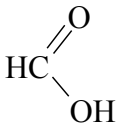
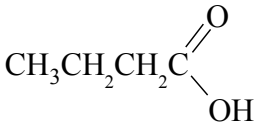
CARBOXYLIC ACIDS: AN INTRODUCTION

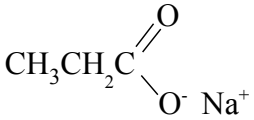
1. a) (i)



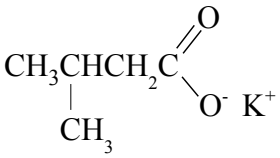
(ii)



(iii)



(iv)



In the last case, don't forget that you always number the chain starting from the carbon in the COOH group (or its ion). If you have drawn a line between the metal ion and the oxygen in the last two cases, that is very naughty!

b) (i) sodium ethanoate

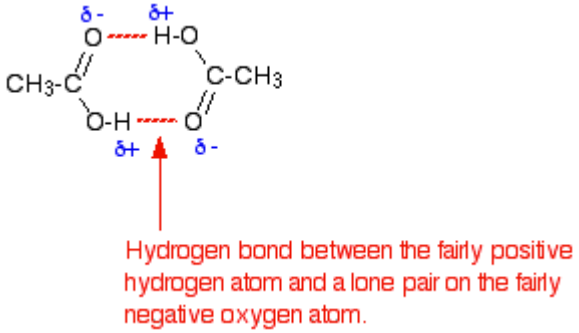
(ii) pentanoic acid

(iii) lithium butanoate

(iv) 2-chloro-3-methylbutanoate

(In the last case, ignore the chlorine to start with, and just name the acid. Then add the fact that there is a chlorine on the number 2 carbon.)

2. a) Using the diagram from the Chemguide page:



The two ethanoic acid molecules joined together are a dimer (a polymer of two). This happens because of the formation of two hydrogen bonds as shown.

b) This produces a molecule which is bigger and has twice as many electrons as a single ethanoic acid molecule. Each of these factors increases the potential for van der Waals dispersion forces, producing strong intermolecular attractions between one dimer and its neighbours. Therefore the boiling point of pure ethanoic acid is quite high

c) You would expect hexanoic acid to be only slightly soluble in water. The quite long hydrocarbon tail of the molecule breaks hydrogen bonds between several water molecules, but only replaces them by weaker van der Waals dispersion forces. That makes dissolving energetically unprofitable.

(Why *slightly soluble* rather than *insoluble*? There is another effect that has to be considered as well as the simple energetics, and that is entropy changes in the system. Entropy can be thought of as a measure of the amount of disorder in the system, and a solution is more disordered than two pure liquids. If you haven't come across entropy yet, don't worry about it for now.)