Organic Chemistry I, CHM 3140, Dr. Laurie S. Starkey, Cal Poly Pomona

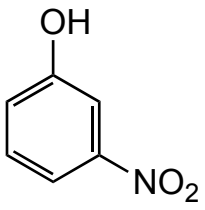
Compare Acid Strength Homework

Name:_____ Section (day/time):_____

The nitro group (NO_2) is an electron-withdrawing group (EWG). The pK_a for meta-nitrophenol (**A**) is 8.3 and the pK_a for para-nitrophenol (**B**) is 7.1. Use this data to explain the effects of the nitro group on the acidity of phenol. **Resonance effects should be considered.** Use complete drawings to support your answer (i.e., draw out the nitro group and ALL relevant resonance forms of the conjugate bases).

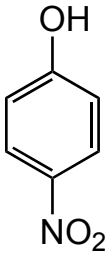
Consider the following guiding questions as you prepare your explanation:

1) What is the relationship between pK_a and acidity? Which is the stronger acid, A or B?
2) What do the conjugate bases of these phenols look like? (please refer to them as **CB-A** and **CB-B**)
3) Are the nitro groups involved in the resonance of CB-A and/or CB-B?
4) Which conjugate base is more stable? Why?



A
meta-nitrophenol
pK_a 8.3

CB-A
structure



B
para-nitrophenol
pK_a 7.1

CB-B
structure

Explain the difference in acidity: