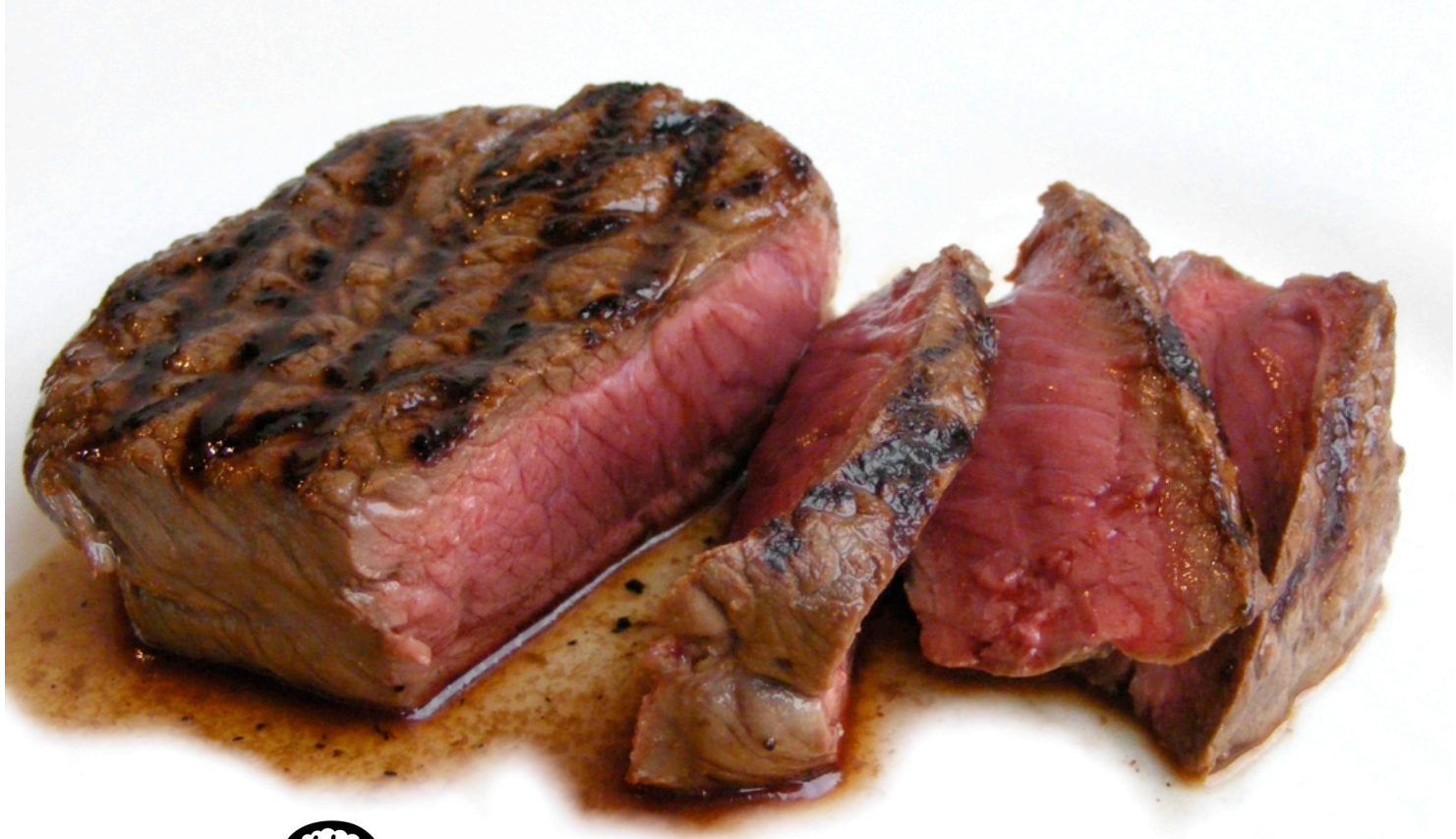


01 – DNA AND PROTEINS

1.2 - Structure and function of proteins (part B)

I

1.2.4 The folding of a polypeptide to form a protein with a unique three-dimensional shape is determined by its sequence of amino acids.

☑ Describe the factors that determine the primary, secondary, tertiary, and quaternary structure of proteins.

