

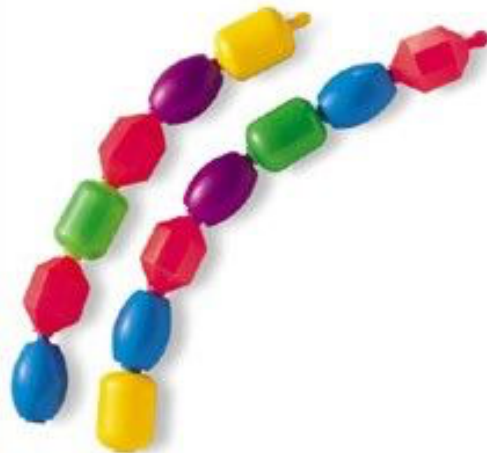


Lesson 4

PROTEIN FORMATION



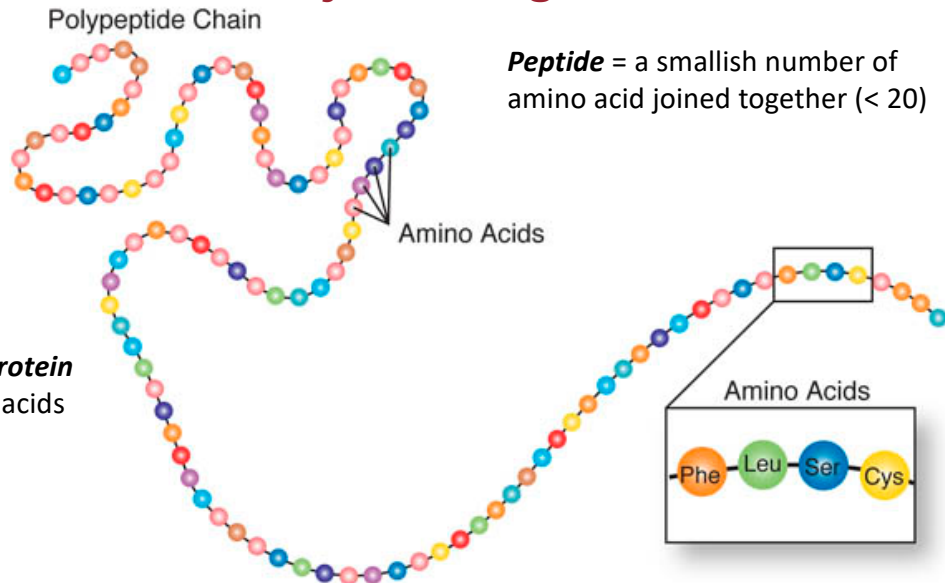
**Proteins are Macromolecules
made of component amino acids**



How are these baby toys able to represent a protein?



Proteins are made of amino acids joined together



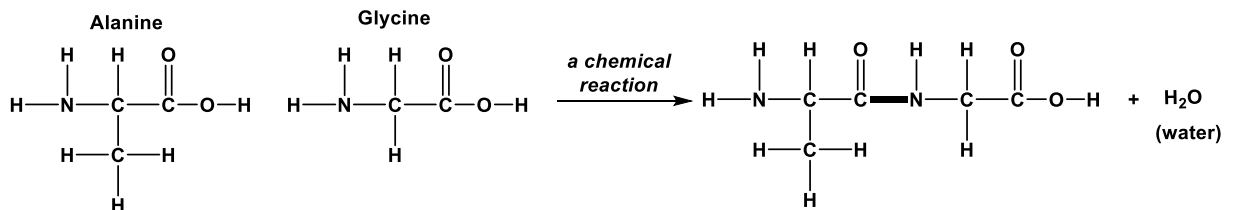
Polypeptide = protein
= a lot of amino acids joined together

Any individual protein is a large molecule, which is sometimes called a *macromolecule*. A protein is a *macromolecule* because it is comprised of amino acids joined together by *covalent bonds*.



Joining amino acids into peptides

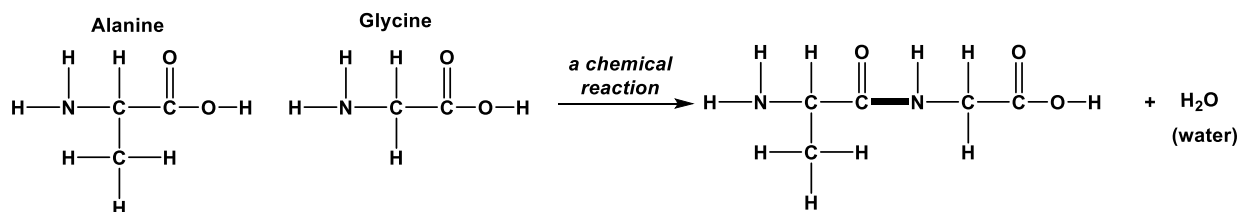
The new molecule is called a **dipeptide** of alanine and glycine residues.



