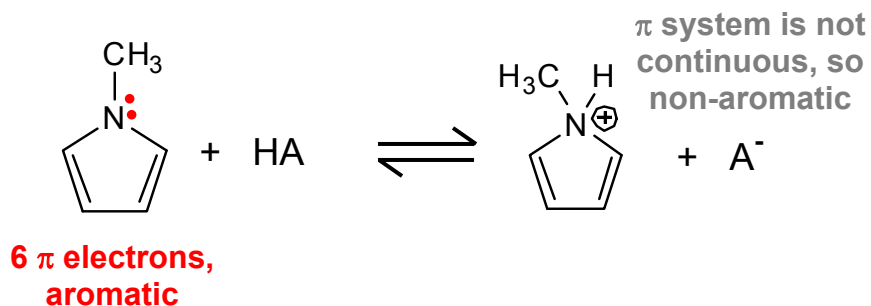


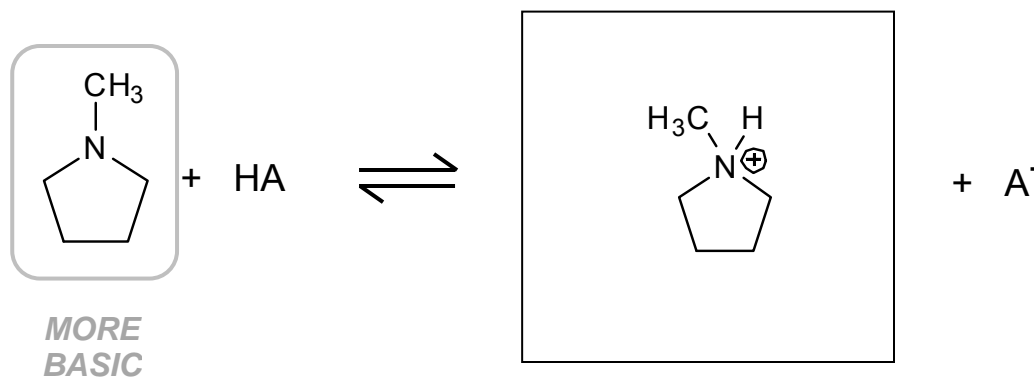
## Chemistry 2302

### Workshop 5 Solutions Aromatic Ions in Acid-Base Reactions

In the first set of molecules, *N*-methylpyrrole starts out aromatic, but aromaticity is broken if the nitrogen is protonated:



That's not going to happen. So, the second molecule of the set is more basic, because it doesn't have any aromaticity to be broken.



The next problem is a little more complicated. At first glance, it might look the same as the first problem—once again, there is a nitrogen atom with a lone pair that can re-hybridize  $sp^2$ , such that the first molecule is aromatic.

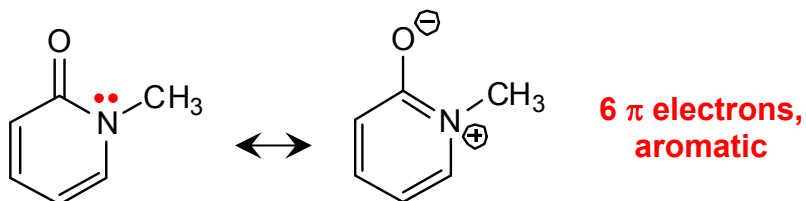
7  $\pi$  electrons.

4 from double bonds,

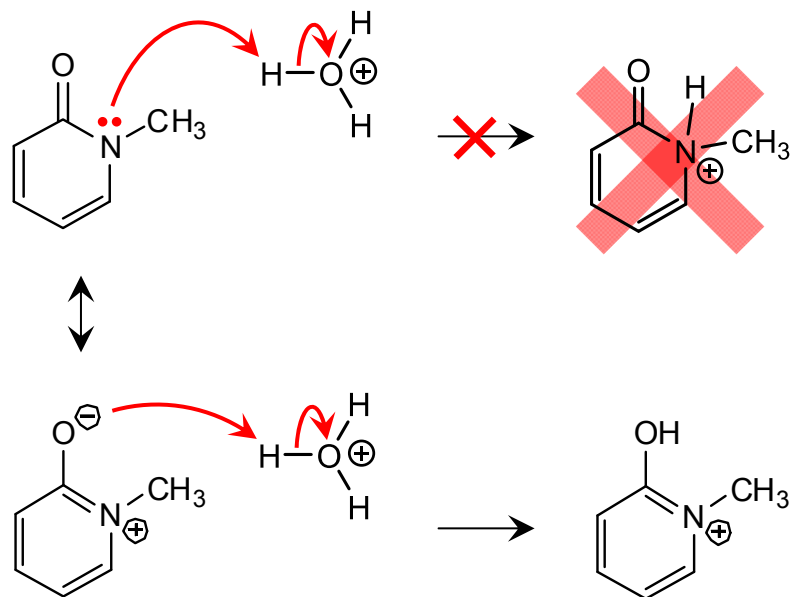
2 from nitrogen lone pair,

1 (half of shared pair) from C=O  $\pi$  bond on carbon.