2

KEY MACROMOLECULES

Polymer (macromolecule)	Monomer
DNA/RNA	_____
Carbohydrate (complex sugar)	_____
Lipid (fat)	_____
Protein (polypeptide)	_____

Typical amino acid

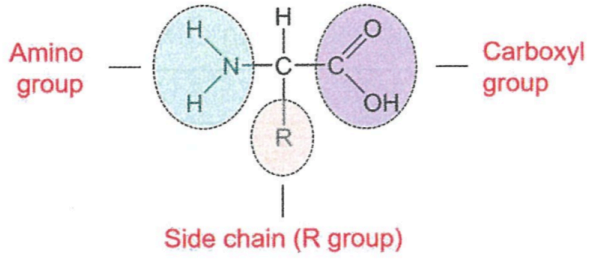
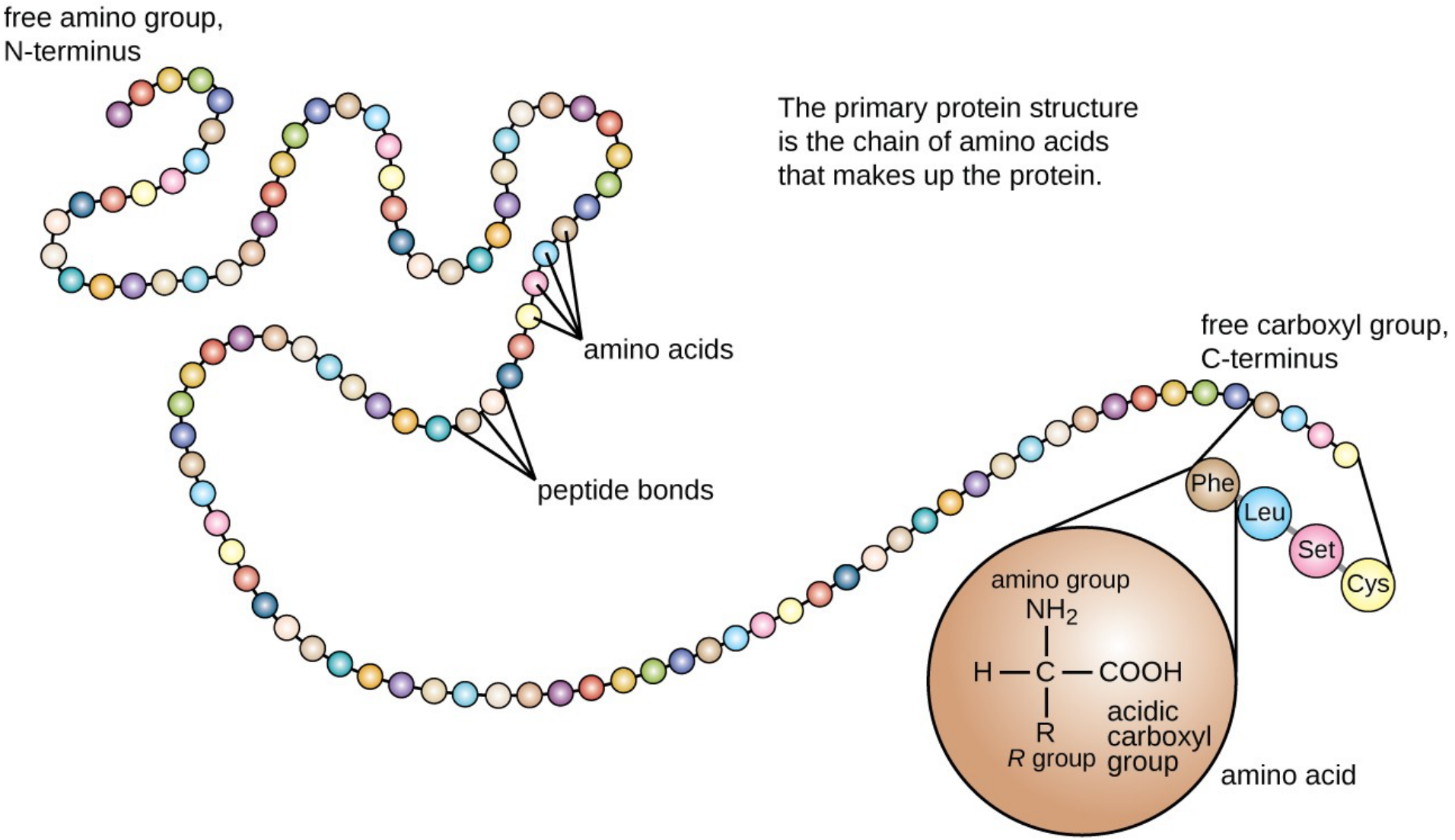


