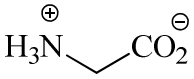
Marks 7

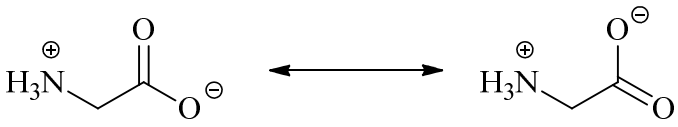
- Glycine, NH_2CH_2COOH, is the simplest of all naturally occurring amino acids. The pK_a of the acid group is 2.35 and the pK_a associated with the amino group is 9.78. Draw a structure that indicates the charges on the molecule at the physiological pH of 7.4.



This pH is much *greater* than the pK_a value of the acid group: it is *deprotonated*.

This pH is much *lower* than the pK_a value of the amino group: it is *protonated*.

Use your structure to illustrate the concept of resonance.



What are the hybridisation states and geometries of the two carbon atoms and the nitrogen atom in glycine?

The carbon on the acid group is sp^2 hybridised and the geometry is trigonal planar.

The carbon on the CH_2 group is sp^3 hybridised and the geometry is tetrahedral.

The nitrogen is sp^3 hybridised and the geometry is tetrahedral.

Propionic acid, CH_3CH_2COOH, has a melting point of –20.7 °C while glycine has a melting point of 292 °C. Suggest a reason why these two molecules have such different melting points.

Propionic acid has strong hydrogen bonds, giving it a relatively high melting point.

However, glycine has very strong ionic bonds between the NH_3^+ and CO_2^- groups giving it *very* high melting point.