

Kit molecular Bioquímica, profesor
Referencia: QBR005

Contenido:





Cantidad	Elemento	Color	Orificios/tipo	Dia. mm
42	Carbono (C)	Negro	4 tetra. sp ³ .	23
24	Carbono (C)	Negro	3 Trigonal. sp ²	23
2	Carbono (C)	Negro	2 lin. sp	23
12	Nitrógeno (N)	Azul	Tetra. sp ³ .	23
12	Nitrógeno (N)	Azul	Trigonal sp ²	23
10	Nitrógeno	Azul	Angular 105	23
20	Oxígeno	Rojo	2 angular	23
10	Oxígeno	Rojo	2 lineal	23
10	Oxígeno	Rojo	1	23
10	Hidrógeno	Blanco	2 lineal	17
2	Azufre	Amarillo	2 angular	23
6	Fosfóro	Morado	4 tetra sp ³	23
1	Metal	Gris	4 tetra sp ³	23
1	Metal	Gris	6 octaédrico	23
100	Hidrógeno	Blanco	Enlace atómico	16
150	Enlace		NV	
10	Enlace-V	Gris	Enlaces-V	
1	Herramienta para retirar enlaces	Crema		






Por favor lea estas instrucciones antes de construir los modelos.

Tipos de componentes:

Los modelos compactos (relleno semiespacial) usan el hidrógeno átomo-enlace y las piezas atómicas estándar, teniendo un rango de hibridaciones sp, sp², sp³, d²sp³. Se suministran dos tipos de enlaces cortos, que tienen los siguientes usos:

1. Enlace-NV ML-15 "No visible". Este enlace está diseñado para unir piezas atómicas estándar (p.ej. carbono, oxígeno, etc.). El enlace-NV acerca los átomos y la escala internuclear a aproximadamente 1.3 cm / Angstrom.
2. Enlace-V gris ML-20. Este enlace solo se usa para hacer anillos planos de 5 átomos, cuando algo de la tensión en la unión es absorbida por la "V" que puede doblarse ligeramente.

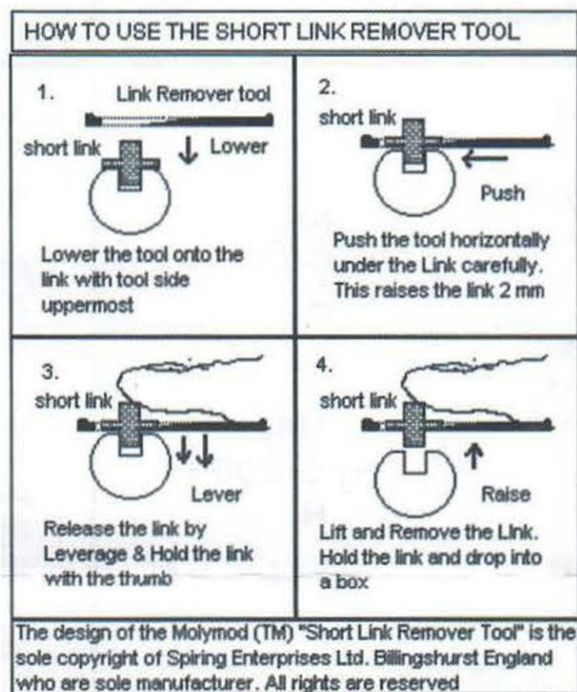
 <p>atom-link 16 mm white</p>	<p>2-holes 23 mm</p>  <p>MA-200 red MA-201 yellow</p>	<p>2-holes 17 mm linear 180</p>  <p>MA-210 white</p>	<p>4-holes 23 mm tetrahedral 109</p>  <p>MA-400 black MA-403 yellow MA-401 blue MA-404 grey MA-402 red MA-407 purple</p>
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<p>5-holes 23 mm tribipyramid 90/120</p>  <p>MA-510 purple MA-511 dark blue</p>	<p>6-holes 23 mm octahedra 90</p>  <p>MA-610 grey MA-613 yellow</p>	<p>Link short 12 mm total length</p>  <p>ML-10 white</p>	<p>SLRT</p> 	<p>V-link ML-20</p> 
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Es posible hacer los siguientes tipos alternativos de estructuras: aminoácidos, péptidos, una hélice alfa de 10 péptidos, sacáridos hasta 3 unidades de glucosa, purinas (adenosina, guanina), pirimidinas (citosina, timina, uracilo), 4 unidades de cadena de fosfato de ribosa, ADN de 2 capas, Nucleósidos (adenosina, citidina), Nucleótido (AMP), Coenzima (NAD), mono y diglicéridos, fosfolípido (Lecitina).