Figure 1.13: General structure of an amino acid

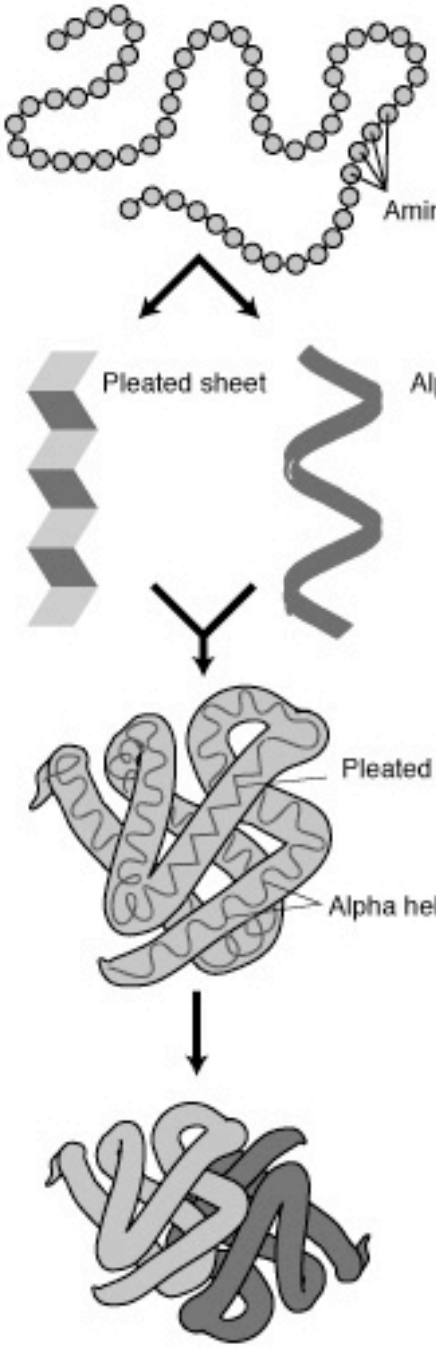
3

Primary Structure



The primary protein structure is the chain of amino acids that makes up the protein.

4



1° peptide bonds between amino acids

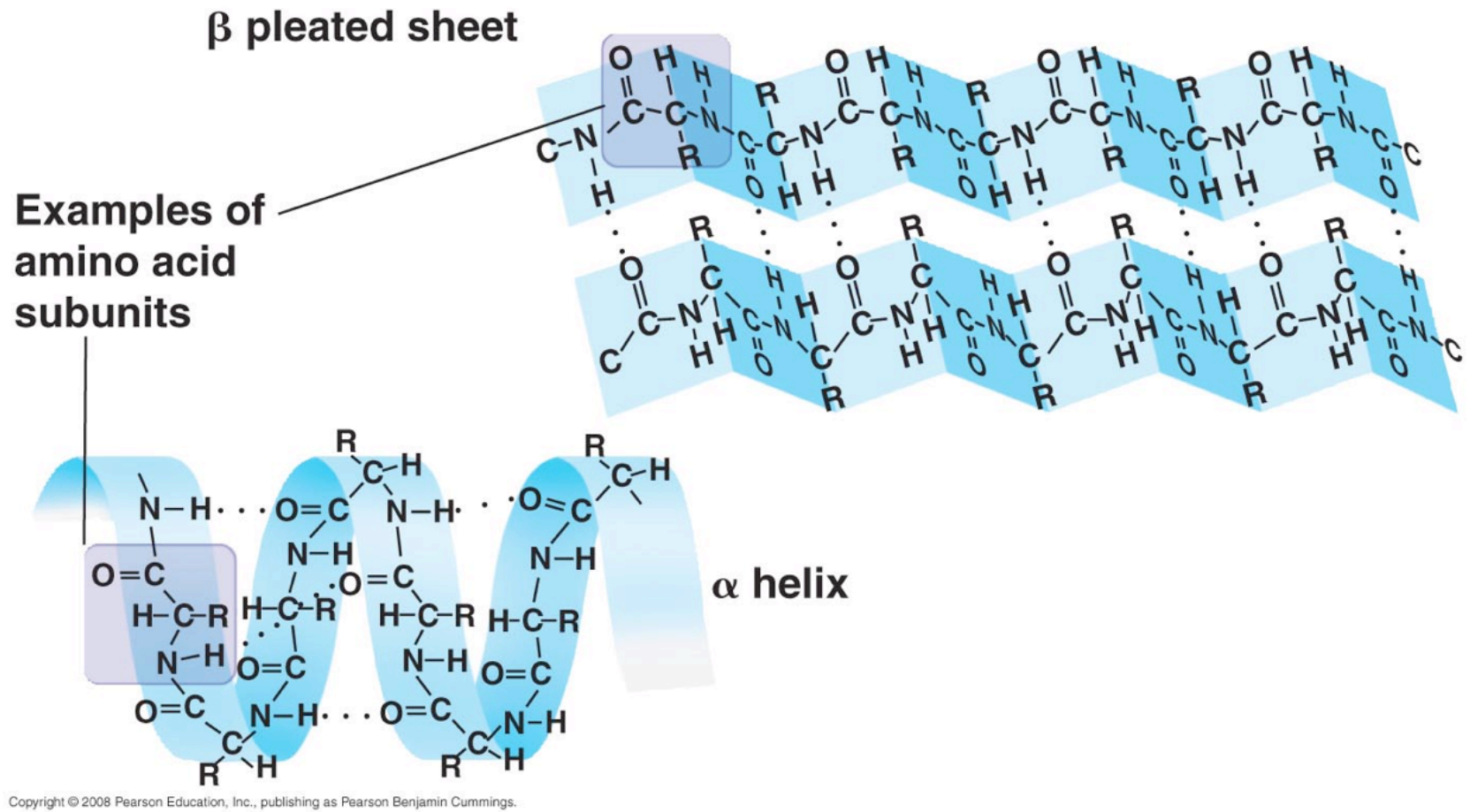
2° hydrogen bonds between aa^s on nearby sections

