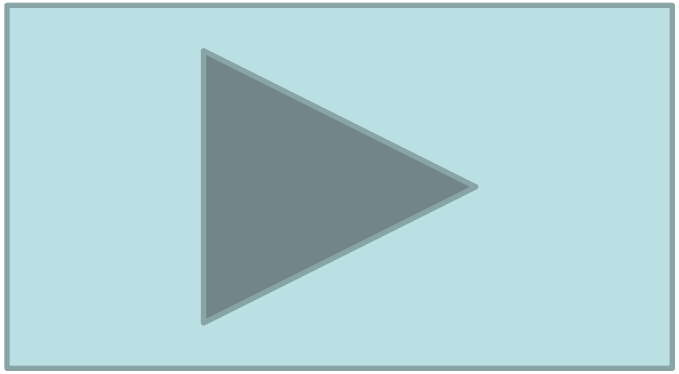
Proteins

National 5 Biology



Q: Why do cells need to make Proteins?

- Here is a list of all the things composed of protein:

1. Hormones (Oestrogen, Progesterone, Testosterone, ADH, Growth hormone…)
2. Cell Membranes- important in making new cells and repairing damaged cells
3. Enzymes – control all chemical reactions
4. Antibodies – to fight infection
5. Hemoglobin in red blood cells
6. Cytochrome carriers

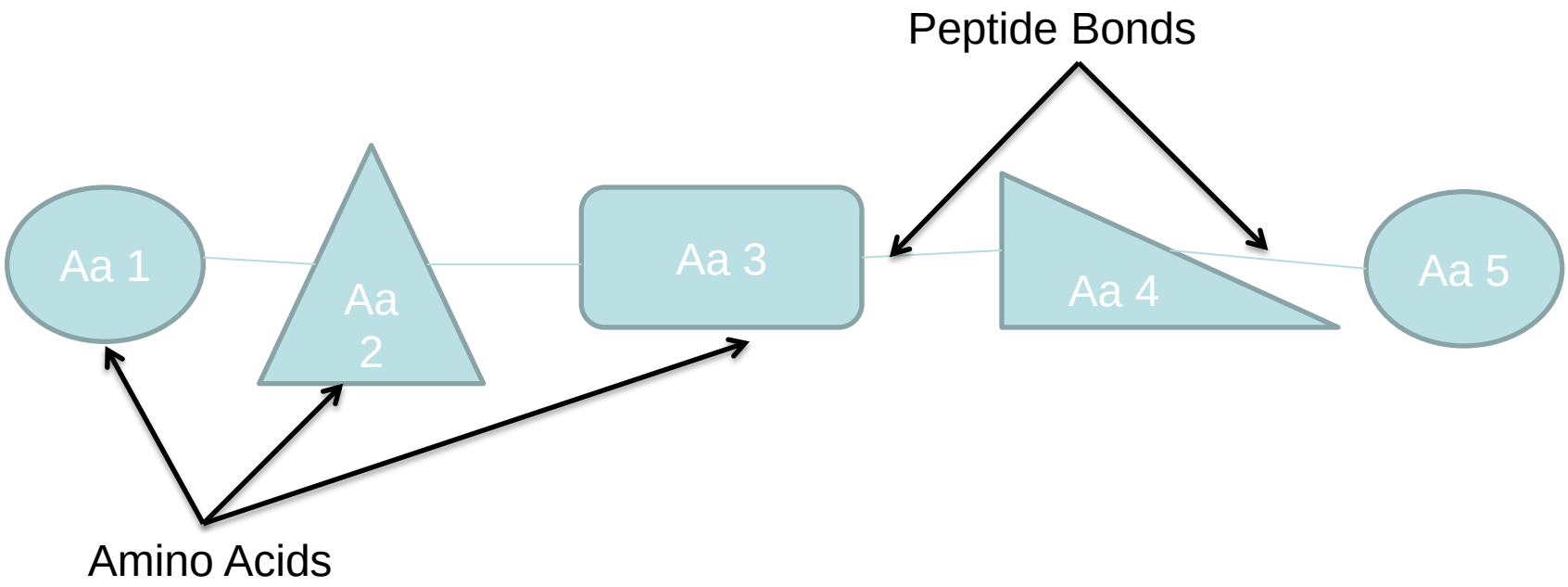
Amazing Biology Fact

- A human being possess 10 000 different types of protein !!!!!!!!!!!!!!!!!!!

