C. PROTEINS

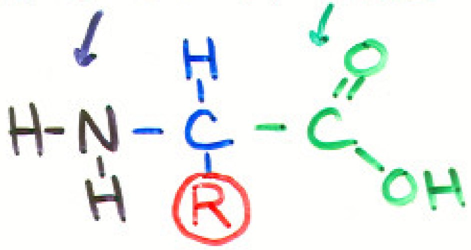
1. FUNCTION:

- STRUCTURAL eg. KERATIN - HAIR + NAILS, COLLAGEN - CONNECTIVE TISSUE
- ENZYMES - SPEED UP CHEMICAL RXNS. SPECIFIC SHAPES REQUIRED
- HORMONES - CHEM. MESSENGERS (SOME)

2. STRUCTURE:

AMINO ACIDS = MONOMERS (a.a.)

*



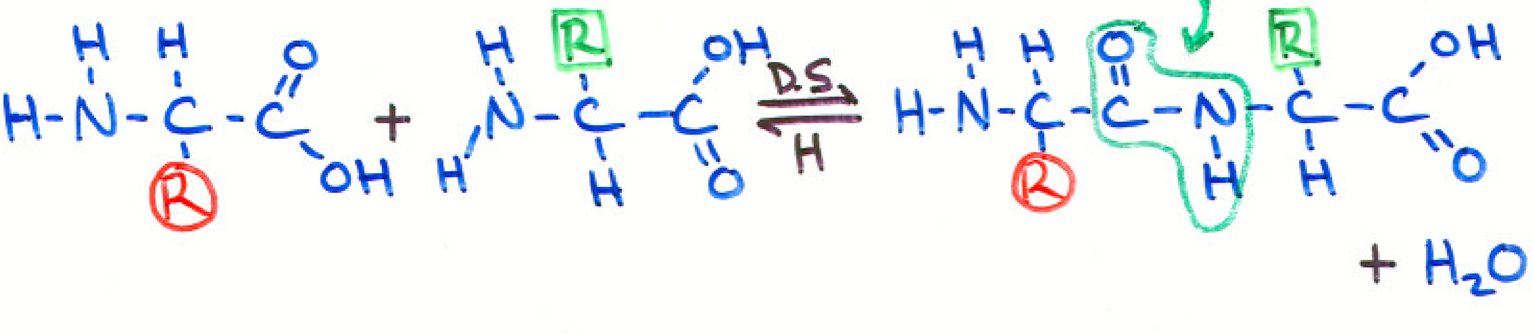
AMINE | CARBOXYL

→ VARIES, DEPENDING ON AMINO ACID

20 DIFFERENT R = 20 DIFF. a.a.

SEE pg. 29/37

JOINED TOGETHER BY PEPTIDE BOND



a.a. + a.a. ⇌ DIPEPTIDE + H_2O

... ⇌ POLYPEPTIDE (100's → 1000's of a.a.)

↳ MACROMOLECULE

3-17

***(a) Every** amino acid contains an amino **group** (NH$_2$) and a carboxyl group (COOH) bonded to a central carbon **atom**. A hydrogen atom and a side **group** are also bonded to the same car**bon** atom. This basic structure is the **same** in all amino acids. The "R" **stands** for the side group, which is dif**ferent** in each kind of amino acid. (b) **The** 20 kinds of amino acids used in **making** proteins. As you can see, their **basic** structures are the same, but they **differ** in their side groups. The side **groups** may be nonpolar (with no differ**ence** in charge between one zone and another), polar but with the two charges balancing one another out so that the side group as a whole is uncharged, negatively charged, or positively charged. The nonpolar side groups are not soluble in water, whereas the charged and polar side groups are water-soluble.*

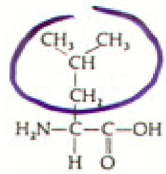
(a)

(b)

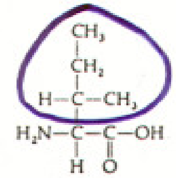
NONPOLAR

ALANINE (ala)

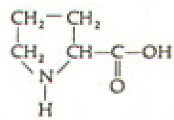
VALINE (val)



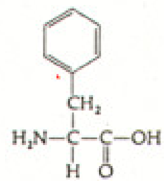
LEUCINE (leu)



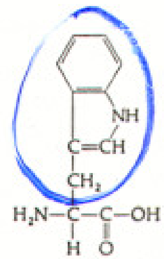
ISOLEUCINE (ile)



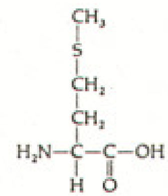
PROLINE (pro)



PHENYLALANINE (phe)

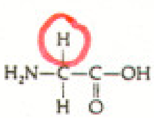


TRYPTOPHAN (trp)

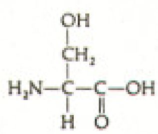


METHIONINE (met)

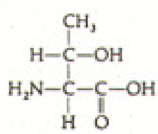
POLAR BUT UNCHARGED



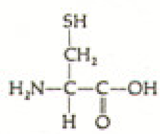
GLYCINE (gly)



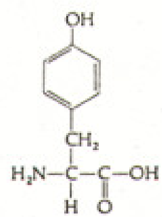
SERINE (ser)