3° stronger bonds between parts of chain: eg. disulphide bridge

4° different bondings between separate aa chains

5

Secondary Structure



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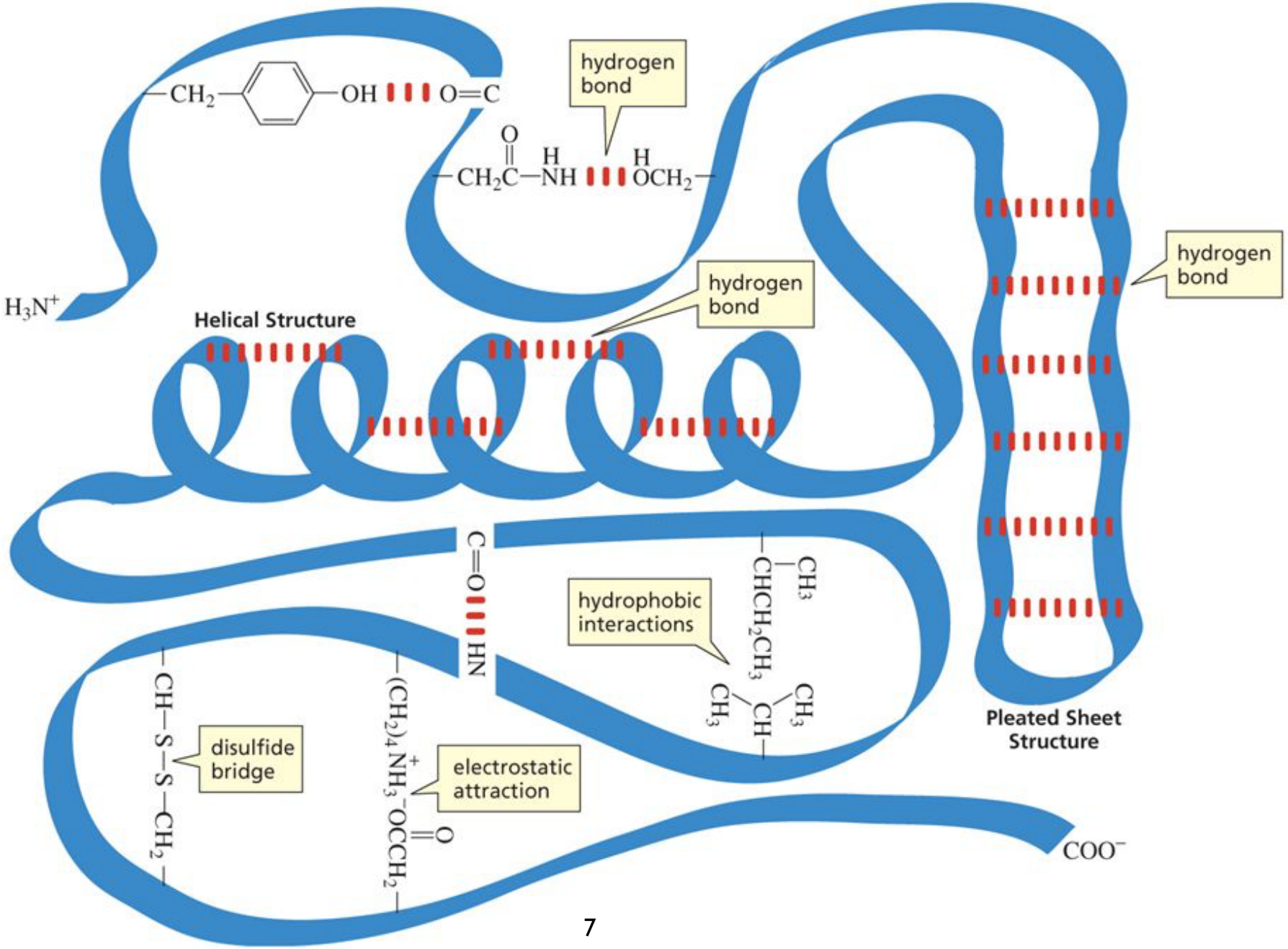
Tertiary Structure



