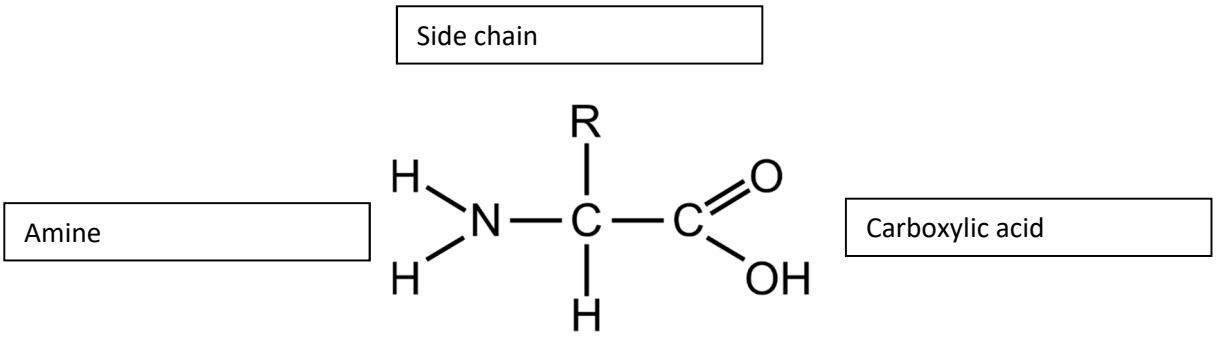
QC3 – Amino Acids

1. Name and label the three functional groups in the general structure of an amino acid:



2. Which functional group is different on every amino acid and how many naturally occurring amino acids are there?

The side chain differs between each amino acid. There are 20 naturally occurring amino acids

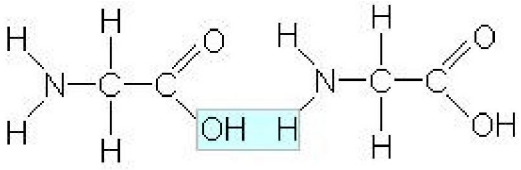
3. Explain what is meant by 'an amino acid is amphoteric'.

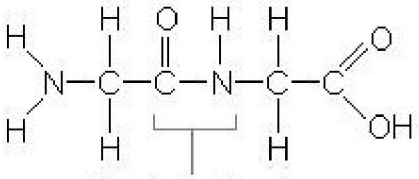
Amphoterism is a property of a molecule which has both acidic and basic character. Amino acids can act as acids, as they have an acidic carboxyl group. They can also act as a base, through their basic amine group.

4. Which reaction is required to break a peptide bond?

A hydrolysis reaction – adding water to split a bond.

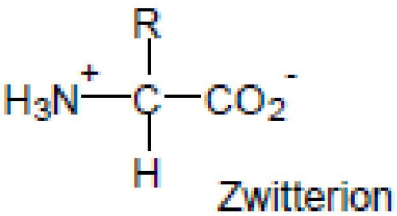
5. Draw the reaction between two glycine molecules, labelling the bond formed:





A molecule of water is removed from two glycine amino acids to form a peptide bond.

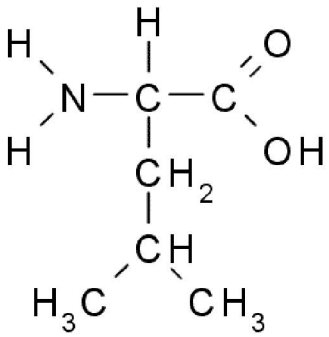
6. This is the general structure of a zwitterion:



Describe how the structure of a zwitterion would change if the solution was acidified with dilute hydrochloric acid.

Adding acid would lower the pH of the system, and increase the concentration of H^+ ions. This would protonate the $-COO^-$ group, becoming -COOH. The amino acid would now have an overall positive charge, and is no longer a zwitterion.

7. Give the systematic name for this amino acid.



2-amino-4-methylpentanoic acid