No es posible hacer cada estructura al mismo tiempo. Los modelos están diseñados para ensamblarlos y desmontarlos. Si necesita modelos permanentes de estructuras particulares, p.ej. ADN o hélice alfa, los mismos están disponibles como kits.

Nota: Los enlaces pueden extraerse usando la herramienta para retirar enlaces cortos, la cual está incluida en este kit. Recomendamos usar el método correcto, el cual se explica a continuación.



Escala: Las piezas atómicas estándar que vienen en este juego tienen tamaños de volumen más pequeño que la correspondiente escala internuclear y por lo tanto la escala total se llama relleno semiespacial o compacto. La escala promedio es aproximadamente 1,3 cm/Ångström.

Notas sobre el uso de las piezas atómicas: Para algunos elementos hay opción de átomos y la selección depende de los ángulos requeridos, por ejemplo:

1. Los anillos aromáticos planos (benceno) requieren carbono trigonal 120°
2. Los anillos planos de 5 átomos (purinas) pueden requerir algunos 109° y también el uso de enlaces-V para acomodar la ligera variación en los ángulos.
3. Los átomos de hidrógeno lineal (2 orificios) se usan para puentes de hidrógeno y los de oxígeno lineal (2 orificios) para hélice alfa.
4. Los grupos alqueno y peptídico tienen enlaces coplanarios y sus modelos se construyen usando carbono trigonal y piezas atómicas de nitrógeno. Si hace falta que no haya rotación en absoluto se podrían pegar los átomos en la interfaz de las piezas atómicas usando pegamento de poliestireno. Sin embargo, no recomendamos pegar, ya que los enlaces son lo suficientemente firmes para evitar la rotación accidental.

Es conveniente consultar un libro de texto de Bioquímica para buscar ejemplos y orientación dentro de la gran variedad de estructuras moleculares.

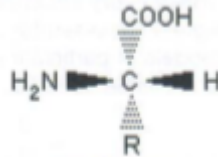
Aminoácidos

Clasificación de los aminoácidos basada en la composición química del grupo R.

1. Alifáticos, 2. Hidroxil, 3. Azufre,
4. Ácidos (y amidas), 5. Imino,
6. Básicos, 7. Aromáticos

Configuración de los aminoácidos naturales

Cada aminoácido, excepto la glicina, tiene un centro quiral con una configuración alrededor del carbono que transporta el aminoácido alfa



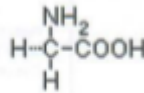
L-aminoácido

*** Estructura dipolar de los aminoácidos
 $^+H_3N-CHR-COO^-$

Alifáticos

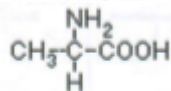
Glicina (gli)

No esencial polar neutral



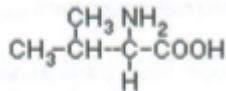
Alanina (ala)

No esencial no polar neutral



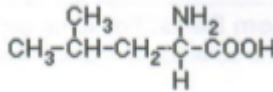
Valina (val)

Esencial no polar neutral



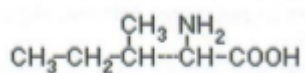
Leucina (leu)

Esencial no polar neutral



Isoleucina (ile)

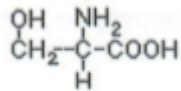
Esencial no polar neutral



Hidroxil

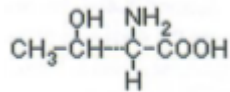
Serina (ser)

No esencial polar neutral



Treonina (tre)

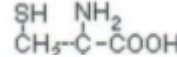
Esencial polar neutral



Azufre

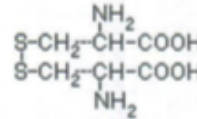
Cisteína (cis)

No esencial polar



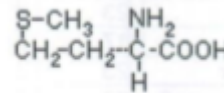
Cistina (cis/2)

No esencial no polar neutral



Metionina (met)

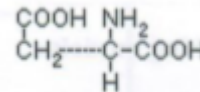
Esencial no polar neutral



Ácidos

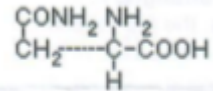
Ácido aspártico (asp)