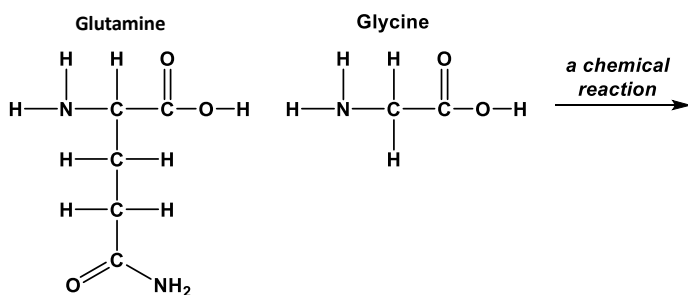
To be a protein, the amino acids must be joined together in a *chemical reaction*.



To make a *peptide bond*, between alanine and glycine, a *chemical reaction* was necessary. Describe what the *chemical reaction* required. What happened in order to make the new peptide bond? When chemists speak of chemical reactions, they talk of *bonds broken* and *bonds formed*. Use those phrases in your explanation.



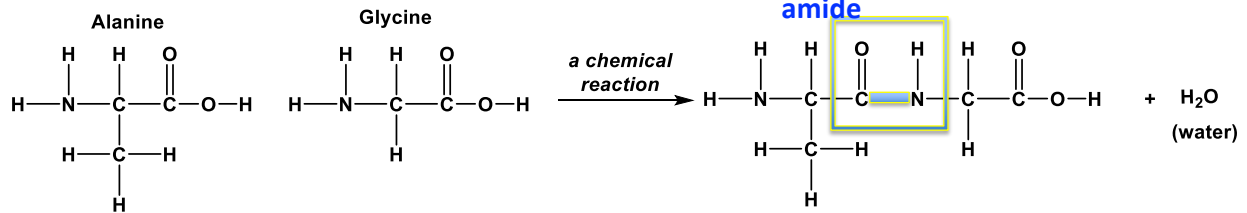
Finish the *chemical reaction* to form the dipeptide of Glycine and Glutamine Draw an arrow pointing to the new peptide bond.



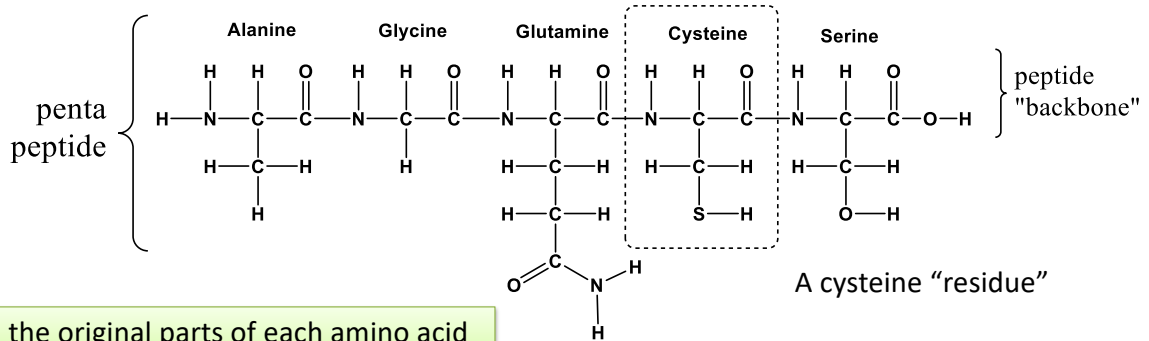


Joining amino acids into peptides

The new molecule is called a dipeptide of alanine and glycine residues



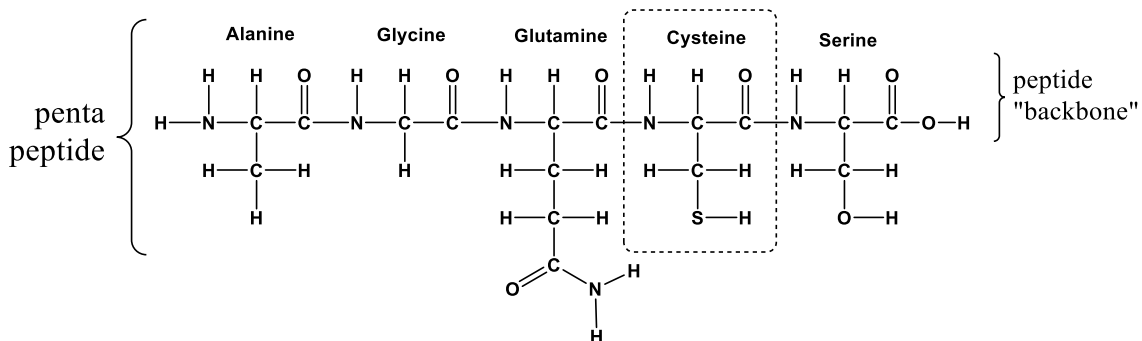
In a protein, amino acids are joined by a particular type of *covalent bond* called a *peptide bond*.



