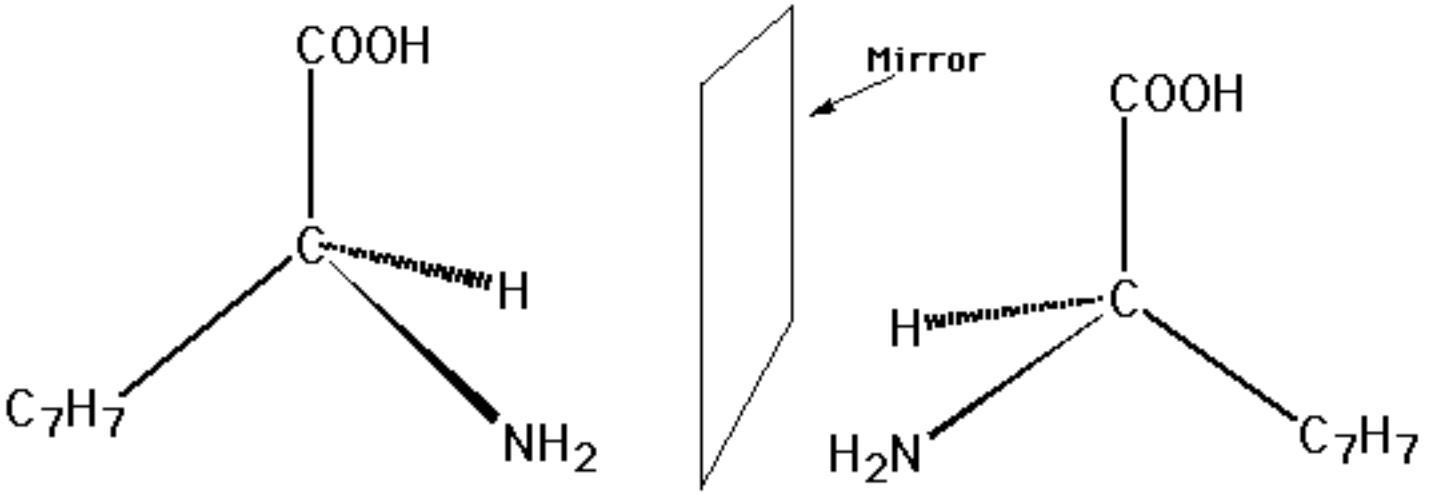
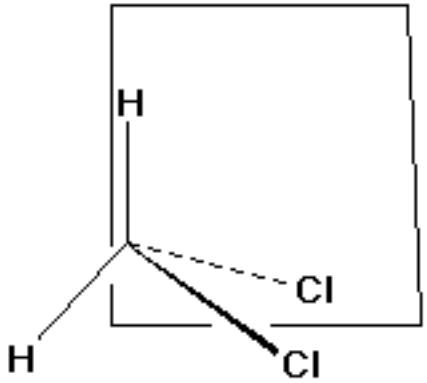


TWO FORMS OF THE AMINO ACID PHENYLALANINE

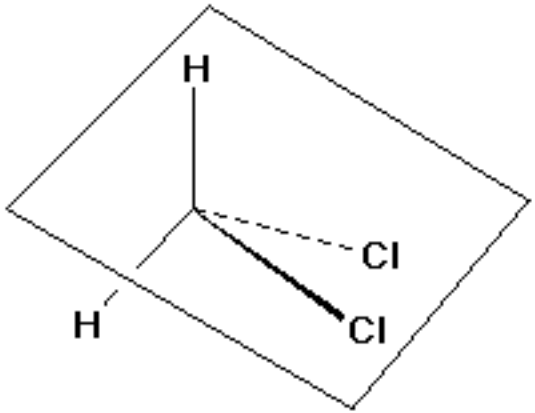
Stereogenic Carbon – A carbon with 4 different groups attached.

Chiral objects have no plane of symmetry



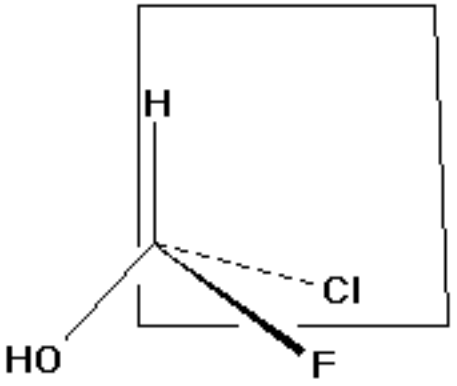
Plane of Symmetry

WHEN TWO OBJECTS HAVE THE PROPERTY THAT THEY ARE NONSUPERIMPOSABLE MIRROR IMAGES, THEY ARE SAID TO BE CHIRAL

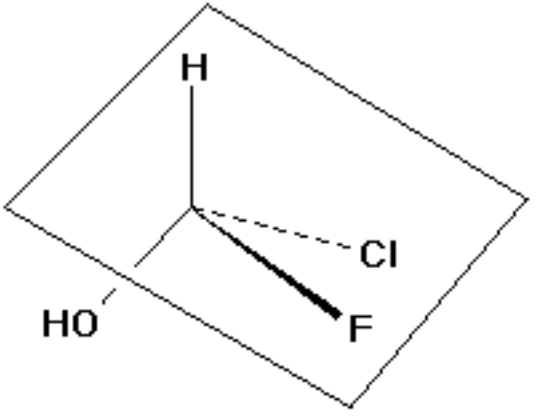


Plane of Symmetry

Chiral objects have no plane of symmetry



No Plane of Symmetry



No Plane of Symmetry

Why is life on earth carbon based?