No esencial polar ácido



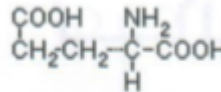
Asparagina (asn)

No esencial polar neutral



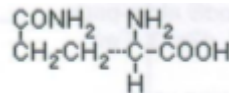
Ácido glutámico (glu)

No esencial polar ácido



Glutamina (gln)

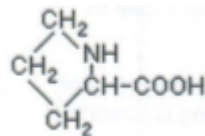
No esencial polar ácido



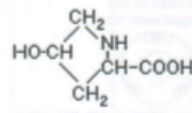
Imino

Prolina (pro)

No esencial no polar neutral



Hidroxiprolina

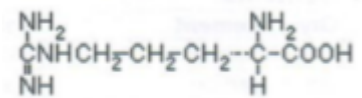


Nota: No es posible hacer todos los aminoácidos al mismo tiempo, pero es posible hacer 1 aminoácido de cada tipo.

Básicos

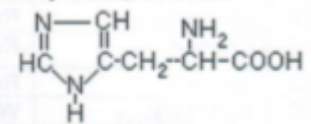
Arginina (arg)

Polar, básico, esencial



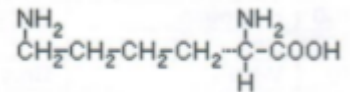
Histidina (his)

Polar, debilmente básico, esencial



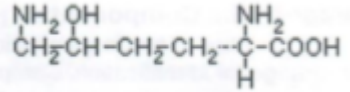
Lisina (lis)

Polar, básico, esencial



Hidroxilisina

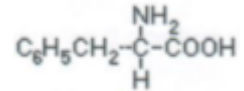
Se encuentra en el colágeno



Aromáticos

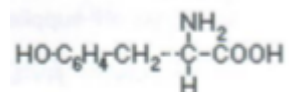
Fenilalanina (fen)

No polar neutral esencial



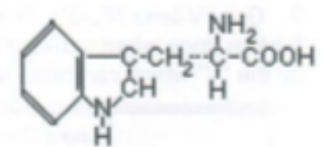
Tirosina (tir)

Polar no esencial



Triptófano (trp)

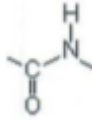
No polar, neutral, esencial



*** Estructura dipolar de los aminoácidos. El átomo de nitrógeno tetrahédrico debe usarse en el grupo amino para permitir la transferencia del ión hidrógeno.

Péptidos

El enlace peptídico es un enlace amida formado por la reacción de condensación entre el grupo carboxilo de un aminoácido y el grupo amino de otro.



Grupo peptídico -CO.NH-

Los 4 átomos del grupo peptídico están en un plano y los 2 átomos de carbono alfa adyacentes están también en el mismo plano espacial.

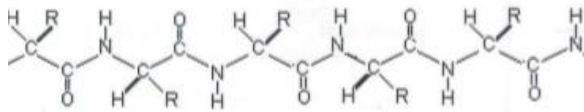
Notas

1. Los grupos H y R están fuera del plano.
2. Los átomos de O y N están en una posición transgeométrica uno en relación con el otro.

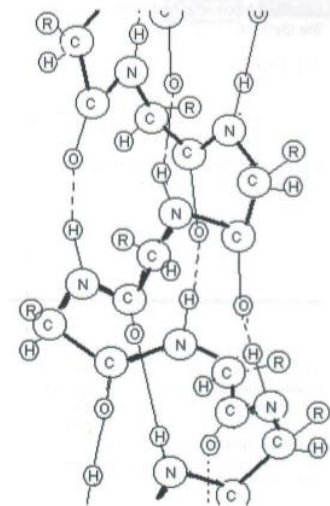
Construcción del modelo:

Un nitrógeno trigonal se debe usar en el grupo peptídico. Un hidrógeno lineal de 2 orificios será necesario para un péptido secundario (p.ej. hélice alfa)

Cadena polipéptido de 5 uds (estructura primaria)



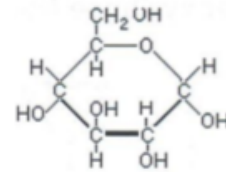
Hélice alfa (estructura secundaria)