- PROTEINS ARE IMPORTANT MAN !!!!!!!!

Structure of a Protein Molecule

- A protein molecule is a long chain of amino acids linked by peptide bonds



Proteins

- Genes are sections of DNA which carry specific information to make proteins.
- DNA is double stranded so cannot move out of the nucleus into the cytoplasm where proteins are made.
- mRNA is a single stranded 'copy' of a section of DNA that codes for a specific protein.

Page 23 – 24 in pupil booklet

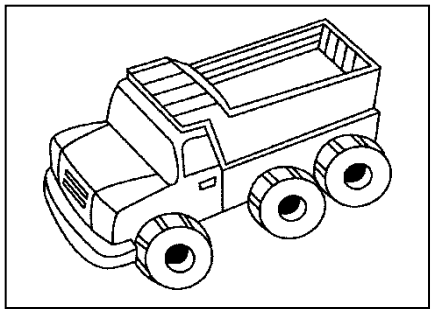
What does a cell need to make protein?

- A gene (A specific section of DNA);
- A copy of this section of DNA (mRNA);
- A Ribosome (protein factory) found in the cytoplasm;
- Amino acids;
- Transfer molecules to bring amino acids to the ribosome.

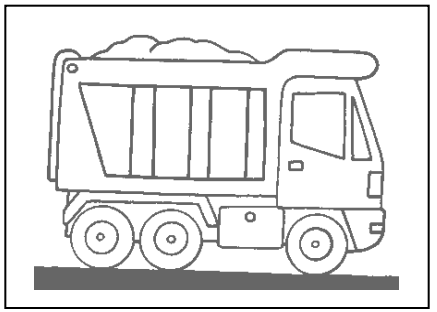
Building a house

1. Architect draws the plans **(Gene – specific base sequence for a protein)** and keeps the original copy **(DNA)** in his office **(nucleus)**.

2. **Copy** of plans **(mRNA)** sent to building site **(ribosome)** in the city **(cytoplasm)**



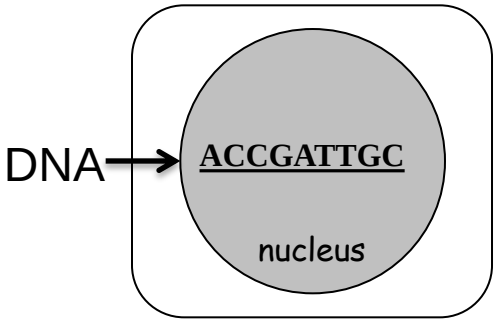
3. At the building site **(ribosome)** bricks **(amino acids)** are put together to from the walls of the house **(protein)**



4. Lorry **(tRNA)** brings bricks **(amino acids)** to building site **(ribosome)**

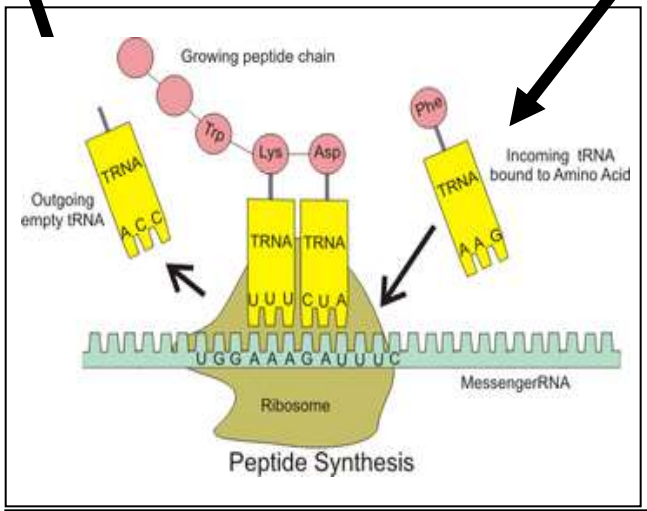
5. Empty lorry **(tRNA)** goes off to collect more bricks **(amino acids)**