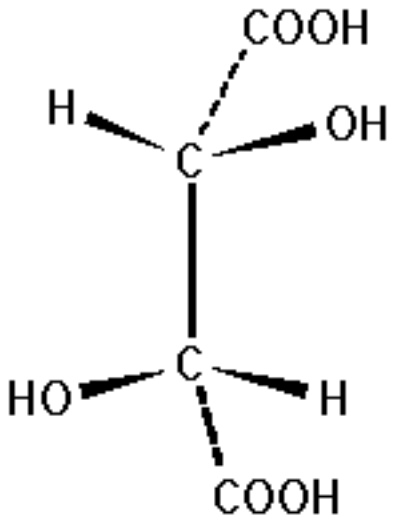
1. The tetrahedral carbon and Chirality

   van't Hoff and Pasteur

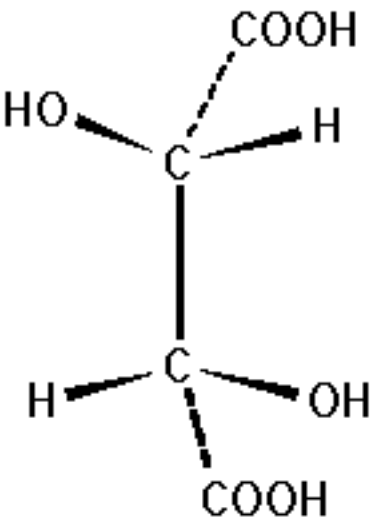
2. The versatility of carbon

   Single, double and triple bonding in carbon

Louis Pasteur = Left and right-Handed crystals of Tartaric acid:

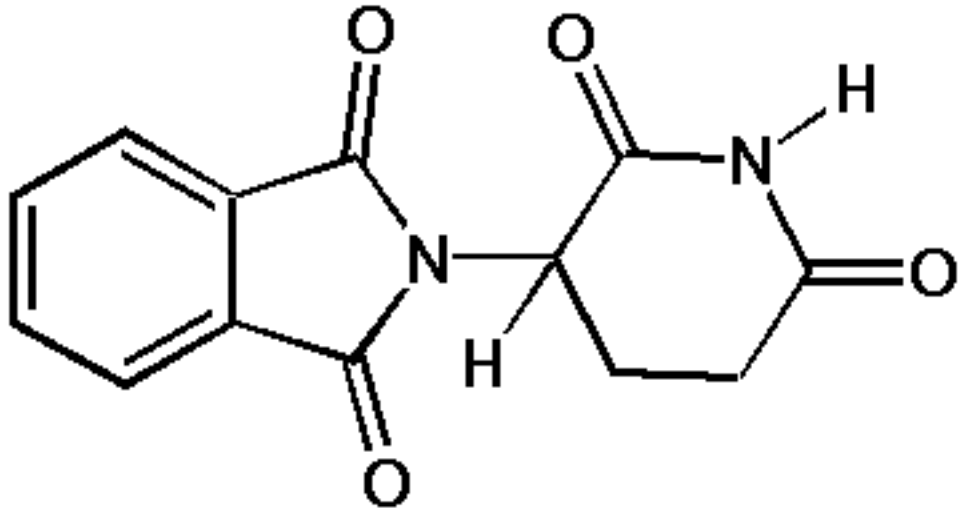


Tartaric-1



Tartaric-2

Thalidomide: A teratogen - causes birth defects. Prescribed as a tranquilizer for pregnant women



