

20.201 Homework 1

Due in class: Monday, September 12th, 2005

Note: This homework won't be graded toward your final grade of the course.

1) For each of the following chemicals:

- i) Draw the structures of the following cigarette smoke chemicals.
- ii) Identify as many functional groups as possible by circling and naming them.
- iii) And indicate any electrophilic or nucleophilic atoms in the functional groups.

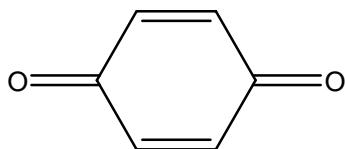
a) **Acetaldehyde**

b) **NNK (4-(METHYLNITROSAMINO)-4-(3-PYRIDYL)BUTANONE)**

c) **2'-deoxyadenosine**

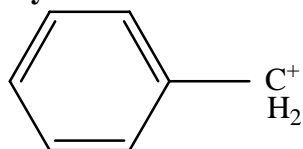
2) Draw resonance structures for the following compounds, showing electron pushing:

a) **benzoquinone**



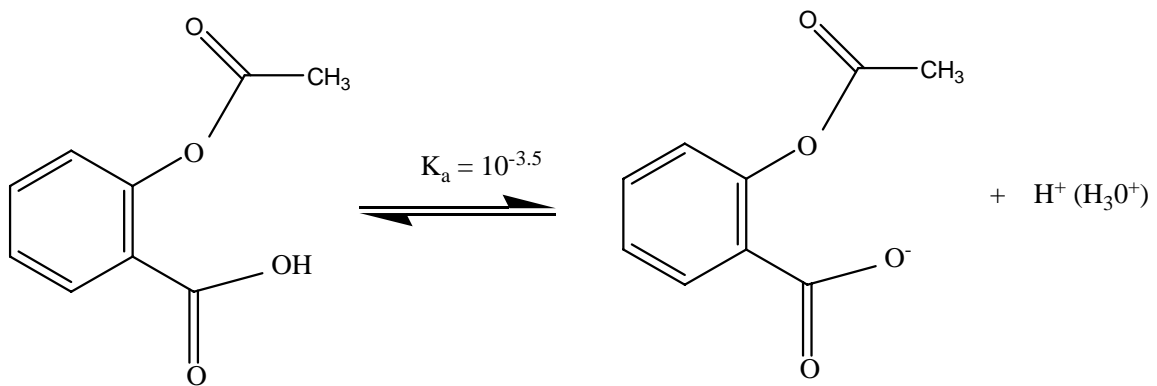
b) **CH₃N₂OH**

c) **Benzylic carbocation**



3) The molecule shown below is acetylsalicylic acid (i.e. aspirin)

a) Please derive the Henderson-Hasselbach equation using the following dissociation equilibrium:



b) Calculate the ratio of charged (base) to uncharged (acid) forms of aspirin at pH 2 and pH 7?

- c) Where in the body would you expect to find significant diffusion of aspirin into cells, if you assume that the charged form does not diffuse across cell membranes?