Polisacáridos

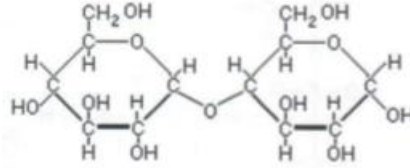
Monosacárido

Glucosa $\text{C}_6\text{H}_{12}\text{O}_6$



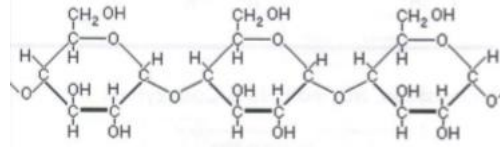
Disacárido

Maltosa $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

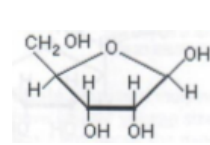


Polisacárido

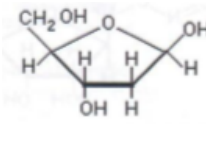
Almidón (amilosa)



Pentosas

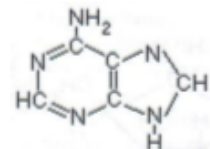


Ribosa

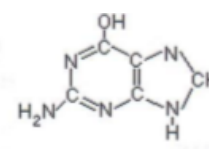


Desoxirribosa

Purinas

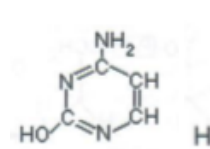


Adenina

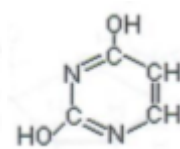


Guanina

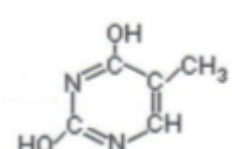
Pirimidinas



Citosina

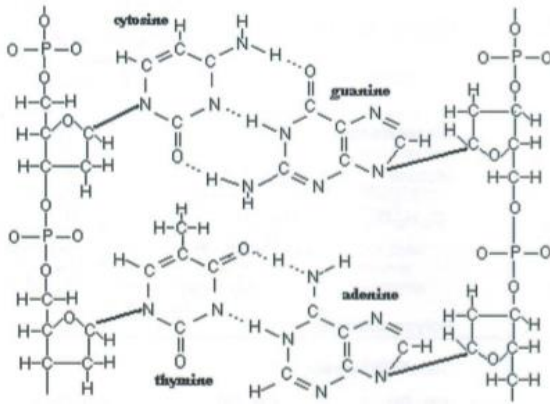


Uracilo



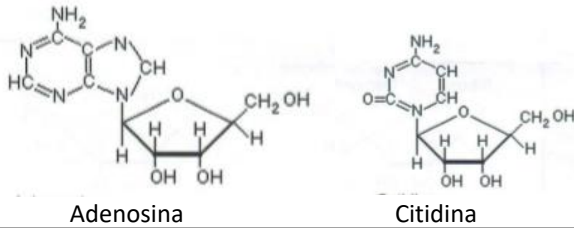
Timina

Ácido desoxirribonucleico (ADN)

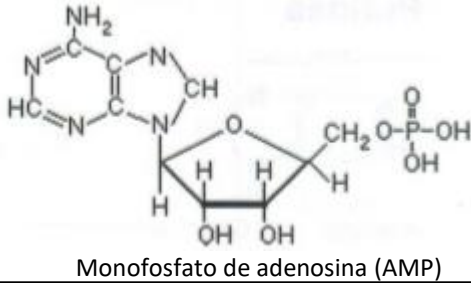


Nucleósidos, Nucleótidos y Coenzimas

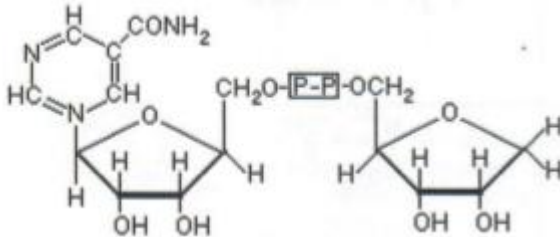
Nucleósidos



Nucleótido

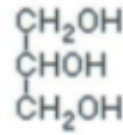


Coenzima

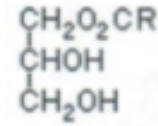


NAD
Nicotinamida adenina dinucleótido

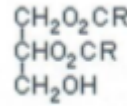
Glicéridos y fosfolípidos



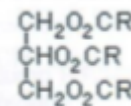
Glicerol



Monoglicérido



Diglicérido



Triglicérido

R es una cadena larga, p.ej.