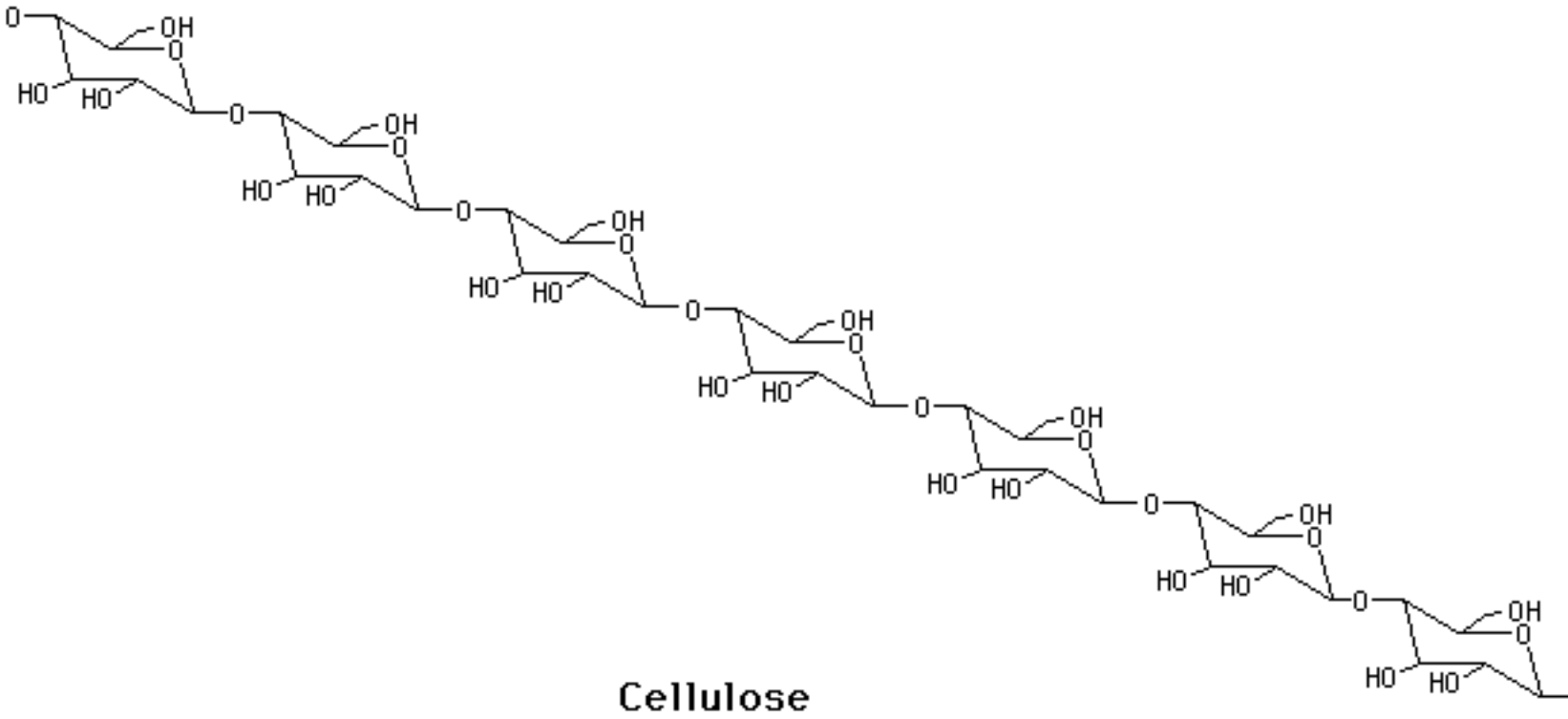
S-Thalomide

R-Thalomide

Frances 0. Kesley - Distinguisghed federal service award

LINKING MOLECULES TOGETHER:

POLYMERS


O
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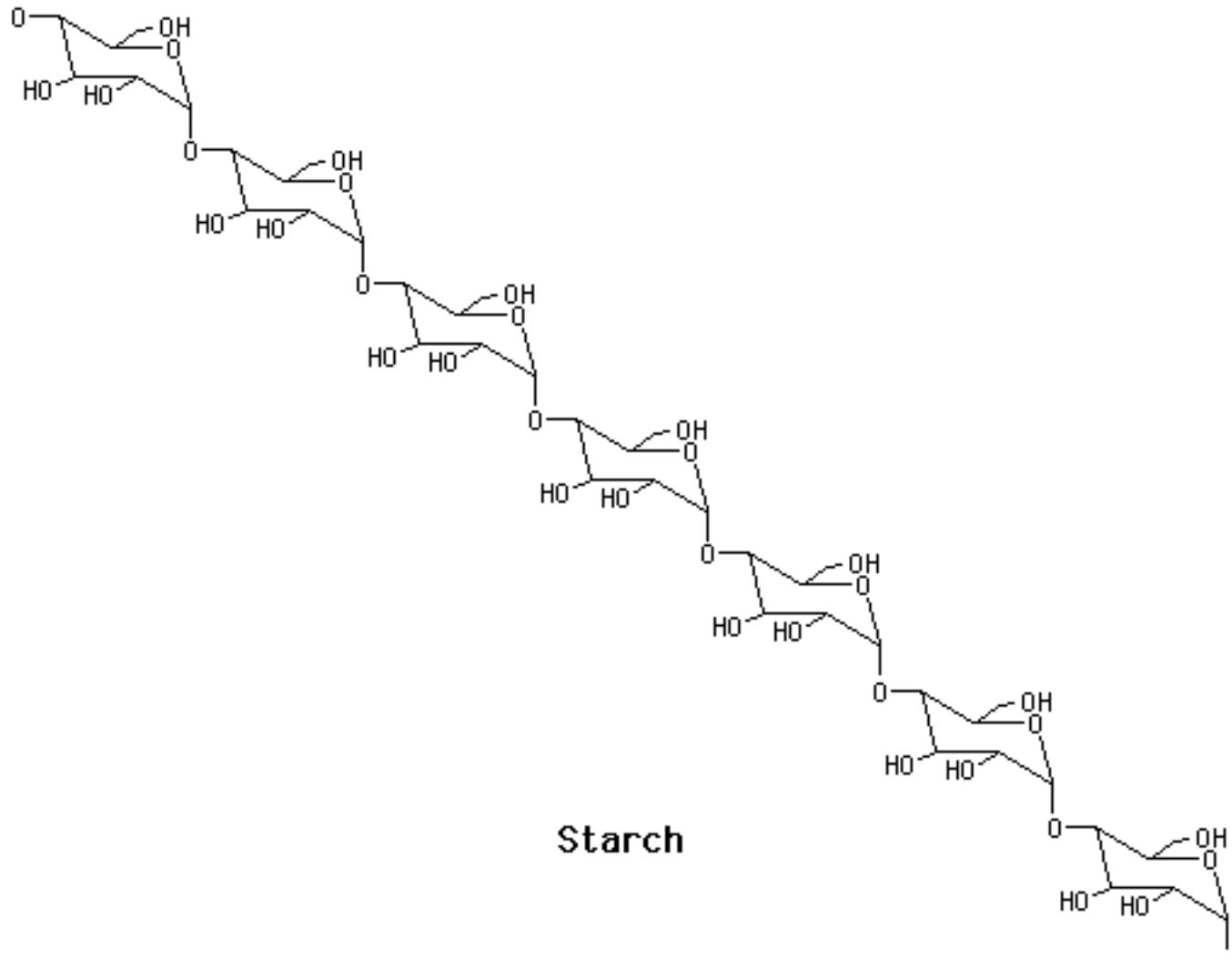
Cellulose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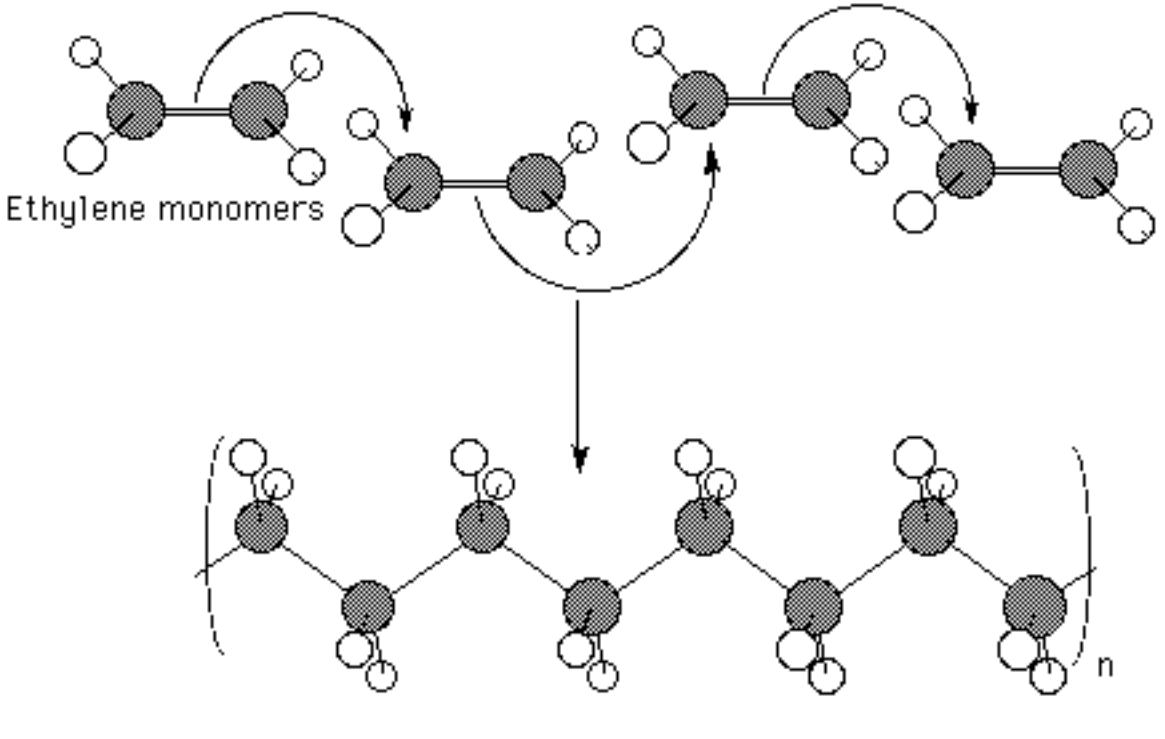
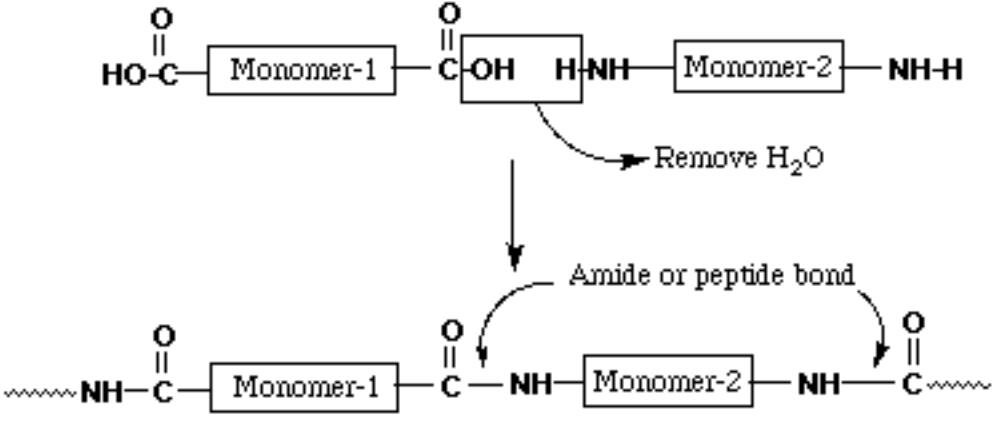
Starch

