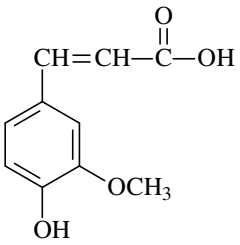
Would you like to avoid unpleasant "surprises" at next Friday's exam? Then please look at the study guides that I have posted online for chapters 1-3.[1] For example, did you know that you *won't* have access to a periodic table, a chart of pK_a values, or a calculator during the exam? Did you also know that you should bring a molecular modeling kit to the exam and that sharing models will be discouraged? Exam ground rules are provided online.[2]

#1. (last page from 50 minute exam #1, Fall 2000)[3,4]

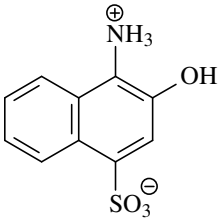
(14 points) Circle the most acidic hydrogen in each acid and estimate its pK_a. Be as precise as you can be. Full credit will only be given for acids that are placed within ±2 pK_a units of the correct (or most reasonable) value.

a. Ferulic acid (found in cell walls and also used as a food preservative)



pK_a =

b. A starting point for the manufacture of several chemical dyes



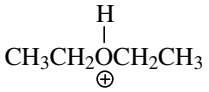
pK_a =

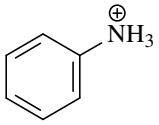
(20 points) Identify the most and least acidic molecules in each group.

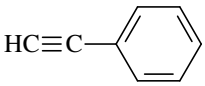
a. $CH_3CH_2NH_3^+$ $CH_3CH_2NH_2$ CH_3CH_2OH

b. $FCH_2CH_2CO_2H$ CH_3CHFCO_2H $CH_3CF_2CO_2H$

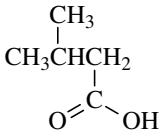
c.

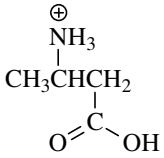


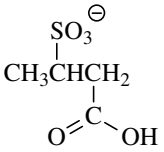




d.







[1] http://blogs.reed.edu/chem201202/study-guides.html

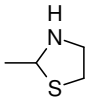
[2] http://blogs.reed.edu/chem201202/exams.html

[3] Try to work these problems at least once as exam problems, i.e., without referring to your book or notes, but feel free to consult your book and notes before deciding on a final answer (books and notes won't be available during the exam).

[4] The exam's value was 100 points and lasted 50 minutes. Since the total value assigned to problem #1 was 34 points, my expectation is that you can solve all of these pieces and draw all your answers in one-third of the exam time, 17 minutes.

#2. (second page from 50 minute exam #1, Fall 2005)

www.pherobase.net contains an information database on pheromones (chemicals that act as signals between organisms). The database lists these compounds as pheromones for the speckled cockroach:



2-methylthiazolidine

4,5-dihydro-2-methylthiazole

(*16 points*) Predict the pK_a of each pheromone's conjugate acid. Your answer must be based on a close structural analogy, i.e, I want you to identify the acidic functional group in each compound (call this group a "model" acid) and use the model to estimate the compound's pK_a. Also, draw the chemical equilibrium used to define the model acid's pK_a.

Compound	predicted pK_a	chemical equilibrium used to define pK_a of model acid
thiazolidine		
thiazole		

(*6 points*) Over what pH ranges would you expect the thiazolidine to carry a positive charge? A negative charge?

+1 charge _____ -1 charge _____

#3. Loudon problems from chapter 3: 25D, 32D, 33D, 34B, 38B, 40B, 45