Palmítico $\text{C}_{15}\text{H}_{31}$

Esteárico $\text{C}_{17}\text{H}_{35}$

Oleico $\text{C}_{17}\text{H}_{33}$

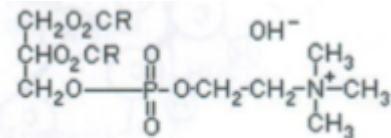
Ácido esteárico $\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$

Ácido oleico $\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$

Los fosfolípidos son 1,2-diglicéridos con un grupo fosfato y otro grupo, usualmente una base unida a la posición 3 del glicerol.

P.ej.

Lecitina



Molecular model set teacher, Biochemistry
Reference: QBR005

Content Detail:





Qty.	Element	Colour	Holes/type	Dia.mm·
42	Carbon (C)	Black	4 tetra. sp ³ .	23
24	Carbon (C)	Black	3 Trigonal. sp ²	23
2	Carbon (C)	Black	2 lin. sp	23
12	Nitrogen (N)	Blue	Tetra. sp ³ .	23
12	Nitrogen (N)	Blue	Trigonal sp ²	23
10	Nitrogen	Blue	angular 105	23
20	Oxygen	Red	2 angular	23
10	Oxygen	Red	2 linear	23
10	Oxygen	Red	1	23
10	Hydrogen	White	2 linear	17
2	Sulphur	Yellow	2 angular	23
6	Phosphorus	Purple	4 tetra sp ³	23
1	Metal	Grey	4 tetra sp ³	23
1	Metal	Grey	6 octahedral	23
100	Hydrogen	white	Atom link	16
150	Link		NV	
10	V-link	Grey	V-links	
1	Link remover tool	cream		






Please read these instructions before making models:

Component Type:

Compact models (semi-space-filling) use the atom-link hydrogen and the standard atom-parts, having a range of hybridizations sp, sp², sp³, d²sp³. Two types of short links are supplied, and these have the following uses:

1. "Non-visible" NV-Links ML-15. This link is intended for joining standard atom parts (e.g. carbon, oxygen, etc.). The NV-Link brings the atoms close together and the internuclear scale to approximately 1.3 cm/ Angstrom.
2. Grey V-links ML-20. This link is only used for making planar 5-atom rings when some of the strain in the bonding is absorbed by the "V" which can bend slightly.

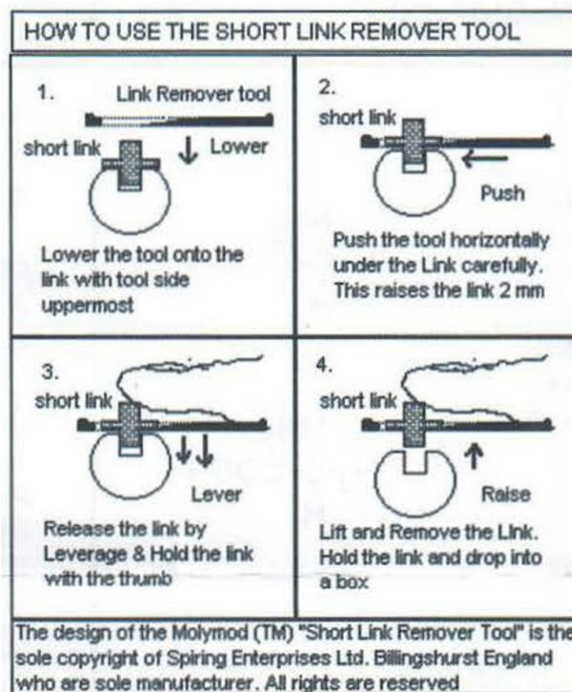
 <p>atom-link 16 mm white</p>	<p>2-holes 23 mm</p>  <p>MA-200 red MA-201 yellow</p>	<p>2-holes 17 mm linear 180</p>  <p>MA-210 white</p>	<p>4-holes 23 mm tetrahedral 109</p>  <p>MA-400 black MA-403 yellow MA-401 blue MA-404 grey MA-402 red MA-407 purple</p>
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<p>5-holes 23 mm tribipyramid 90/120</p>  <p>MA-510 purple MA-511 dark blue</p>	<p>6-holes 23 mm octahedra 90</p>  <p>MA-610 grey MA-613 yellow</p>	<p>Link short 12 mm total length</p>  <p>ML-10 white</p>	<p>SLRT</p> 	<p>V-link ML-20</p> 
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It is possible to make the following alternative types of structures; Amino-acids, Peptides, a 10 peptide Alpha-helix, Saccharides up to 3 glucose units, Purines (adenosine, guanine), Pyrimidines (cytosine, thymine, uracil), 4 Ribose phosphate chain units, 2-layer DNA, Nucleosides (adenosine, cytidine), Nucleotide (AMP), Coenzyme (NAD), mono and diglycerides, Phospholipid (Lecithin).