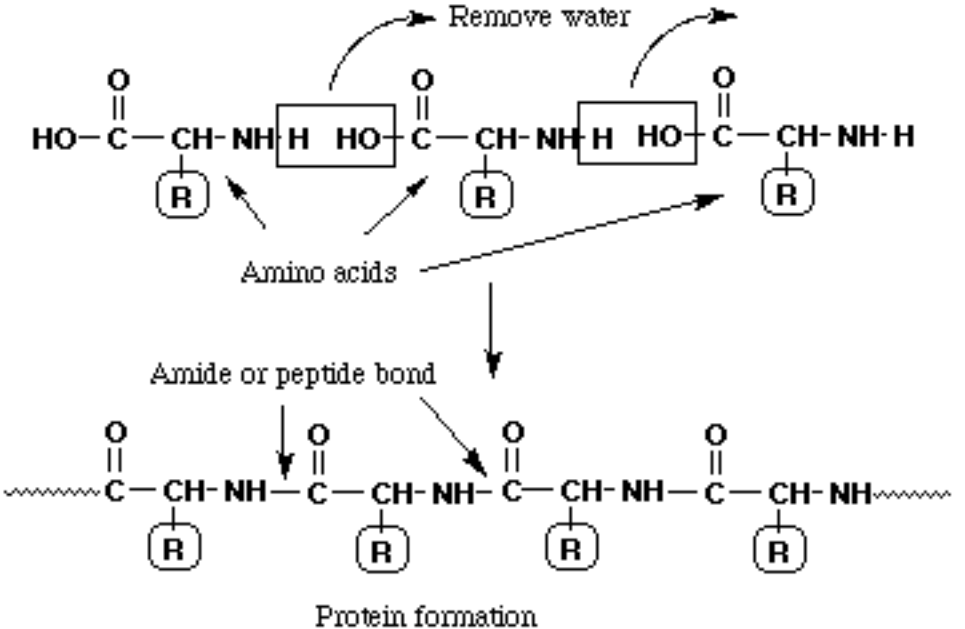

Ethylene monomers
n
Polyethylene

Nylon is a synthetic polymer with peptide bonds



Nylon - A condensation polymer

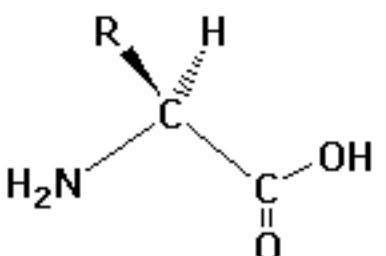
Nylon and Proteins have similar bonds holding them together



AMINO ACIDS

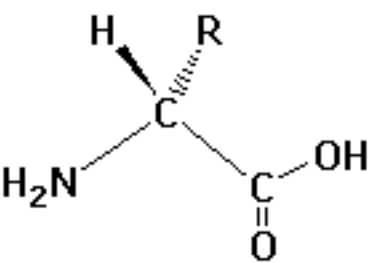
all have the same basic structure: 