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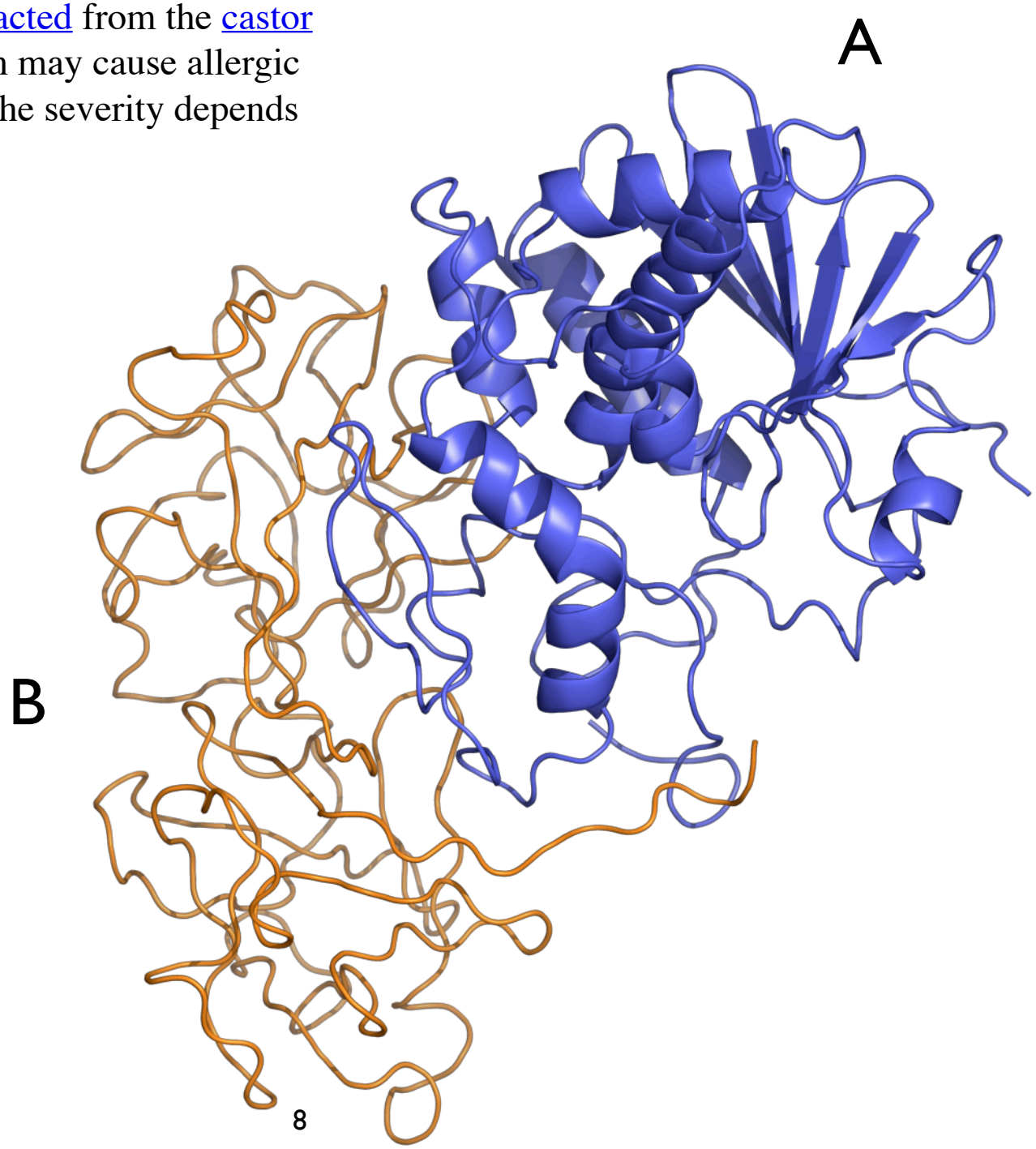
Ricin () is a protein that is extracted from the castor bean (*Ricinus communis*). Ricin may cause allergic reactions, and is toxic, though the severity depends on the route of exposure.



Quaternary Structure
(two subunits)

☑ Describe the factors that determine the primary, secondary, tertiary, and quaternary structure of proteins.

