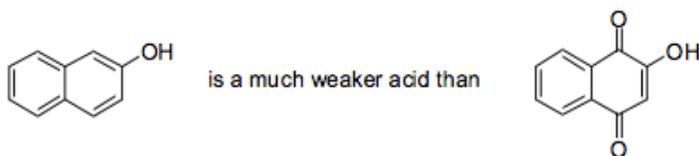


Acids & Bases

Attached with this problem sheet is "A Problem Oriented Approach to Acidity and Basicity" written by Dr Peach (Somerville) and Dr Eames (Hull). You should work through this "Programmed Approach" and "How to use curly arrows" many times. Cover up the answer, read and do the question, and then uncover the answer to see how you did, then move on to the next frame. Make sure you can do *all* of the problems which have answers before attempting the problems below. Hand in the answers to the 8 questions on this tutorial sheet.

1. Explain the following observations.

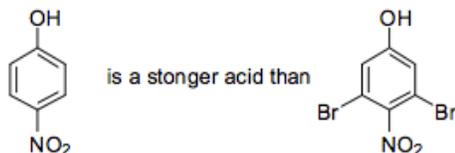
a)



b)

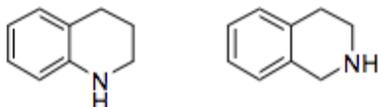
EtSH is a stronger acid than EtOH
(Et = C₂H₅)

c)



2. Which of the following is the most basic?

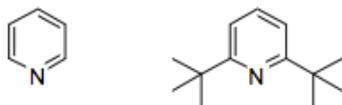
a)



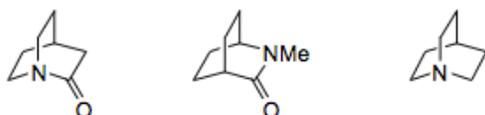
b)

NaOEt NaSEt

c)



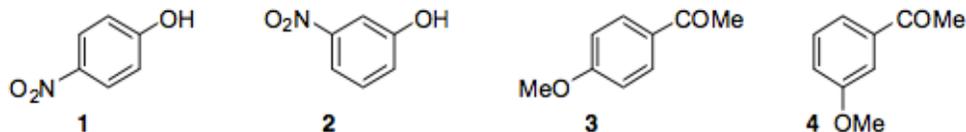
d)



3. a) The pK_a of acetic acid, CH₃CO₂H is 4. For a dilute solution of acetic acid, at what pH is the

concentration of $\text{CH}_3\text{CO}_2\text{H}$ equal to the concentration of CH_3CO_2^- ? State the approximate concentrations of $\text{CH}_3\text{CO}_2\text{H}$ and CH_3CO_2^- at i) pH 5 ii) pH 7

b) *p*-Nitrophenol **1** is a stronger acid than *m*-nitrophenol **2**. *p*-Methoxyacetophenone **3** is a stronger base than *p*-nitroacetophenone. Explain.

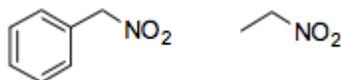


c) For each of the following pairs of compounds, explain which is the stronger acid.

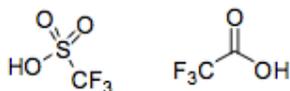
i)



ii)



iii)

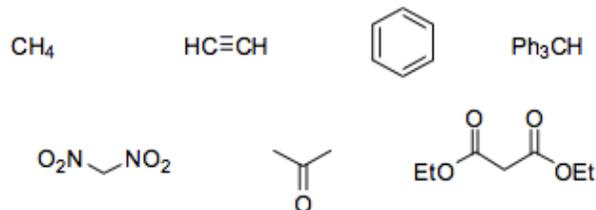


iv)



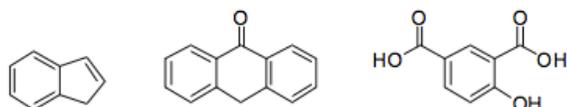
d) Assign the following pKa values to the following carbon acids and explain your assignment:

pKa values: 43, 37, 33, 25, 20, 13, 4

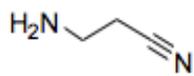
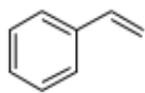


4. a) Distinguish between the terms “mesomeric effect” and “inductive effect”. Given an example of a case where a substituent is i) mesomerically electron donating; ii) inductively electron donating.

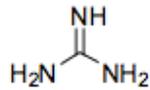
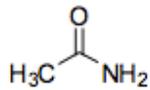
b) Identify, with justification, the most acidic proton in the following molecules.



c) Identify with justification, the most basic site of the following compounds and draw the protonated forms.



d) Which of the two molecules shown is more basic?



N.B. Please learn how to use skeletal diagrams such as:



and