All exist as this enantiomer

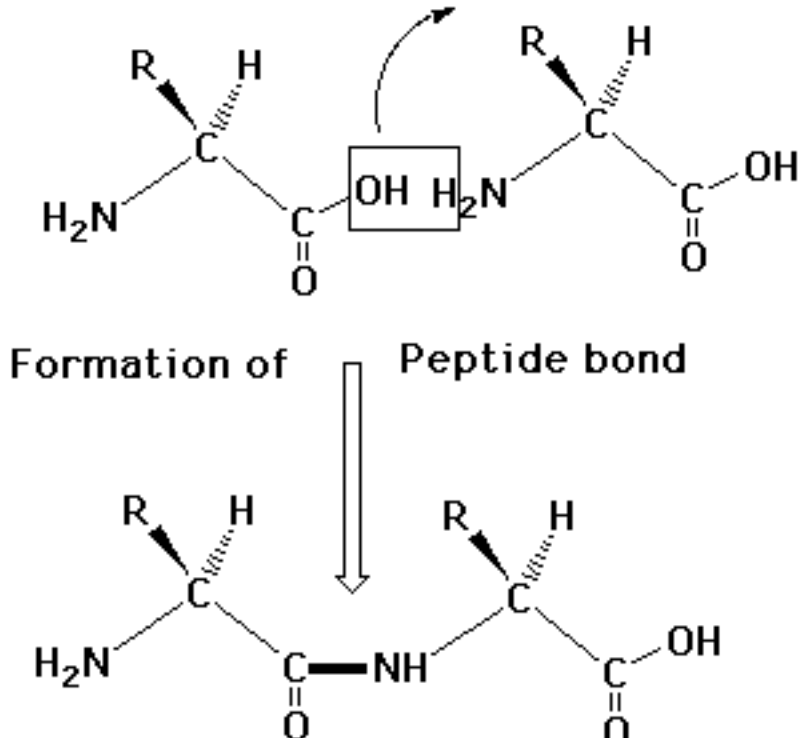


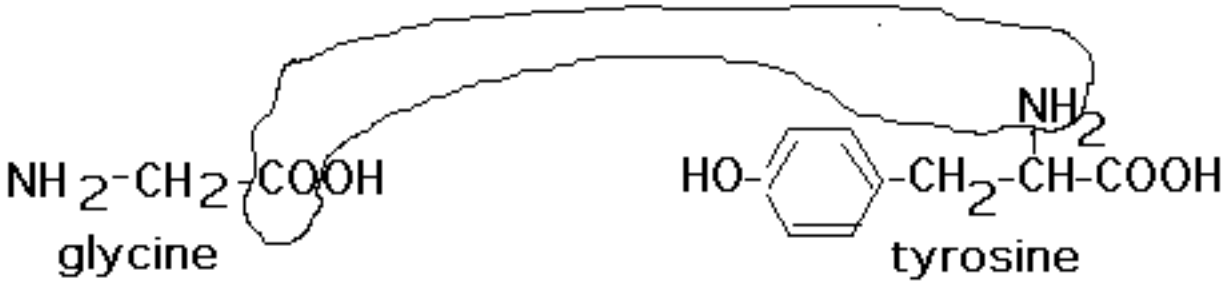
L-AMINO ACID

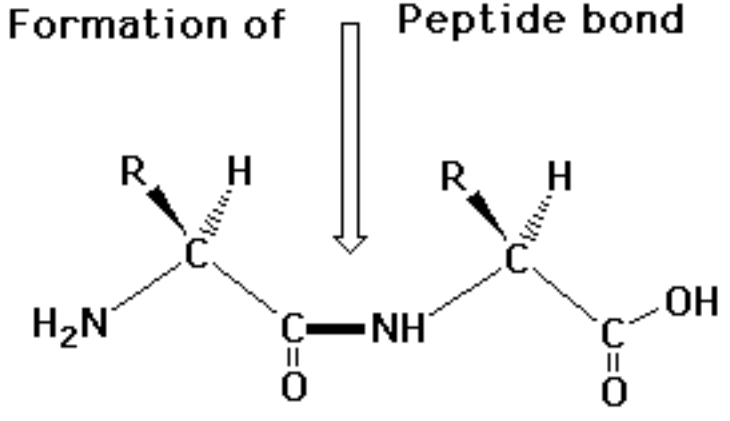
Not this

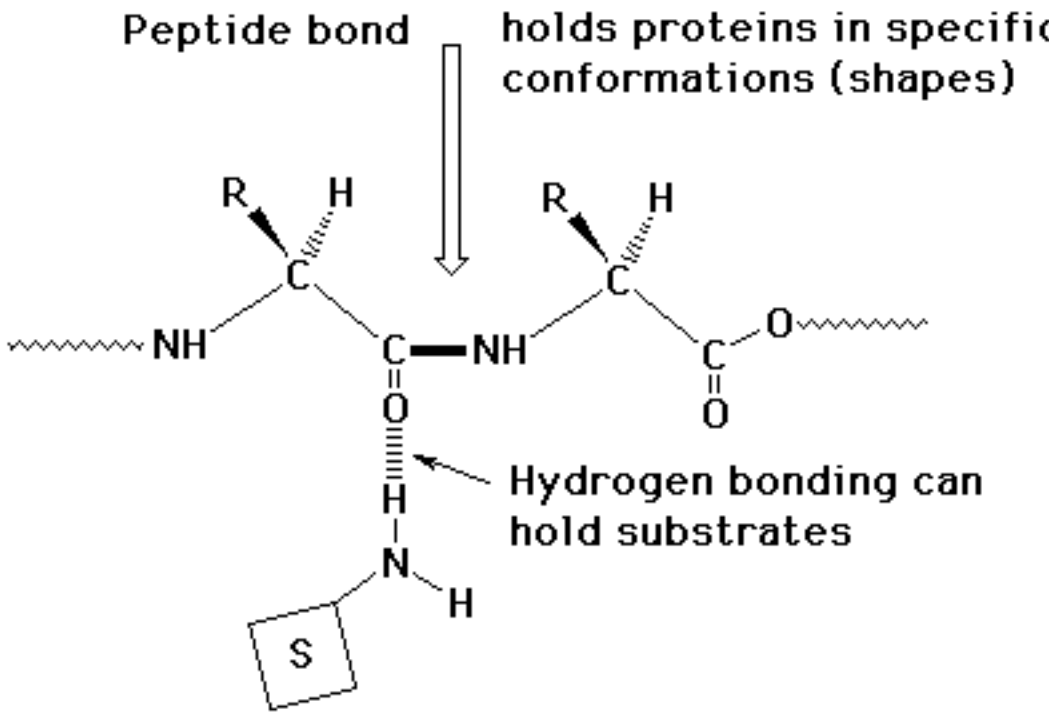


D-AMINO ACID


R
H
C
H_2N
C
O
OH
H_2N
R
H
C
C
OH
O
Formation of
Peptide bond
R
H
C
H_2N
C
NH
O
R
H
C
C
OH
O

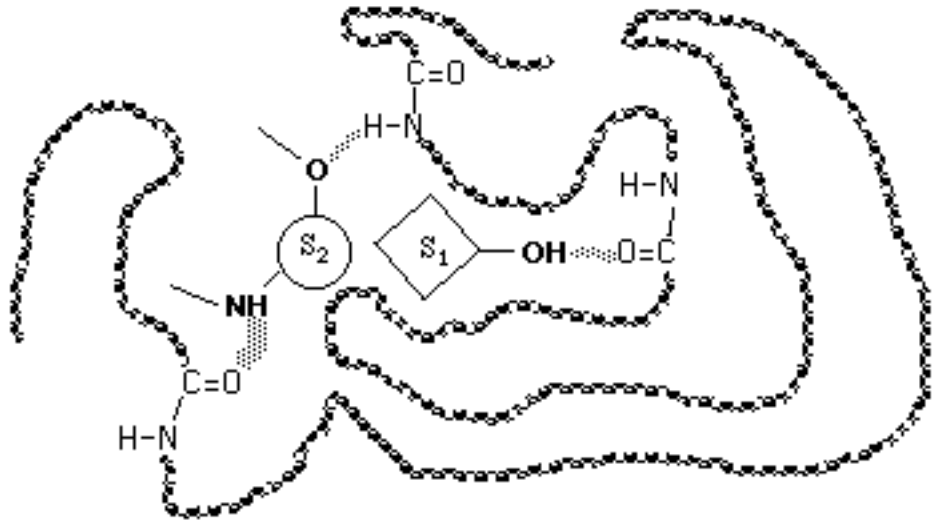

NH2-CH2-COOH
glycine
HO-
-CH2-CH-COOH
NH2
tyrosine


Formation of
Peptide bond
R
H
R
H
H2N
C
NH
C
OH
O
O


Peptide bond
holds proteins in specific conformations (shapes)
R
H
R
H
NH
NH
O
O
O
H
N
H
S
Hydrogen bonding can hold substrates