Primary	codons determine order; peptide bonds bind them
Secondary	
Tertiary	
Quaternary	

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1.2.5 Proteins are essential to cell structure and functioning.

1.2.6 Examples of proteins with specific [3D] shapes include

- enzymes,
- some hormones,
- receptor proteins,
- and antibodies.

☑ Explain why the three-dimensional structure of a protein [its specificity] is critical to its function.

Two Key Types of Protein Molecules

1. Fibrous

usually structural (hair, connective tissue, etc); usually only show 1° and 2° structure; for example:

- Keratins: soft, weak, makes up hair
- Collagens: tough and strong, in cartilage, tendons, bone, etc
- Elastins: elastic proteins, allow many tissues to resume their original shape after being stretched or contracted

Two Key Types of Protein Molecules

2. Globular

non-structural; often show 3° and 4° structure;
for example:

- Enzymes: catalyse various reactions in cells
- Hormones: chemical messages between cells
- Haemoglobin: carries oxygen
- Antibodies: protect body from invading organisms

KEY = control and regulation

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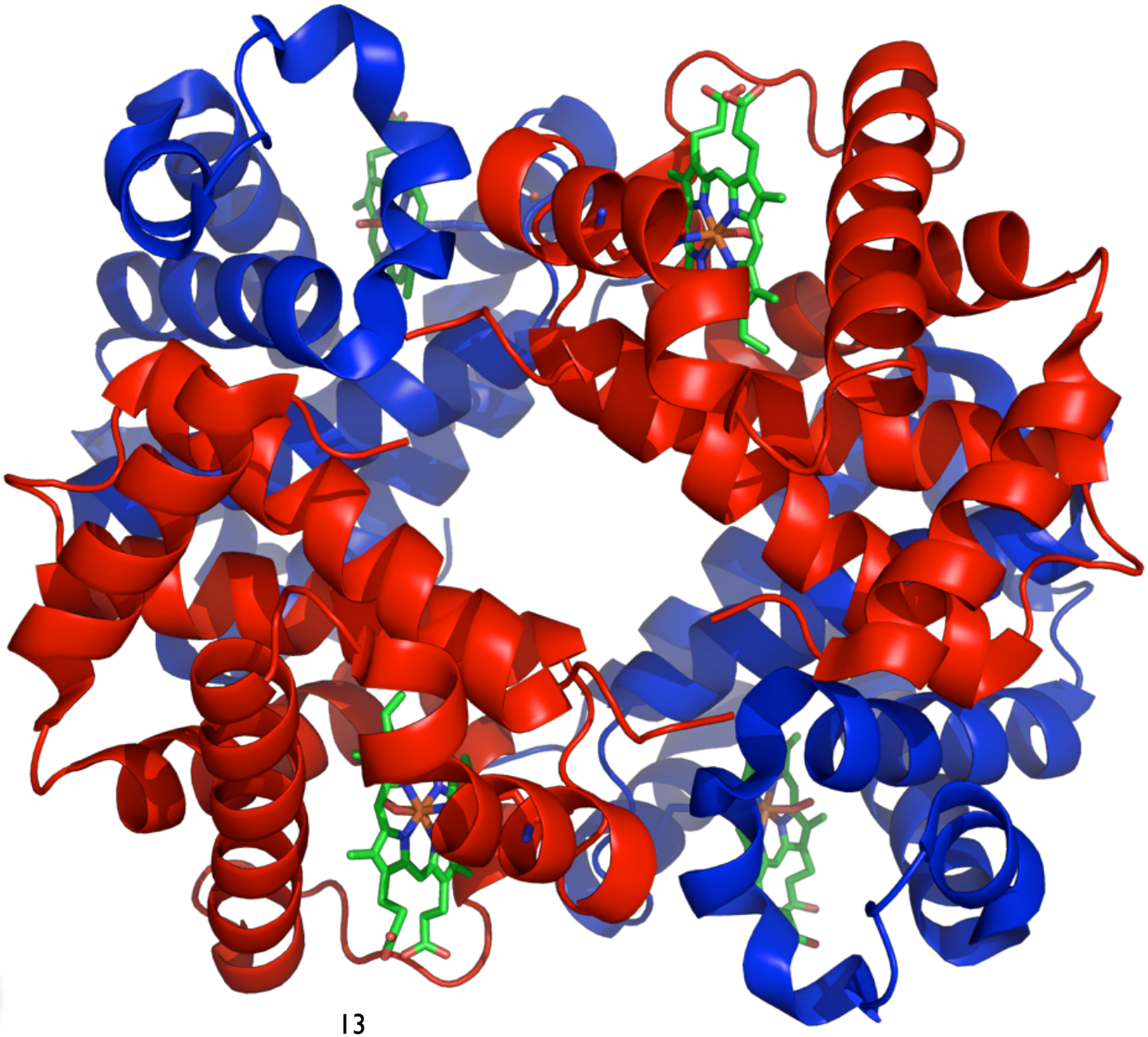
Haemoglobin
(quaternary structure)