Building a protein



1. The **sequence of bases** of DNA in the nucleus act as a **plan.** The DNA is too big to leave the nucleus.

2. Copy of DNA base sequence, called messenger RNA (mRNA), sent to ribosome in the cytoplasm

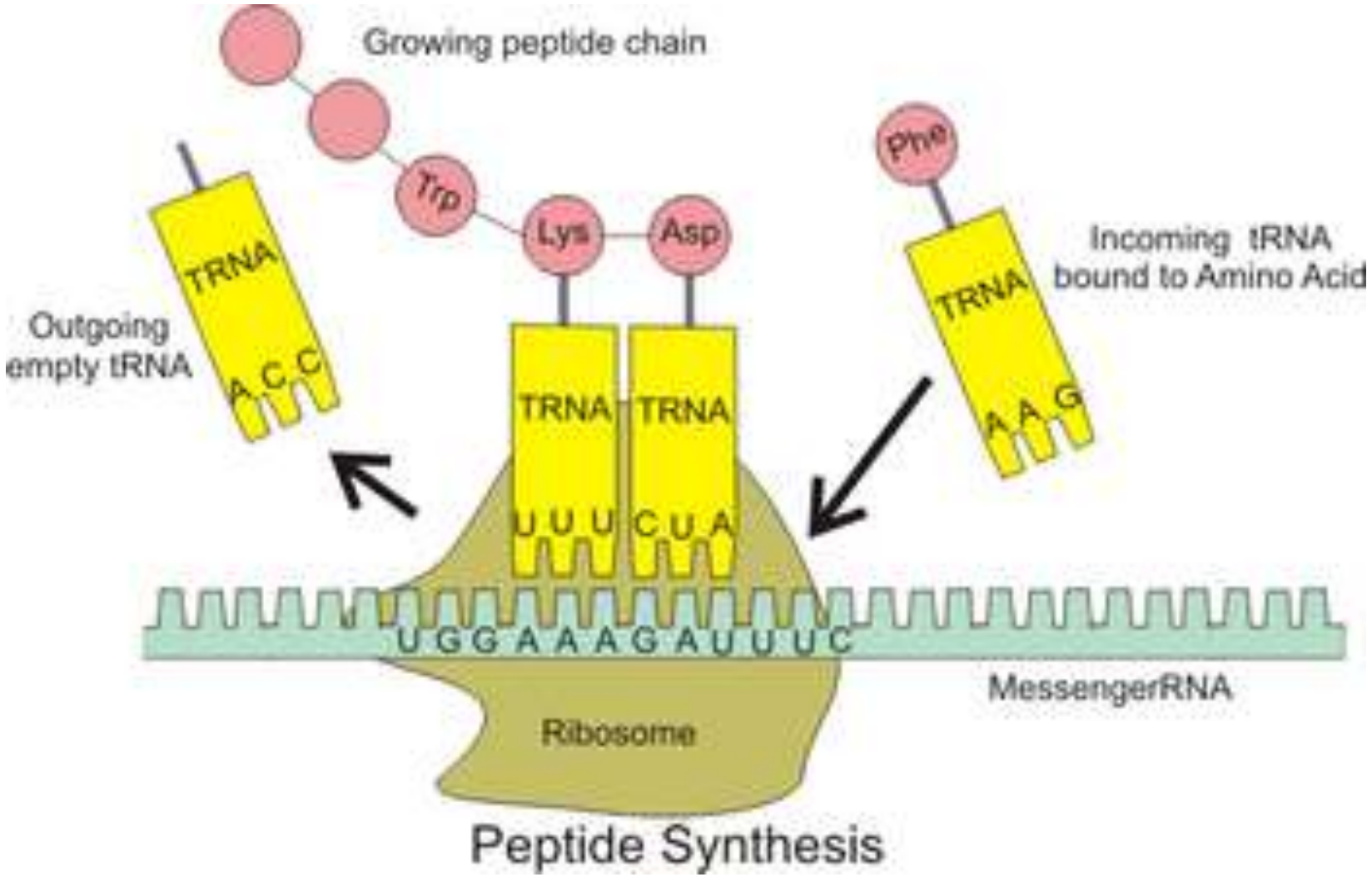


3. At the **ribosome, amino acids** are joined together to form a **protein molecule.**

5. **Empty transfer** molecules goes off to collect another amino acid

4. **Transfer molecules** bring amino acids to ribosome

CYTOPLASM


Growing peptide chain
Trp
Lys
Asp
Phe
TRNA
A C C
Outgoing
empty tRNA
TRNA
TRNA
U U U C U A
TRNA
A A G
Incoming tRNA
bound to Amino Acid
U G G A A A G A U U U C
MessengerRNA
Ribosome
Peptide Synthesis