Proteins function as catalysts (enzymes) by providing cavities which fit specific substrate molecules

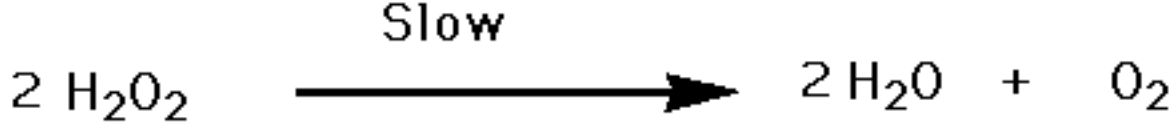
Often two molecules can be brought close together in this way

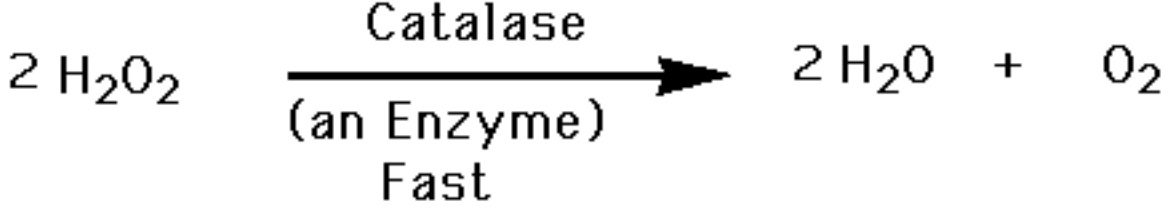


= Polymer chain of enzyme

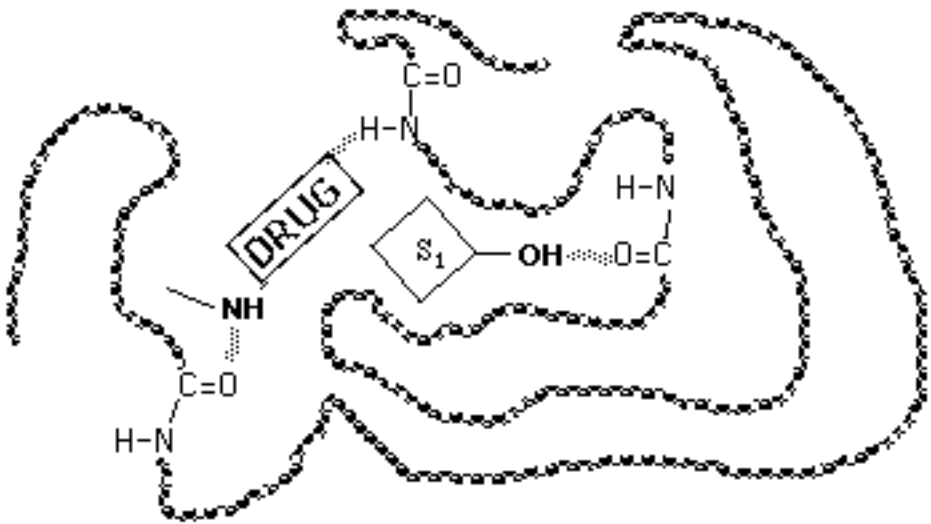
= Hydrogen bonds

FUNCTION OF ENZYMES: SPEEDING UP THE RATE OF A REACTION





Antibiotics often have the same shape as a substrate molecule and act by blocking a site for one of the substrate molecules



= Polymer chain of enzyme

= Hydrogen bonds

The amino acids are sometimes symbolized by one letter symbols so a portion of a protein chain may look like:

G-V-P-P-Q-D-E-Y-N-W-G-A-

Protein chains may be broken into smaller pieces by hydrolysis and we can use this technique to sequence proteins:

Pentapeptide of unknown sequence

H_2O | **Partial hydrolysis**

V-D- E-H- D-E- F-V-

Acids and Bases

Acids - Proton donors

Bases - Proton acceptors

Water is the base

Acids - Proton donors

Bases - Proton acceptors

Water is the base

Acids that completely dissociate in water are strong acids

The reaction goes to completion (completely dissociated)

