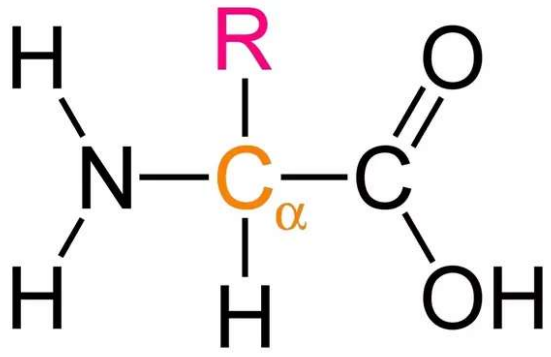
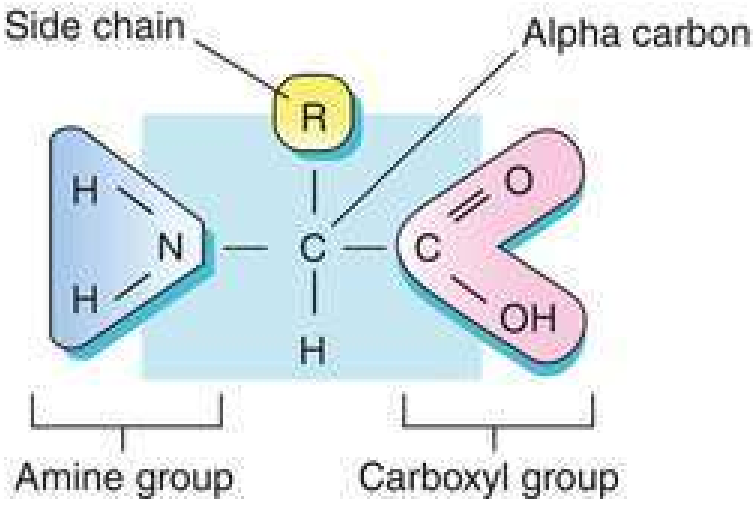
Alpha (α) amino acids

Mr Dhue

α- Amino Acids

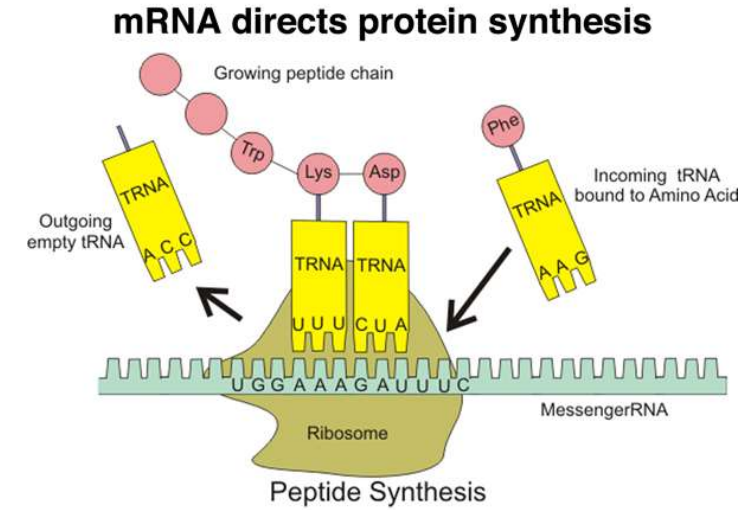
- Alpha amino acids contain both an amino functional group (- NH_2) and a carboxylic acid (- COOH) functional group, attached to the **same** alpha carbon
- The R group varies to the type of amino acid

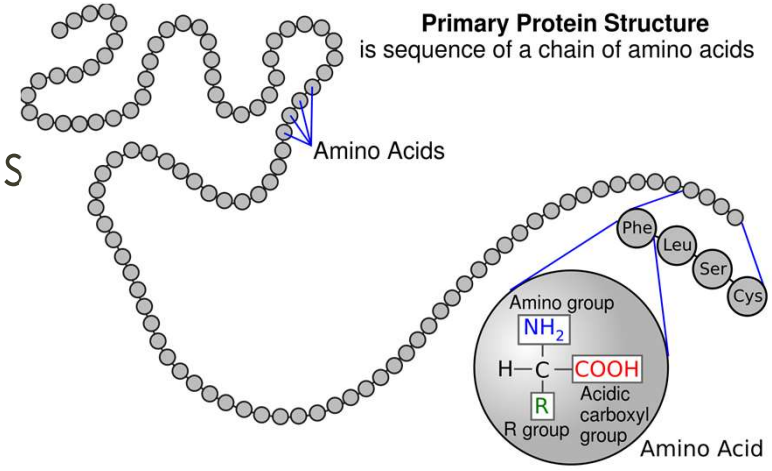


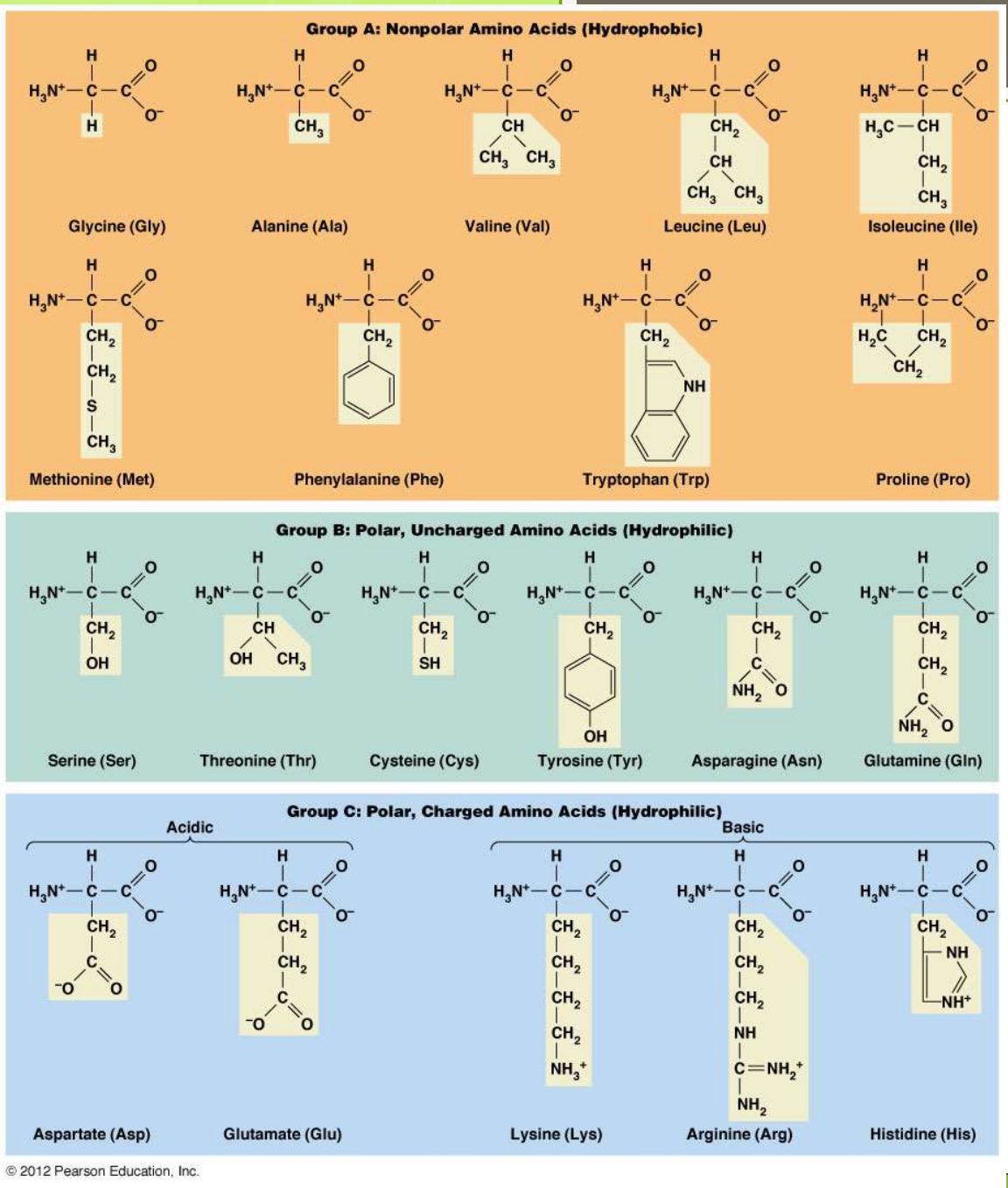


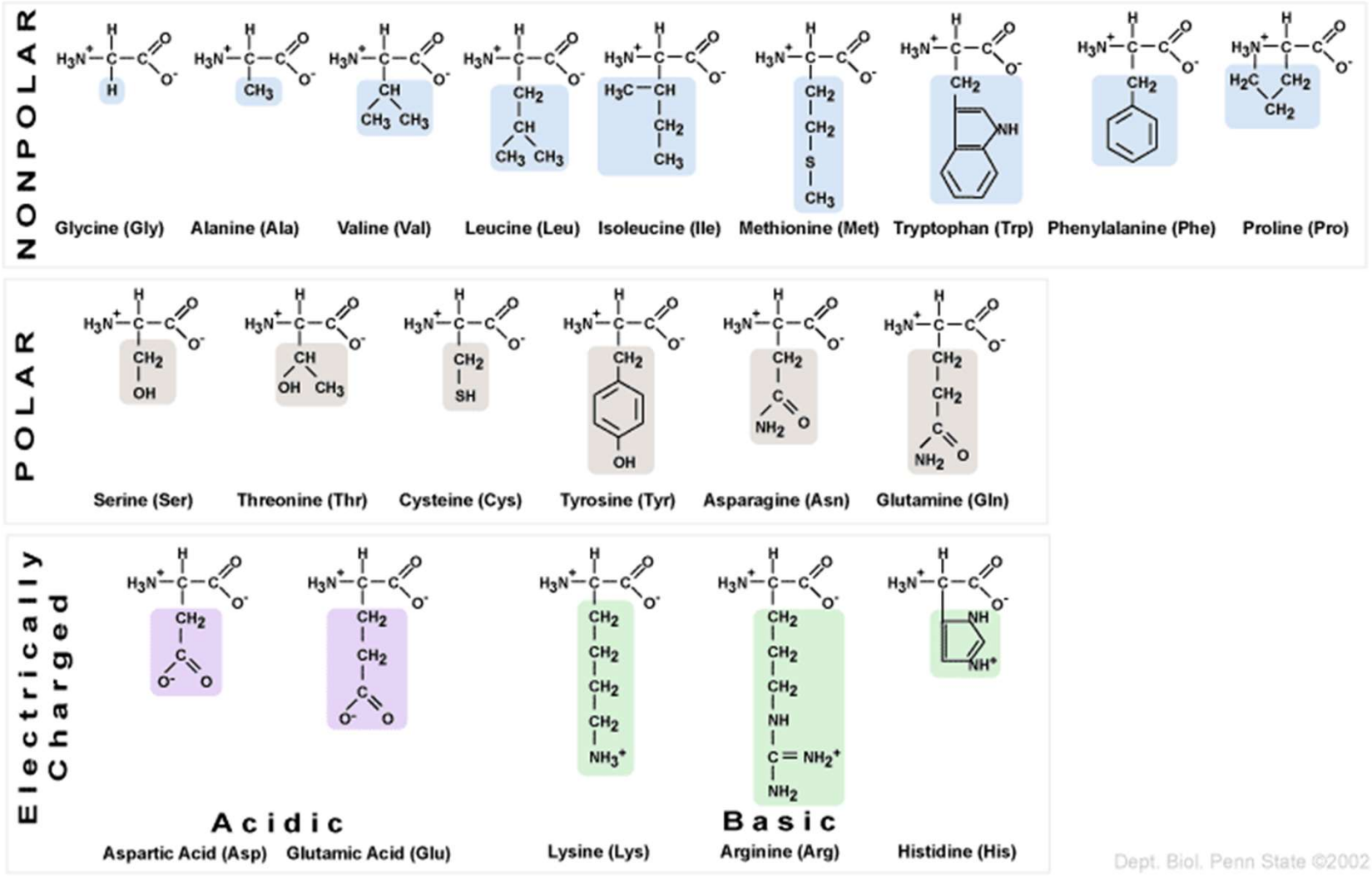
Are they important ?

- Amino acids are the building blocks used to make proteins
- They are the monomers to make the polypeptides
- There are 20 naturally found alpha amino acids(on your data sheet)
- An individual protein can be formed from many thousands of amino acids in various combinations








NONPOLAR
Glycine (Gly)
Alanine (Ala)
Valine (Val)
Leucine (Leu)
Isoleucine (Ile)
Methionine (Met)
Tryptophan (Trp)
Phenylalanine (Phe)
Proline (Pro)
POLAR
Serine (Ser)
Threonine (Thr)
Cysteine (Cys)
Tyrosine (Tyr)
Asparagine (Asn)
Glutamine (Gln)
Electrically Charged
Acidic
Aspartic Acid (Asp)
Glutamic Acid (Glu)
Lysine (Lys)
Basic
Arginine (Arg)
Histidine (His)
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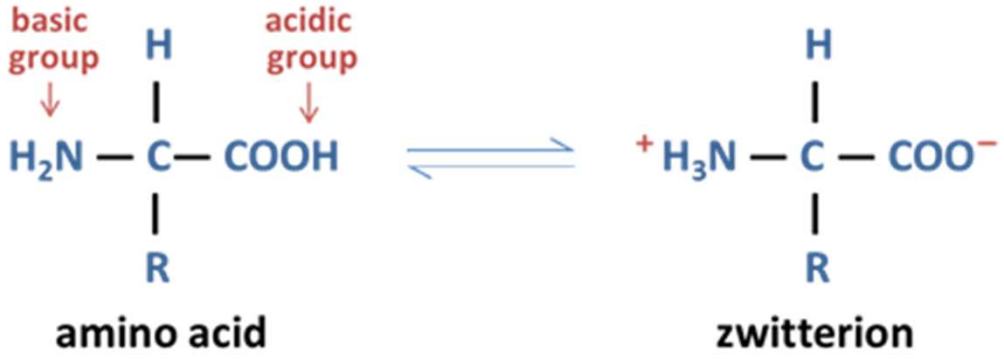
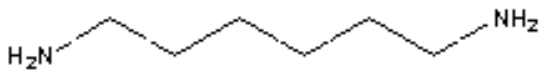
The zwitterion

- As solids (at room temperature) and in aqueous solution amino acids are better represented as the dipolar ion form, called a zwitterion.
- It is important to see that the positive and negative charges are localised. Also that the charges are not dipoles (partial charges) like for IMF's
- Overall the zwitterion is neutral.

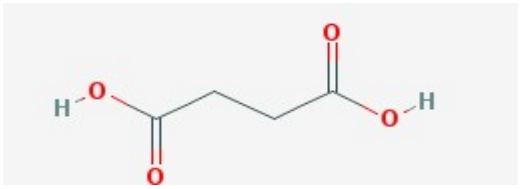


Melting points

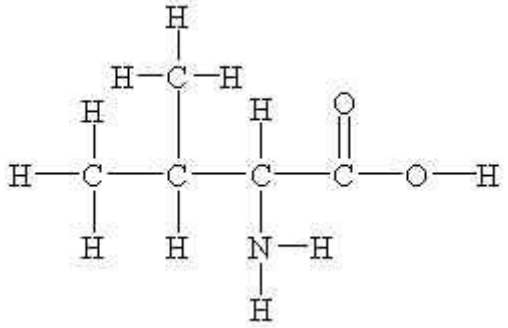
- Zwitterions show melting points much higher than expected based on molar mass.
- Instead of relying on hydrogen bonds between each molecule it now also has ionic bonds.
- Also note that most amino acids decompose before melting with the high temperatures.



M_R 116 m.p. = 40 °C

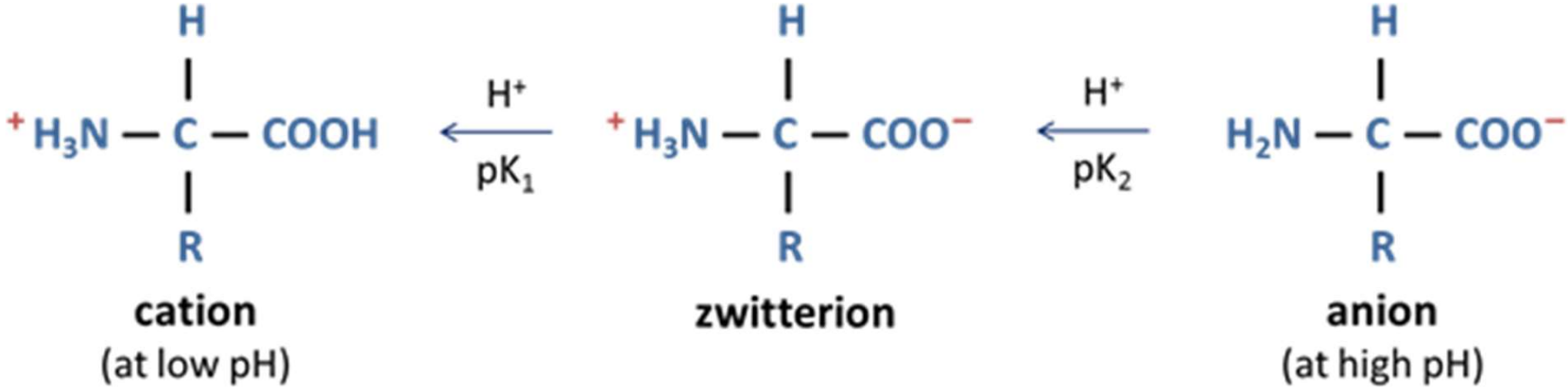


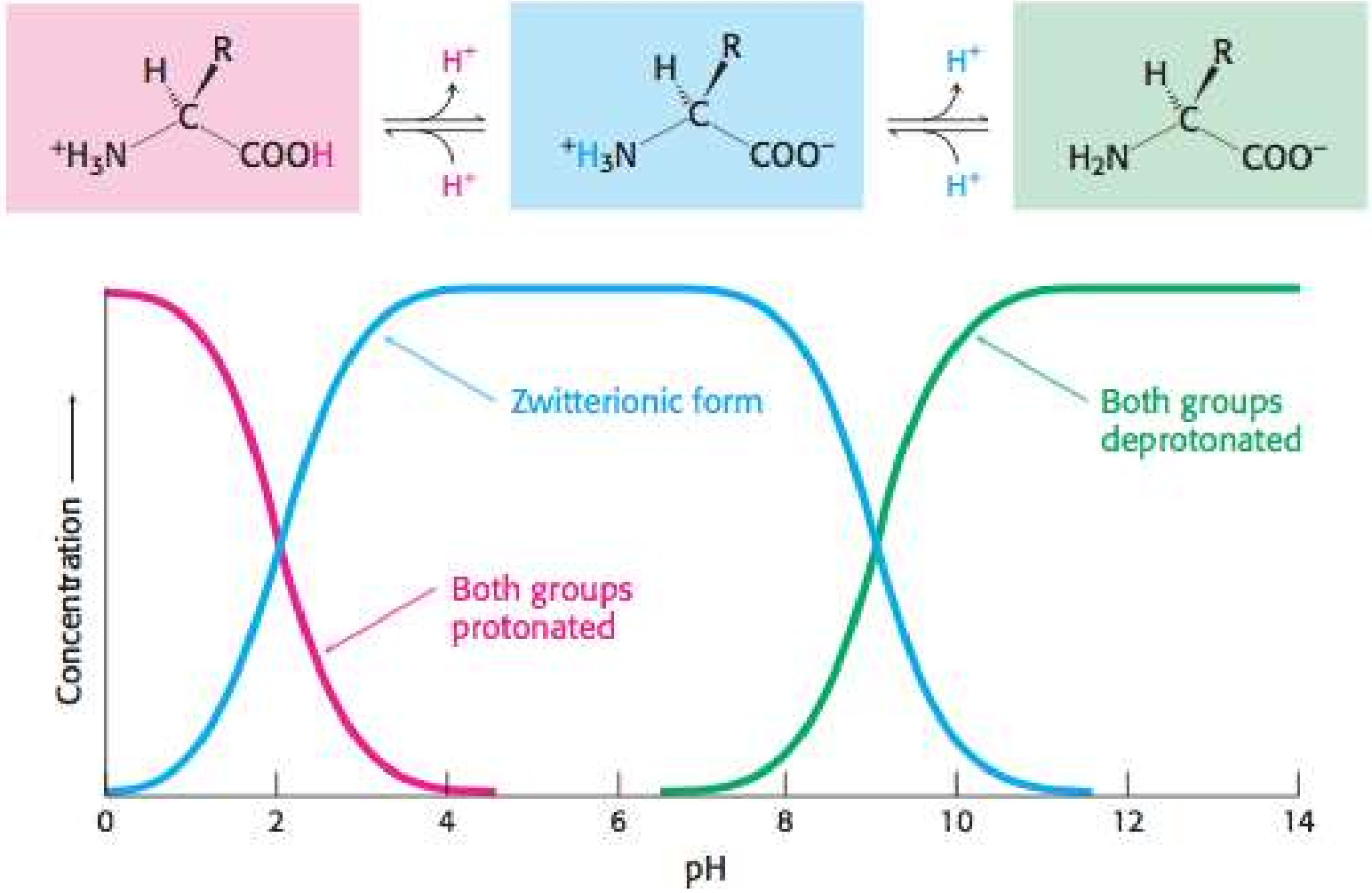
M_R 118 m.p = 186 °C



M_R 117 m.p.= 300 °C

- Zwitterions change their form depending on the pH
- The presence of acid or base will shift the equilibrium between the different forms of the zwitterion
- They can act as buffers in solution.




H
R
C
+H3N
COOH
H+
H+
H
R
C
+H3N
COO−
H+
H+
H
R
C
H2N
COO−
Concentration
Zwitterionic form
Both groups protonated
Both groups deprotonated
0
2
4
6
8
10
12
14
pH