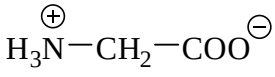
Marks 5

- Glycine, NH_2CH_2COOH, the simplest of all naturally occurring amino acids, has a melting point of 292 °C. 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.

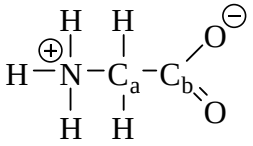
As pH = 7.4 is higher than the pK_a of the acid group, -COOH, it will exist primarily in its deprotonated, conjugate base form, $-COO^-$.

As pH = 7.4 is lower than the pK_a of the amino group, $-NH_2$, it will exist primarility in its protonated form, $-NH_3^+$.

Glycine will exist in the uncharged, zwitterionic form: 

Describe the hybridisation of the two carbon atoms and the nitrogen atom in glycine and the geometry of the atoms surrounding these three atoms.

The structure is:



N has 4 bonds and no lone pairs: sp^3 with a tetrahedral arrangement.

C_a has 4 bonds and no lone pairs: sp^3 with a tetrahedral arrangement.

C_b has 3 bonds and no lone pairs: sp^2 with a trigonal planar arrangement.

Glycine has an unusually high melting point for a small molecule. Suggest a reason for this.

Glycine with a positively and a negatively charged end. There is therefore ionic bonding between the molecules leading to strong intermolecular forces.