Find the original parts of each amino acid



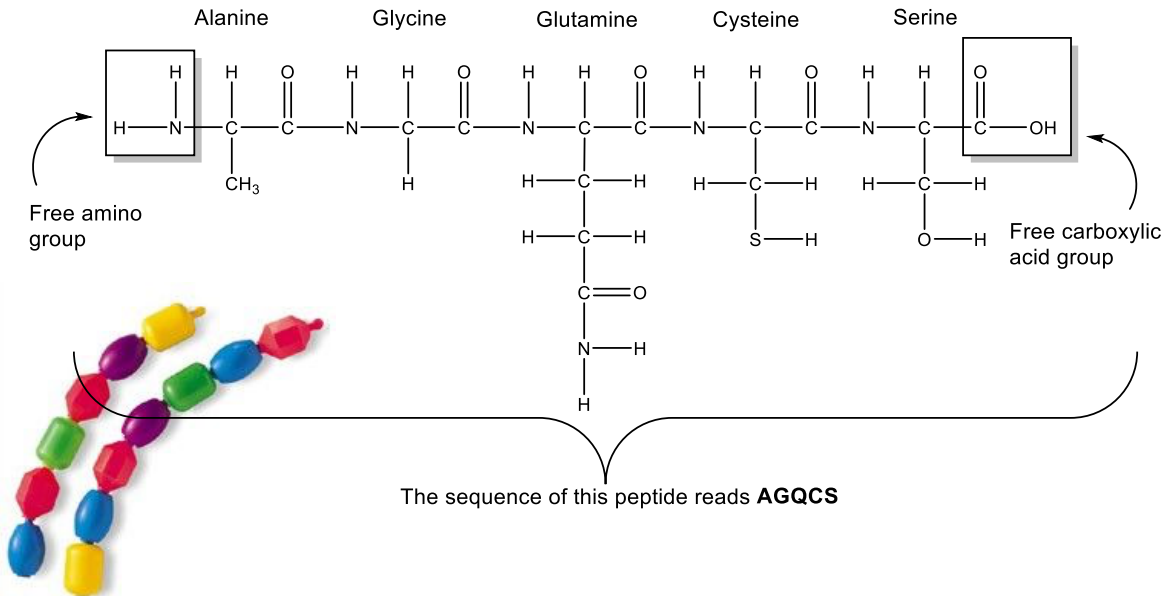
Joining amino acids into peptides...and proteins



If you had started with all free amino acids, how many water molecules would you have formed in making this pentapeptide?



Making a protein – order matters



Amino Acid Alphabet

Name	3 letter abbrev	One letter abbrev	Name	3 letter abbrev	One letter abbrev
Alanine	Ala	A	Leucine	Leu	L
Aspartic Acid	Asp	D	Lysine	Lys	K
Asparagine	Asn	N	Methionine	Met	M
Arginine	Arg	R	Phenylalanine	Phe	F
Cysteine	Cys	C	Proline	Pro	P
Glycine	Gly	G	Serine	Ser	S
Glutamic Acid	Glu	E	Threonine	Thr	T
Glutamine	Gln	Q	Tryptophan	Trp	W
Histidine	His	H	Tyrosine	Tyr	Y
Isoleucine	Ile	I	Valine	Val	V



How are proteins different from one another? *The amino acid sequence*

There are many, many, many proteins in the natural world, and each one is different from the next because of their *primary sequence*. Each unique protein is comprised of amino acids but with a unique sequence/order.

Each of these sequences represents an individual protein. If all three proteins were present in the same mixture, the *mixture* would still be called "protein".

a section of primary sequence from a hypothetical protein

...ELVISLIVES...
...KITCHENSCIENCE...
...ILIKECHEMISTRY...

The "protein" on a nutrition label is really a mixture of many unique proteins

Includes 10g Added Sugars	20%
Protein 3g	
Vitamin D 2mcg	10%



Glutenin and gliadin are the two proteins from wheat flour that are responsible for making the *proteinacious* matrix called "gluten" found in bread.

Glutenin is a large protein of >1000 amino acids. A short 30 amino acid portion of the glutenin primary sequence is shown below:

...PGQLQQPAQGQQGQQPGQAQQGQQPGQGQQ...
(the dots... mean the protein keeps going)

Here is a short 30 amino acid portion of the gliadin primary sequence:

...QLQPFPPQLPYPQQLPYPQQLYPPQPQ...



Gliadin

What do the letters represent?

What do the numbers mean?

What is significant about the arrangement of the parts?

