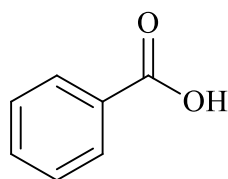
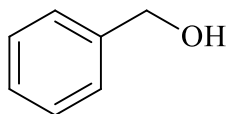
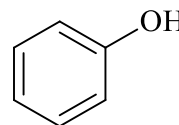


- Benzoic acid **H**, benzyl alcohol **I** and phenol **J** are shown below. The pK_a values of these three compounds are 15.2, 9.9 and 4.2, but not in that order.

**Mark
s**
6

**H****I****J**

Assign the correct pK_a to each of these three compounds.

pK_a values:

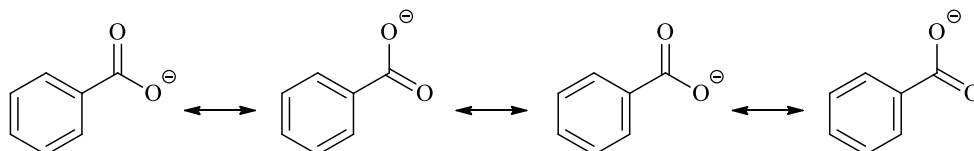
H = 4.2

I = 15.2

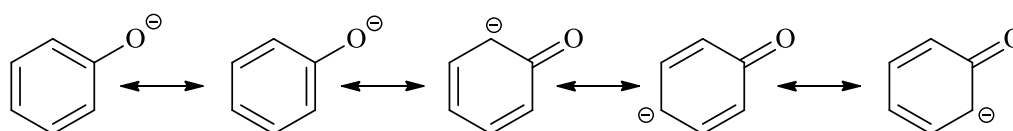
J = 9.9

Draw resonance structures to explain your answer.

The conjugate base of H is stabilised by delocalisation of the negative charge over two electronegative O atoms and over the ring:



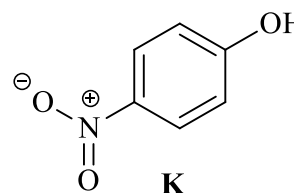
The conjugate base of J is stabilised by delocalisation of the negative charge over an O atom and the ring:



As the delocalisation places negative charge over C as well as O, the stabilisation is smaller than for H.

By resonance stabilisation is possible for the conjugate base of I.

Would you expect 4-nitrophenol, **K**, to be more or less acidic than phenol, **J**? Explain your answer.



K will be more acidic than J as the negative charge of the phenoxide ion can be delocalised into the nitro group, increasing the resonance stabilisation.