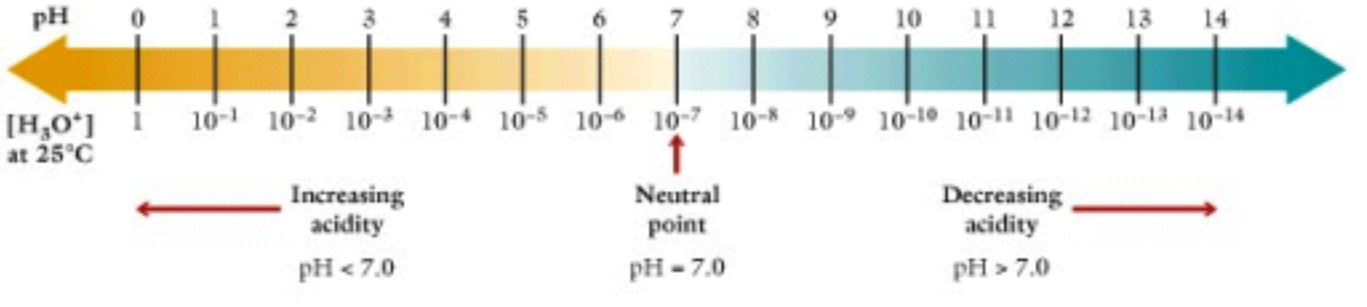
The pH Scale

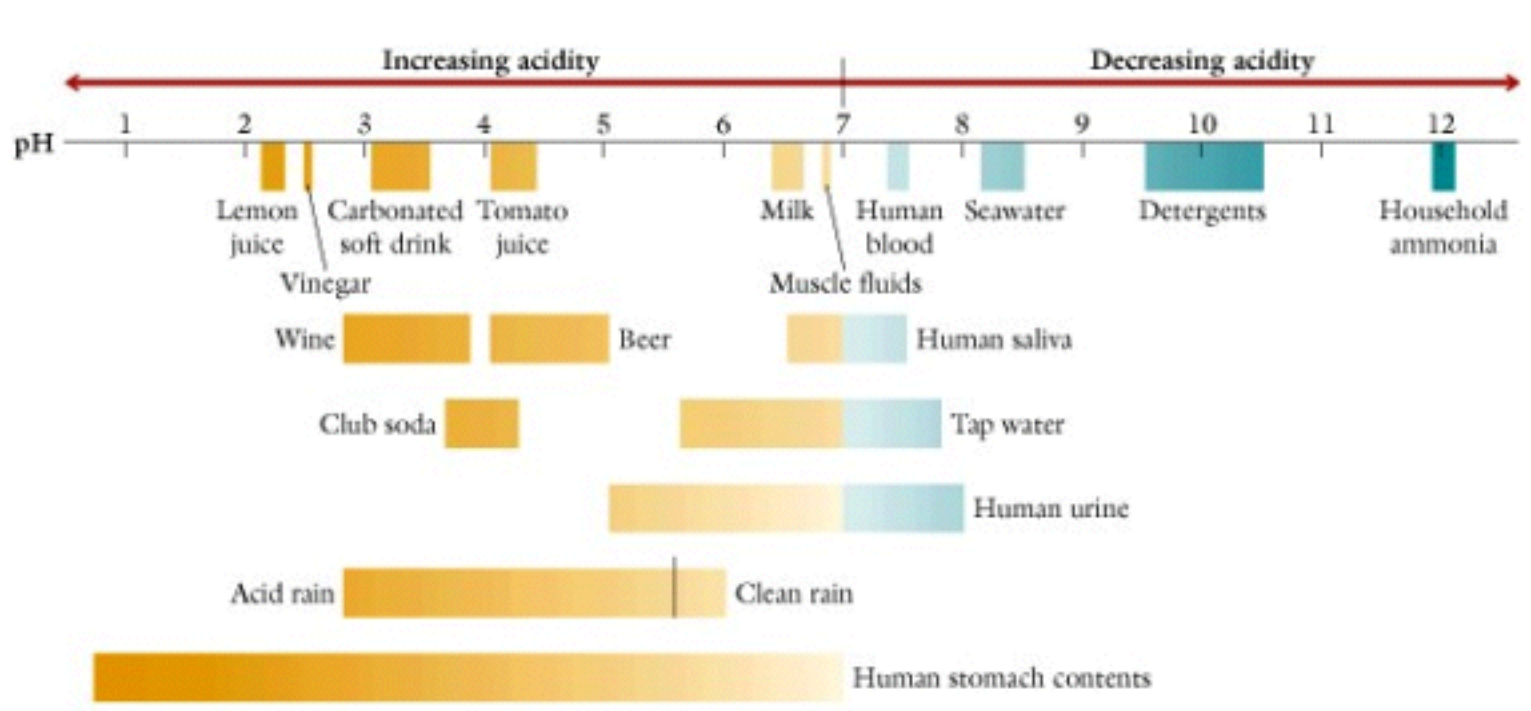
$$pH = -\log [H_3O^+]$$

$$\log 10^x = x$$

In neutral water, $[H_3O^+] = 10^{-7}$ $\log 10^{-7} = -7$ $pH = 7$

pH < 7 Acid pH > 7 base


pH
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
[H3O+] at 25°C
1 10-1 10-2 10-3 10-4 10-5 10-6 10-7 10-8 10-9 10-10 10-11 10-12 10-13 10-14
Increasing acidity
pH < 7.0
Neutral point
pH = 7.0
Decreasing acidity
pH > 7.0


Increasing acidity
Decreasing acidity
pH
1
2
3
4
5
6
7
8
9
10
11
12
Lemon juice
Vinegar
Carbonated soft drink
Tomato juice
Milk
Muscle fluids
Human blood
Seawater
Detergents
Household ammonia
Wine
Beer
Human saliva
Club soda
Tap water
Human urine
Acid rain
Clean rain
Human stomach contents