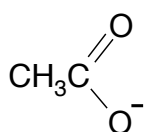


Chemguide – questions

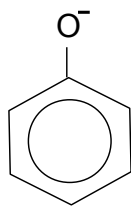
ORGANIC ACIDS

- Two factors affect the strength of an acid. One is the strength of the bond has to be broken between the acidic hydrogen atom and whatever it is attached to. The other is the stability of the negative ions formed.

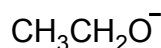
In the case of the organic acids we are interested in, the bond being broken is always an O-H bond, and the main factor is the stability of the negative ions. The negative ions formed from ethanoic acid, phenol and ethanol are:



ion from ethanoic acid



ion from phenol



ion from ethanol

Ethanoic acid is a weak acid, phenol is even weaker, but ethanol is only very, very weakly acidic. That means that the ion from ethanoic acid must be more stable than that from phenol, and the ion from ethanol must be very unstable.

Explain this pattern in as much detail as you can.

- The pK_a values for methanoic acid, HCOOH , and ethanoic acid, CH_3COOH , are 3.75 and 4.76 respectively.
 - What do the two pK_a values show?
 - Explain the difference between the methanoic acid and ethanoic acid values.
- List the following molecules in order of *increasing* acid strength, giving your reasons:
 CH_3COOH
 CH_2ClCOOH
 CH_2FCOOH
 $\text{CH}_2\text{ClCH}_2\text{COOH}$