Variety of Protein Shapes

Learning Outcomes:

1.The variety of protein shapes/functions comes from the order of amino acids;

2.The specific sequence of amino acids leads to coiling and folding of the protein in a certain way which determines the final shape and function;

3.Examples of protein shapes are:-

- **Structural Proteins**
- **Enzymes**
- **Hormones**
- **Antibodies**

Recap

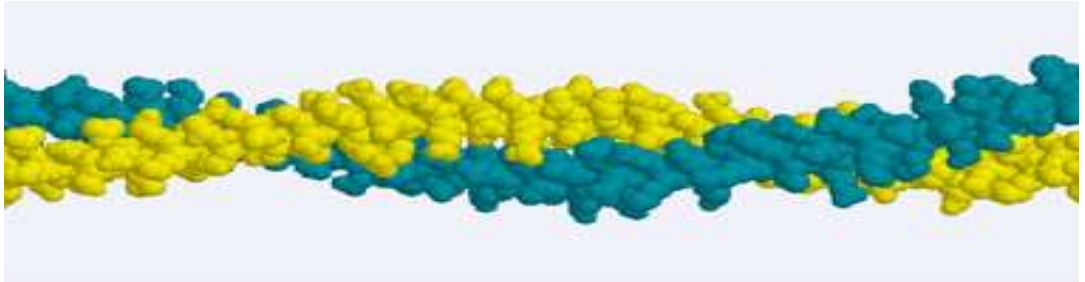
- Order of bases determines the order of amino acids

- The order of amino acids determines the folding and coiling of the protein into a specific shape suited to it's function

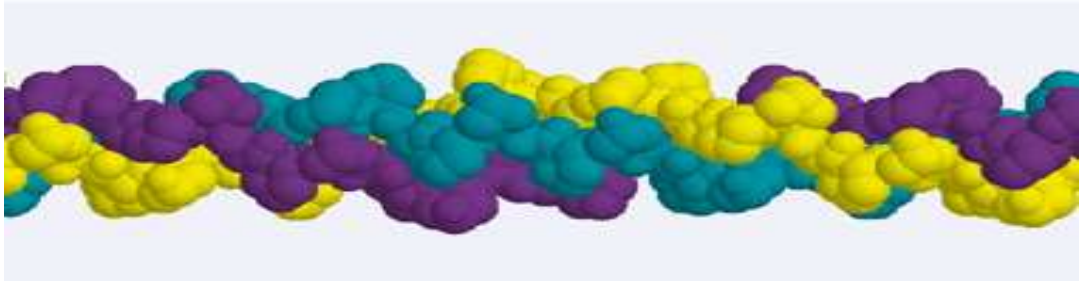
Structural

- Job: to strengthen cell membranes
- Shape: Structural fibres aligned in long chains

