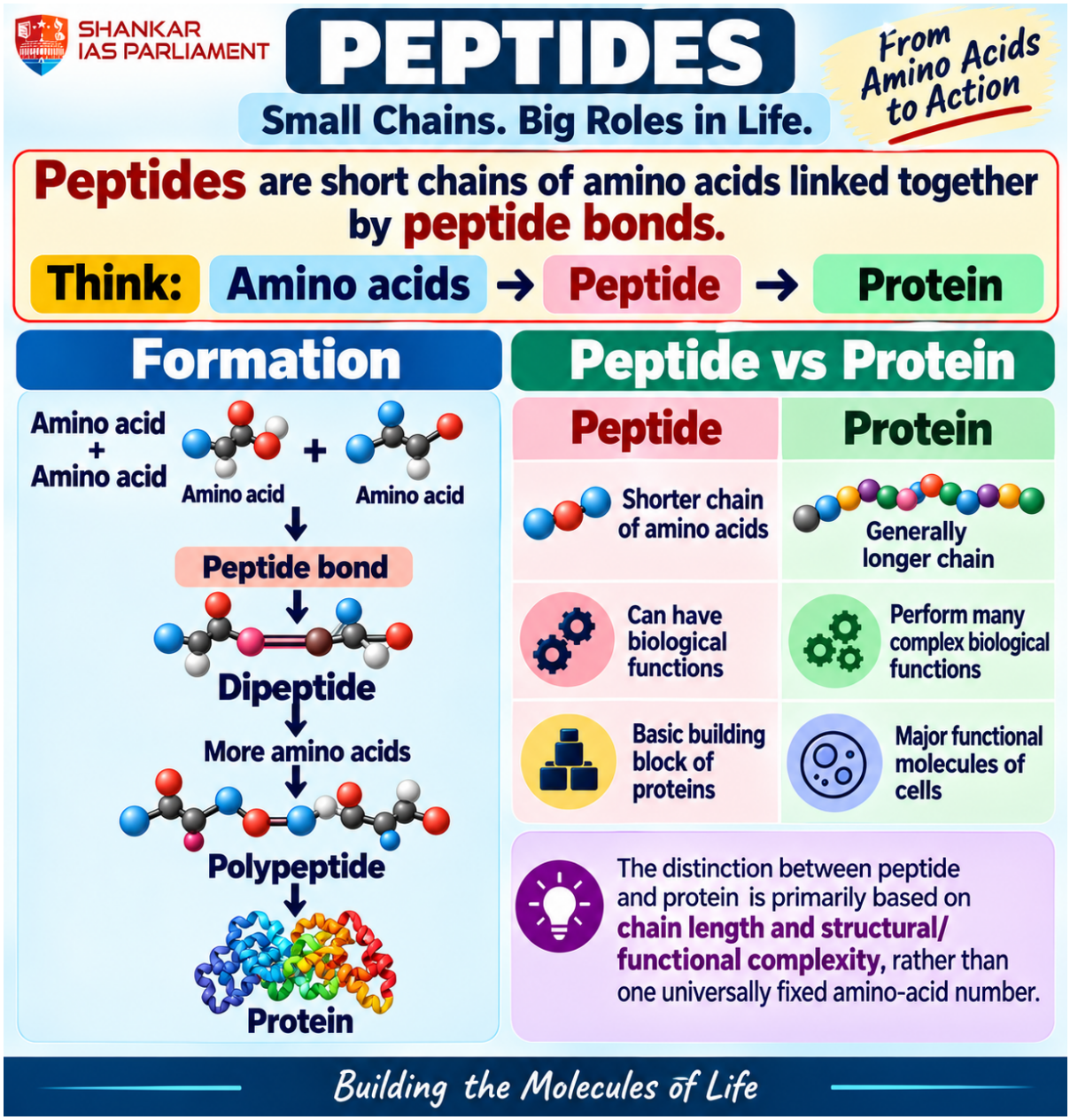
Peptides

Prelims: *Current events of national and international importance | Science & Technology*

Why in News?

A study published in the Proceedings of the National Academy of Sciences (PNAS) reports that specific peptides remain stable in 98% concentrated sulphuric acid.

- **Peptides –** It is a short chain of amino acids linked together by chemical bonds called peptide bonds.
- **Characteristics**
  - Building blocks – Made up of amino acids, the basic units of peptides.
  - Size – Generally contain 2–50 amino acids; longer chains are usually classified as polypeptides/proteins.
  - Formation – The carboxyl group of one amino acid joins the amino group of another.
  - Chemical process – Formation releases a water molecule, called condensation/dehydration synthesis.
- **Functions & Uses**
- **In the Human Body**
  - **Hormonal signalling – It** regulates various biological processes.
  - **Immune defence** – It supports protection against pathogens.
  - **Muscle repair** – It involved in tissue maintenance and repair.
  - **Digestion – C**ertain peptides participate in digestive processes.
  - **For example, insulin** is a peptide hormone that regulates blood glucose levels.
- **Skincare & Wellness**
  - **In skincare, peptides are incorporated into** creams and serums to promote **skin firmness and facilitate repair**.
  - **Supplements –** