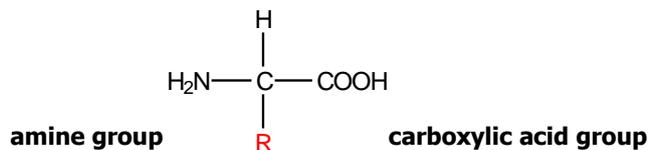


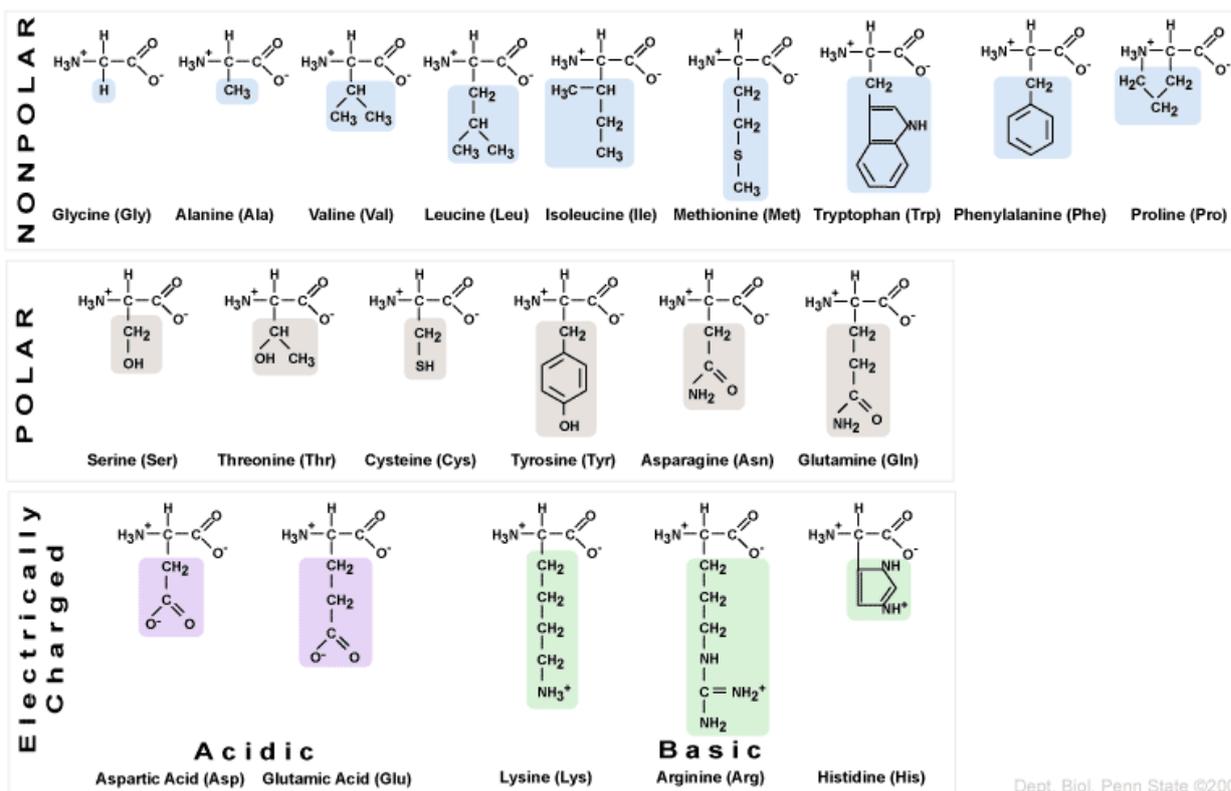
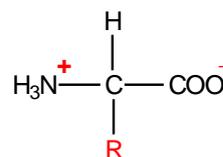


# AMINO ACIDS 1

## Structure of amino acids

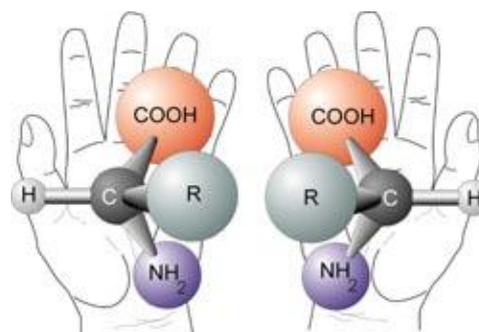


- Amino acids all contain an amine group and a carboxylic acid group.
- The R group varies.
- There are 20 naturally occurring  $\alpha$ -amino acids (where the amine and acid group are separated by one C atom) – you do not have to learn these (some structures are given on the data sheet).
- Each one exists as a zwitterion, where each amine group is protonated by a carboxylic acid group on another molecule. A zwitterion is a species that has both a positive and negative charge on different parts of the particle.
- This means that amino acids are usually solids at room temperature as there is an ionic attraction between zwitterions.

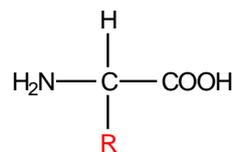


## Optical isomerism

- Amino acids (except glycine, R = H) have a chiral C atom and exist as two enantiomers.
- In nature, only one of these enantiomers is present.



## Reactions of amine / acid groups



### amine group

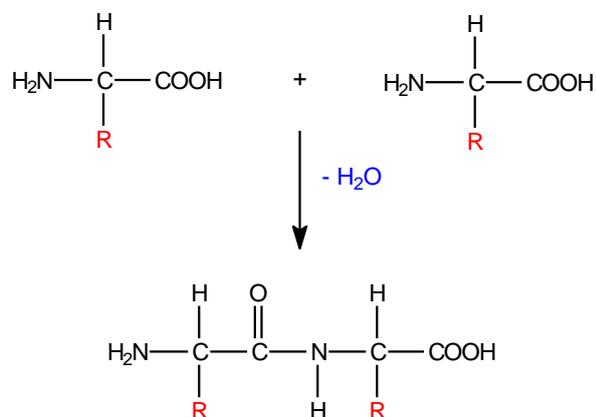
- protonated by acids
- acylation with acyl chloride / acid anhydride
- nucleophilic substitution with halogenoalkanes

### carboxylic acid group

- deprotonated by bases
- esterification with alcohols (with acid catalyst)

## Making peptides

- Amino acids join together in condensation reactions to make dipeptides (with two amino acids joined together) and polypeptides (with several amino acids joined together)
- Proteins contain many amino acids joined together.



## Breaking down proteins and peptides

- Proteins and peptides can be broken back down into their constituent amino acids in the reverse reaction which is hydrolysis.