It is not possible to make every structure at the same time. The models are designed for assembly and disassembly. If you required permanent models of particular structures, e.g. DNA, or Alpha-helix, they are available as Kits.

Note: Links can be extracted using the short link remover tool which is supplied with this set. We strongly advise the use of the correct method which is explained below.



Scale: Standard atom parts as supplied in this set have smaller volume sizes than the corresponding internuclear scale and hence the overall scale is called semi-space-filling, or Compact. The average scale is approximately 1.3 cm/Angstrom.

Notes on use of Atom Parts: For some elements there is a choice of atoms, and the selection depends upon the angles required, for example:

5. Planar aromatic rings (benzene) require trigonal carbon 120°
6. 5 atom planar rings (purines) may require some 109° and also the use of V-links to accommodate the slight variance in angles.
7. Linear hydrogen atoms (2-holes) are used for hydrogen bonding and linear oxygen (2-holes) are used for the alpha-helix.
8. Alkene and peptide groups have coplanar bonds, and their models are made using Trigonal carbon and nitrogen atom parts. If total non-rotation is required, it would be necessary to glue the atoms at the interface of the atom parts using polystyrene glue. However, we do not recommend gluing, since the bonds are already sufficiently firm to avoid accidental rotation.

We recommend the user to consult a Biochemistry textbook for examples and guidance on the variety of structures which occur in biochemistry.

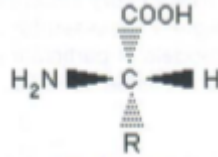
Amino Acids

Classification of amino acids based upon chemical composition of the R group.

2. Aliphatic, 2. Hydroxyl, 3. Sulphur,
4. Acidic (and amides), 5. Imino,
6. Basic, 7. Aromatic

Configuration of natural Amino-acids

Every amino-acid except glycine has a chiral center with a configuration about the carbon carrying the alpha amino acid



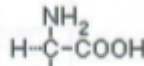
L-amino acid

***Dipolar structure of amino-acids
 $^+H_3N-CHR-COO^-$

Aliphatic

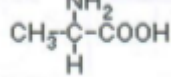
Glycine(gly)

Polar neutral nonessential



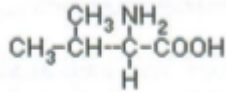
Alanine(ala)

nonpolar neutral nonessential



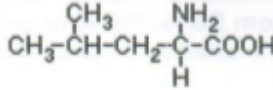
Valine (val)

Nonpolar neutral essential



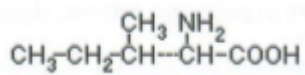
Leucine (leu)

Nonpolar neutral essential



Isoleucine (ile)

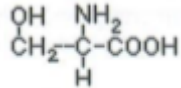
Nonpolar neutral essential



Hydroxyl

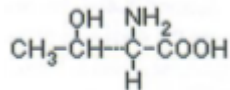
Serine (ser)

Polar neutral nonessential



Threonine (thr)

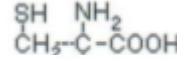
Polar neutral essential



Sulphur

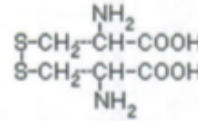
Cysteine (cys)

Polar nonessential



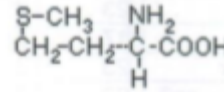
Cystine (cys/2)

Non-polar neutral nonessential



Methionine (met)

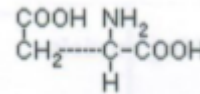
Nonpolar neutral essential



Acidic

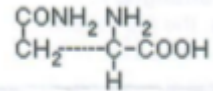
Aspartic acid (asp)

Polar acidic nonessential



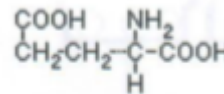
Asparagine (asn)

