• Glycine, NH₂CH₂COOH, is the simplest of all naturally occurring amino acids. The pKₐ of the acid group is 2.35 and the pKₐ 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.

\[ \text{H}_3\text{N}\underset{+}{\text{CO}_2}\text{O}^- \]

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

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

Use your structure to illustrate the concept of resonance.

\[ \text{H}_3\text{N}\underset{+}{\text{O}_2}\text{CO}^- \leftrightarrow \text{H}_3\text{N}\underset{+}{\text{O}^-}\text{CO} \]

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 sp² hybridised and the geometry is trigonal planar.

The carbon on the CH₂ group is sp³ hybridised and the geometry is tetrahedral.

The nitrogen is sp³ hybridised and the geometry is tetrahedral.

Propionic acid, CH₃CH₂COOH, 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 NH₃⁺ and CO₂⁻ groups giving it very high melting point.