E.g. Keratin strengthens hair cells



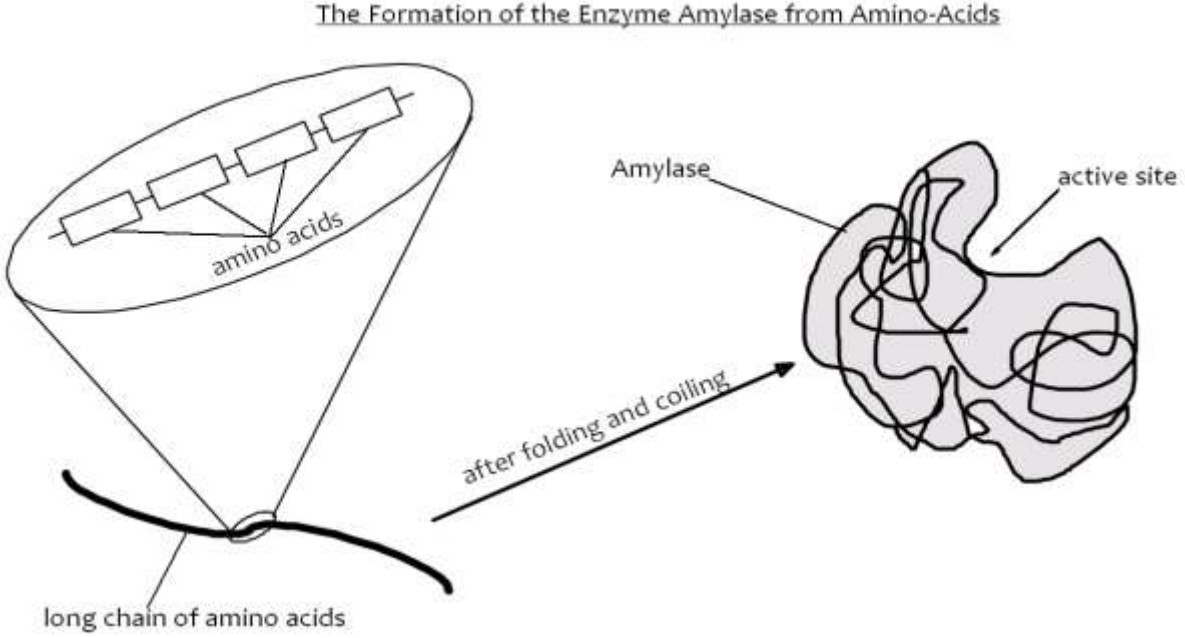
Keratin



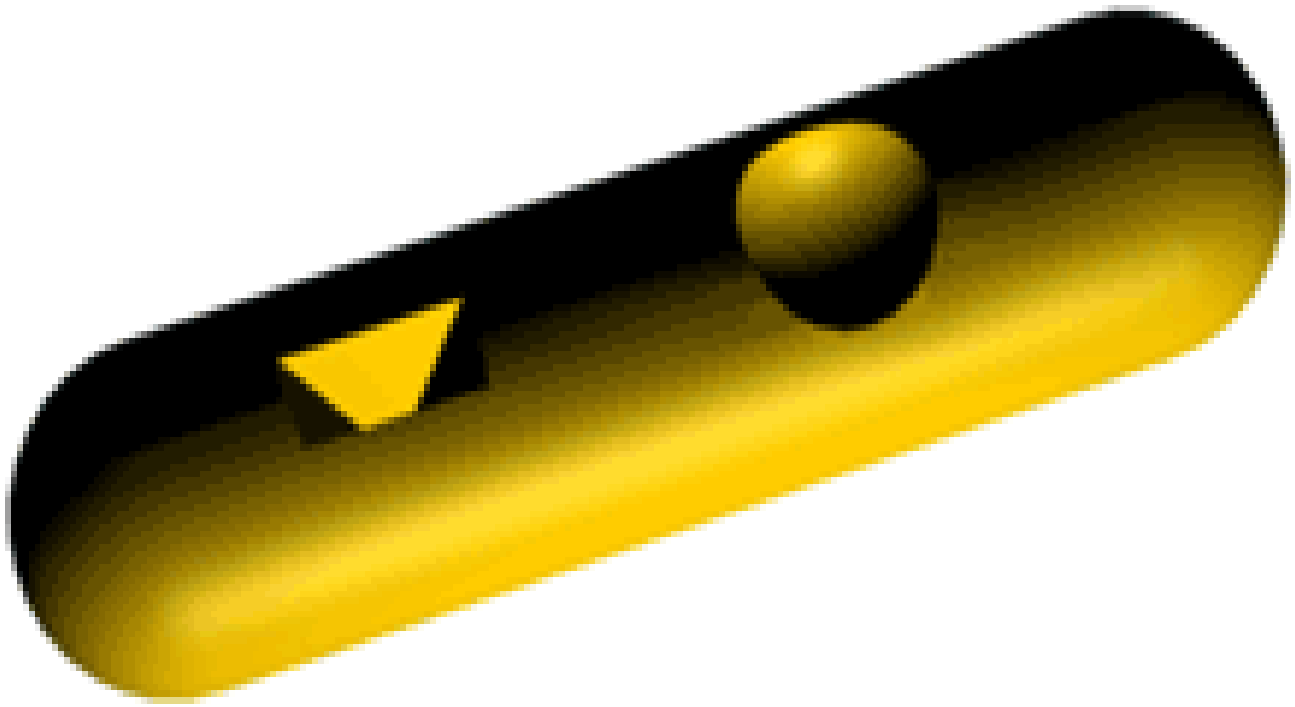
Collagen

Enzymes

- Job: To speed up biochemical reactions
- Shape: Globular with an active site
- E.g. Amylase speeds up the breakdown of starch into maltose.