Polar neutral nonessential



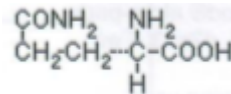
Glutamic acid (glu)

Polar acidic nonessential



Glutamine (gln)

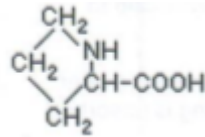
Polar acidic nonessential



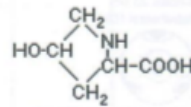
Imino

Proline (pro)

Nonpolar neutral nonessential



Hydroxyproline

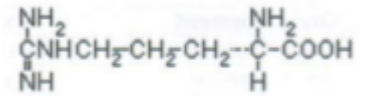


Note: Not all the amino acids can be made at the same time, but it is possible to make one amino acid of each type.

Basic

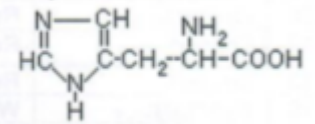
Arginine (arg)

Polar, basic, essential



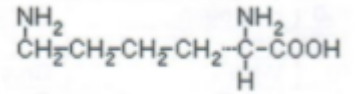
Histidine (his)

Polar, weakly basic, essential



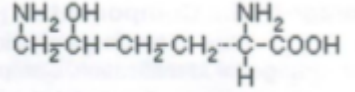
Lysine(lys)

Polar, basic, essential



Hydroxylysine

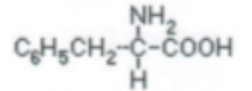
Found in collagen



Aromatic

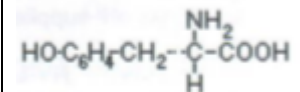
Phenylalanine (phe)

Nonpolar neutral essential



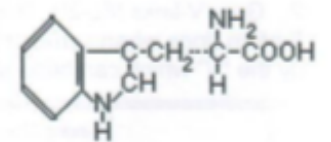
Tyrosine (tyr)

Polar nonessential



Tryptophan (trp)

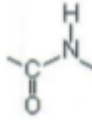
Nonpolar, neutral, essential



***Dipolar structure of amino-acids. The **tetrahedral nitrogen** atom should be used for the amine group to enable hydrogen-ion transfer.

Peptides

The Peptide Bond is an amide linkage formed by the condensation reaction between the carboxy group of one amino-acid and the amino group of another.



Peptide group -CO.NH-

The four atoms of the peptide group are planar, and the two adjacent alpha carbon atoms are also in the same spatial plane.

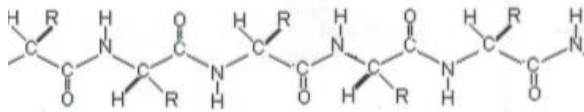
Notes

1. The H and R group are projected out the plane.
2. The O and N atoms are in a trans geometric position to each other.

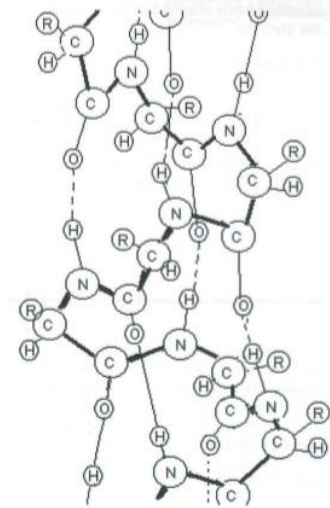
Model making:

A trigonal nitrogen should be used in the peptide group. Linear 2-hole hydrogen will be necessary for secondary peptide (e.g. alpha-helix)

A 5-unit polypeptide chain (a primary structure)



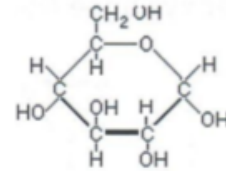
Alpha-helix (a secondary structure)



Polysaccharides

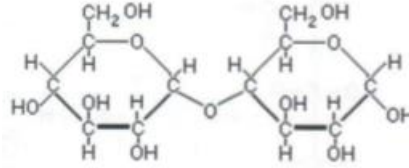
Monosaccharide

Glucose $\text{C}_6\text{H}_{12}\text{O}_6$



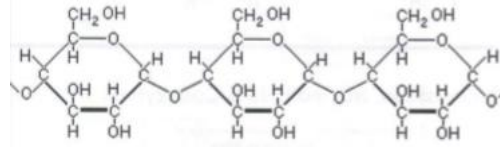
Disaccharide

Maltose $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

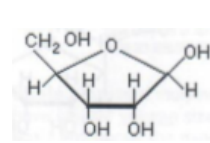


Polysaccharide

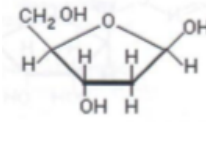
Starch (amylose)