2 pairs of polypeptide chains

Total = 600 amino acids

Other binding groups (Heme)



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How to wreck a protein - Frying and Egg Animation

https://www.sumanasinc.com/webcontent/animations/content/proteinstructure.html

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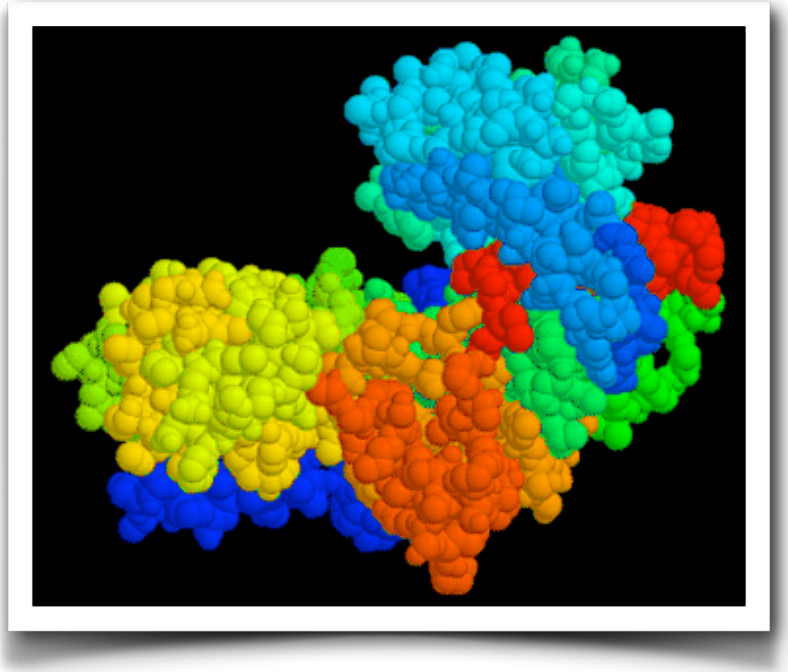
3D SHAPE IS CRITICAL & HIGHLY SPECIFIC to its FUNCTION.

- allows it bind to other proteins (fit together)
- allows it to receive messages from other proteins
- allows it to bind to other molecules (like DNA)
- allows it to bind to only specific molecules

(specificity) to help as a catalyst (speed up reactions)

hexokinase



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Enzyme specificity
(no fit = no function/reduced function)

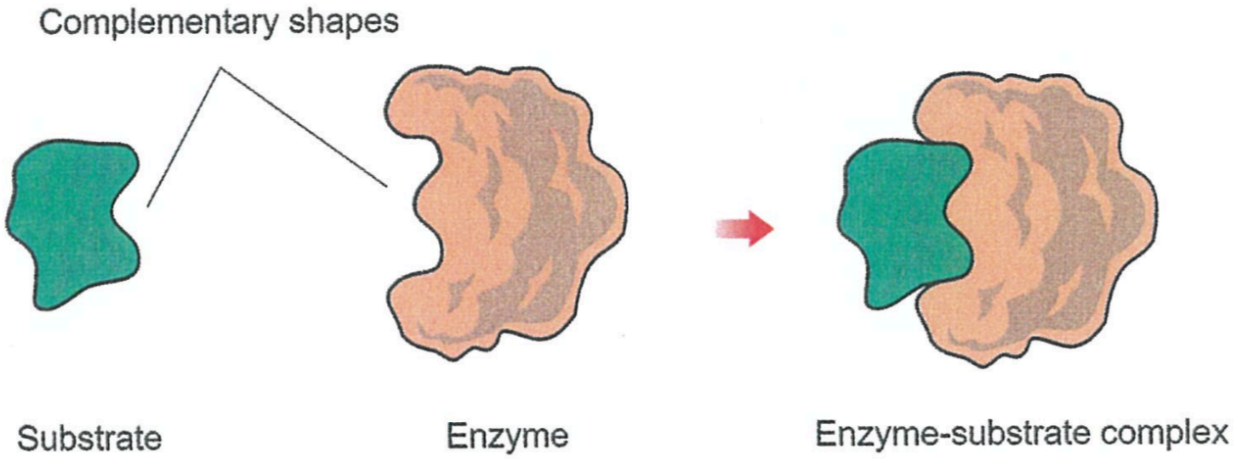

Figure 1.19: Enzyme-substrate interaction.