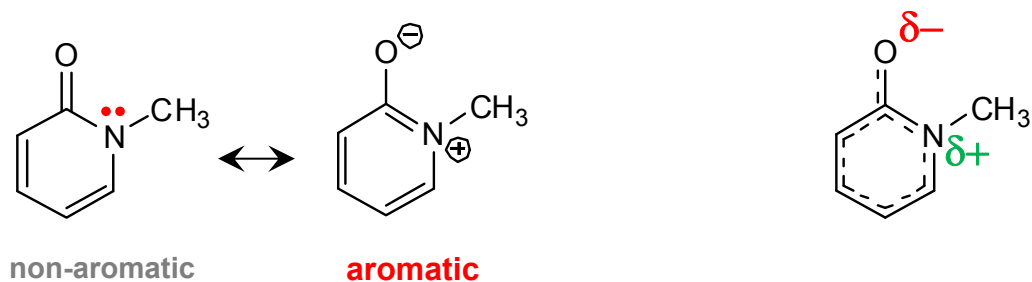
Non-aromatic.



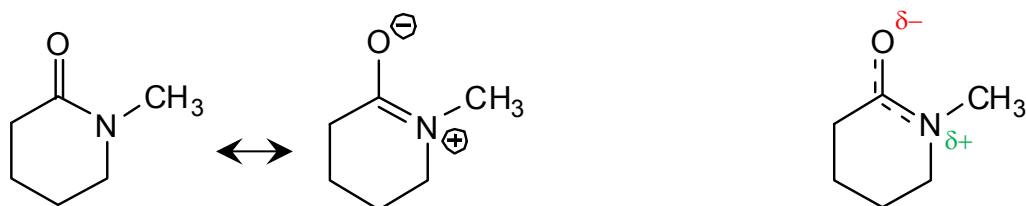
That means this molecule certainly won't protonate at nitrogen, because that would turn our aromatic base into a non-aromatic conjugate acid. But what about protonation at oxygen?



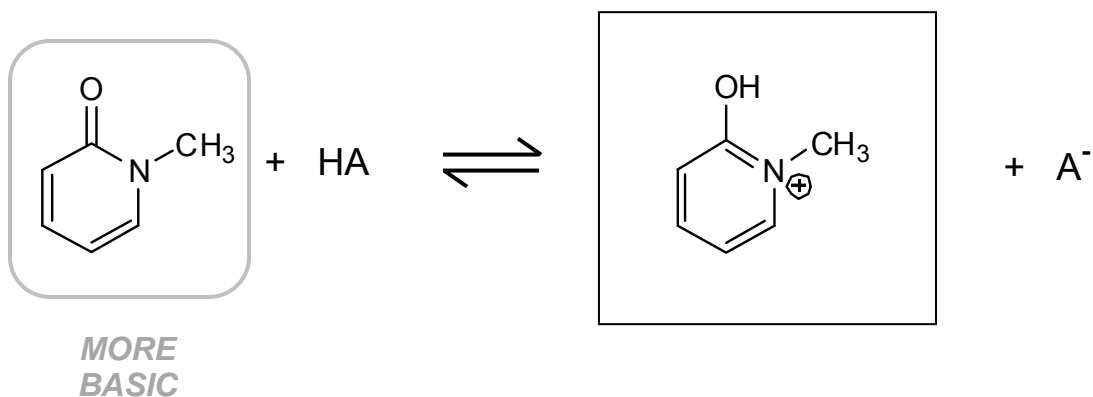
Another way to think about these problems is to analyze the contribution of aromaticity to the contribution of the resonance structures:



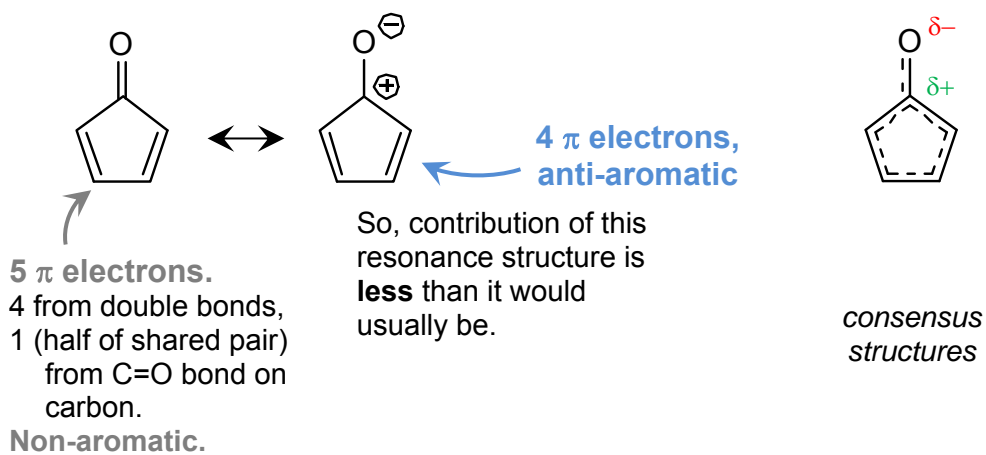
So, contribution of this resonance structure is greater than it would usually be.



The top molecule has more partial negative charge on oxygen, so we would predict that it would be more basic, more willing to donate (excess) electrons to an acid.



The next set of molecules has the exact opposite situation:



That means that, in this case, the second molecule is more basic.