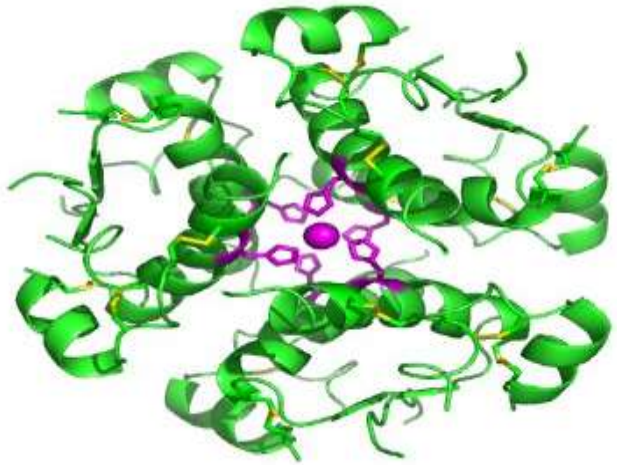
enzyme molecule showing the active site



this is a diagrammatic representation

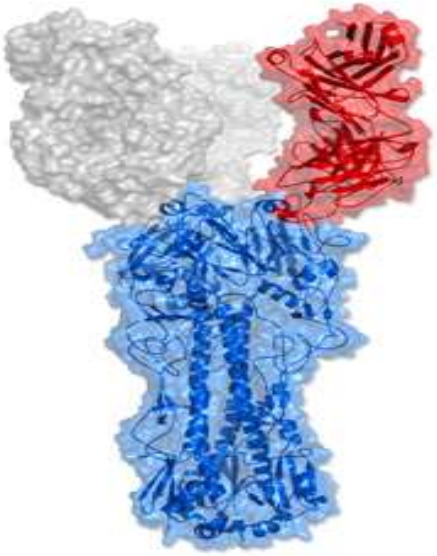
Hormones

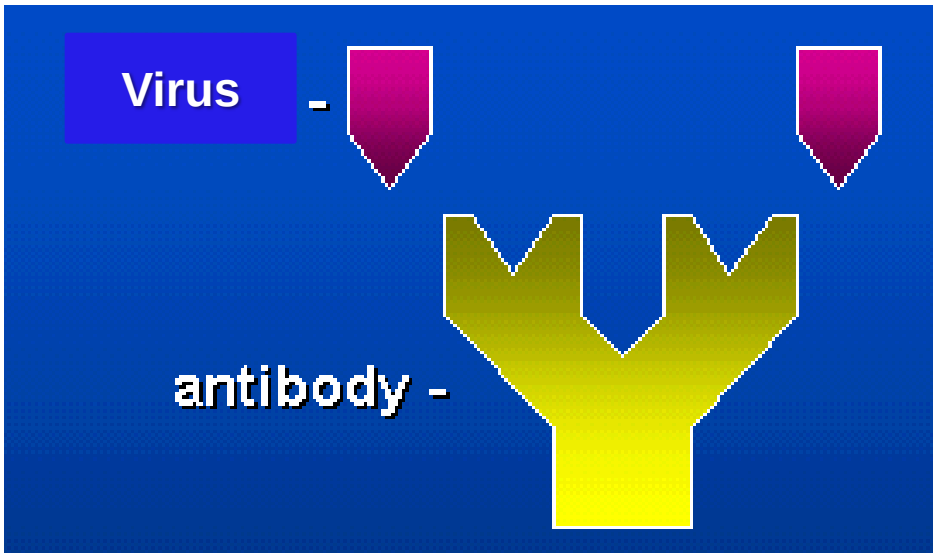
- Job: To chemically regulate growth and metabolism of an organism
- Shape: Globular so they can be transported in the blood
- E.g. Insulin regulates blood sugar levels by converting glucose to glycogen



Antibody

- Job: Fighting viruses
- Shape: Y-shaped (globular) with receptor sites on the ends which bind to viruses and render them harmless.





Proteins play a variety of roles.