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Peptide Hormones & Receptor Proteins

(cell communication in multicellular organisms)

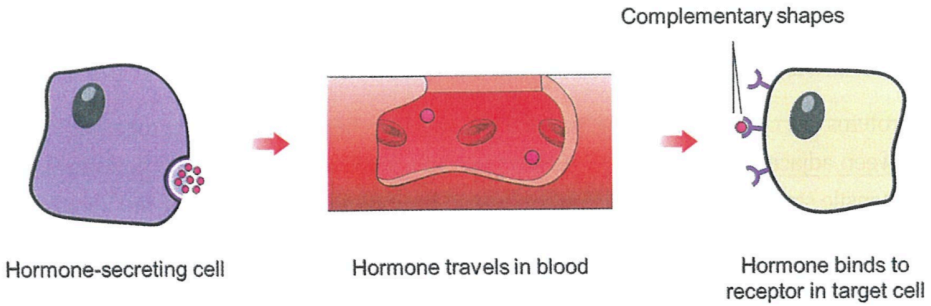
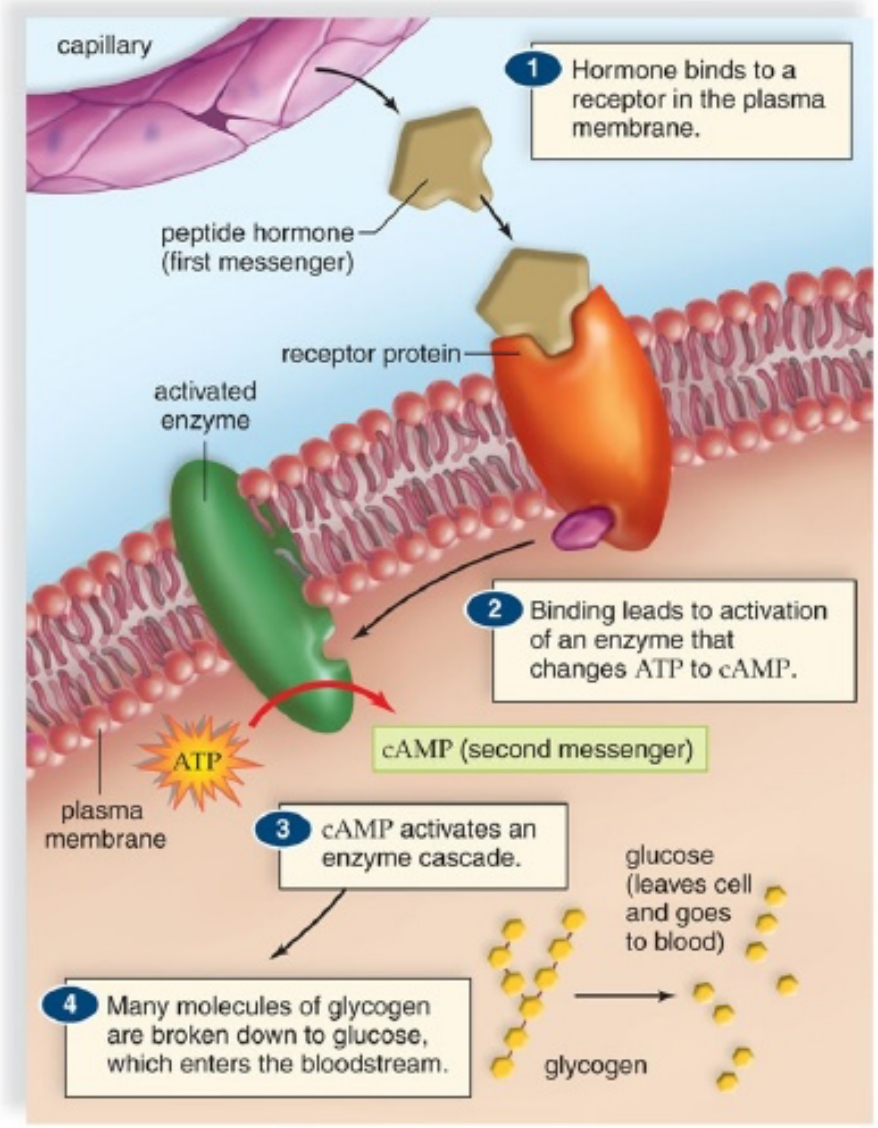


Figure 1.20: Hormone secretion and binding.



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Antibodies

(body self defence proteins)

Antibody = protein molecules that bind to antigens, helping body destroy invaders

Antigen = foreign molecules found on surface invading micro organisms