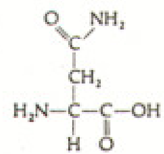
THREONINE (thr)



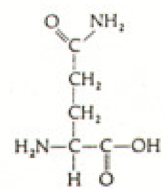
CYSTEINE (cys)



TYROSINE (tyr)

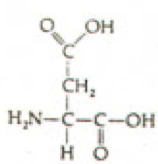


ASPARAGINE (asn)

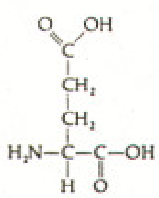


GLUTAMINE (gln)

ACIDIC
(NEGATIVELY CHARGED)

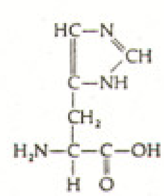


ASPARTIC ACID (asp)

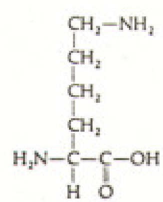


GLUTAMIC ACID (glu)

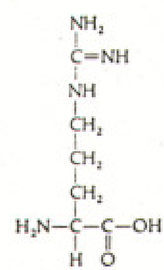
BASIC
(POSITIVELY CHARGED)



HISTIDINE (his)

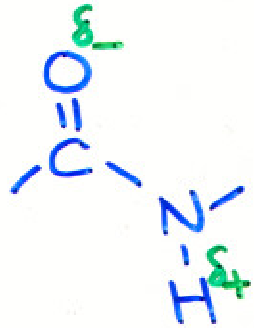


LYSINE (lys)



ARGININE (arg)

THE PEPTIDE BOND, LIKE H_2O, CARRIES PARTIAL CHARGES, i.e. IS POLAR



HELPS GIVE PROTEINS THEIR SHAPE . . .

4 DIFFERENT LEVELS OF ORGANIZATION
SEE H.O.

DENATURATION - IRREVERSIBLE CHANGES IN SHAPE DUE TO EXTREMES IN HEAT AND pH

LOSS OF SHAPE = LOSS OF FUNCTION

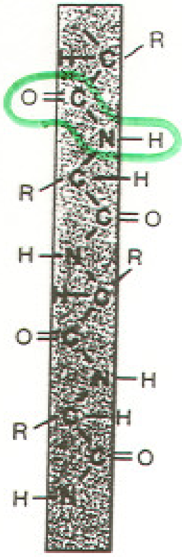
3. TYPES

i. COMPLETE PROTEINS - ANIMAL PROTEINS
CONTAIN ALL ~~8~~ 9 ESSENTIAL a.a.

ii. INCOMPLETE PROTEINS - PLANT PROTEINS.
LACKING AT LEAST 1 ESSENTIAL a.a.

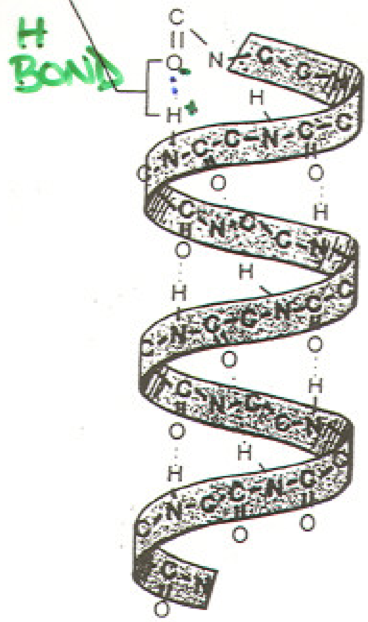
PROTEIN LEVELS OF ORGANIZATION p.39

1. PRIMARY STRUCTURE



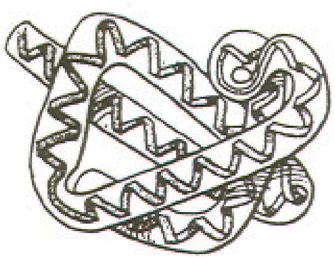
- LINEAR SEQUENCE OF a.a., JOINED BY PEPTIDE BONDS.
- DETERMINED BY DNA

2. SECONDARY STRUCTURE



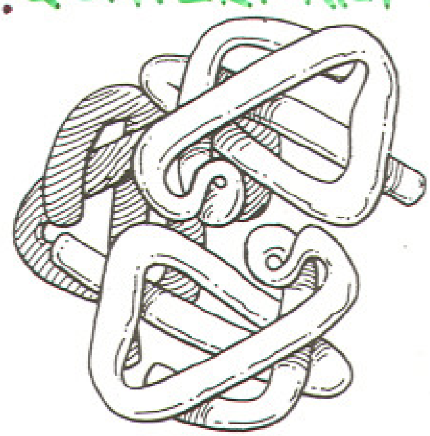
- α HELIX
- RIGHT HANDED
- 3.6 aa / TURN
- * STABILIZED BY H BONDS

3. TERTIARY STRUCTURE



- FINAL 3D SHAPE
- GLOBULAR PROTEINS
- MAINTAINED BY IONIC, COVALENT + H BONDING BETWEEN Ⓡ GROUPS

4. QUATERNARY STRUCTURE



- 2 OR MORE POLYPEPTIDES LINKED TOGETHER
- eg. HEMOGLOBIN