Pentoses

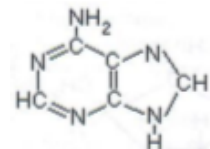


Ribose

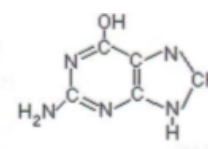


Deoxyribose

Purines

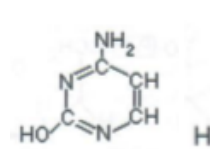


Adenine

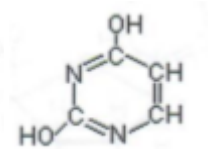


Guanine

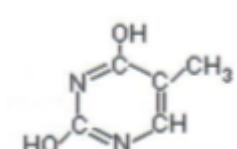
Pyrimidine



Cytosine

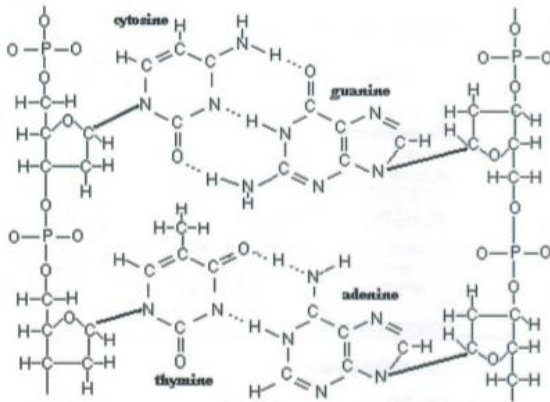


Uracil



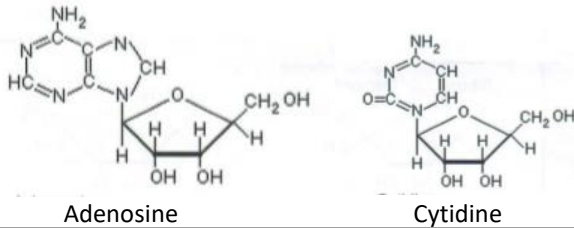
Thymine

Deoxyribose nucleic Acid (DNA)

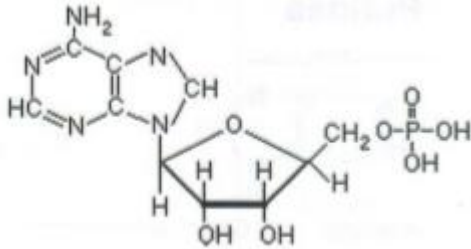


Nucleosides, Nucleotides & Coenzymes

Nucleosides

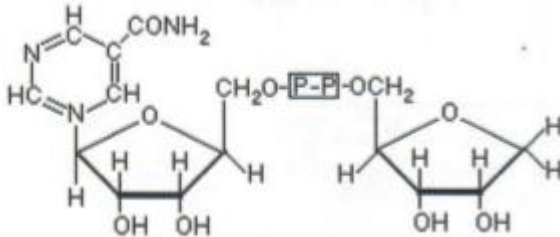


Nucleotide



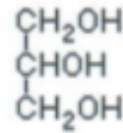
AMP adenosine monophosphate

Coenzyme

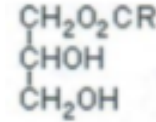


NAD
Nicotinamide adenine dinucleotide

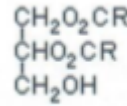
Glycerides and phospholipids



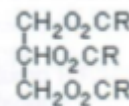
Glycerol



Monoglyceride



Diglyceride



Triglyceride

R is a long chain e.g.

Palmitic C₁₅H₃₁

Stearic C₁₇H₃₅

Oleic C₁₇H₃₃

Stearic Acid CH₃(CH₂)₁₆COOH

Oleic Acid CH₃(CH₂)₇CH=CH(CH₂)₇COOH

Phospholipids are 1,2-diglycerides with a phosphate group and another group usually a base attached to the 3 position of the glycerol.

e.g.

Lecithin

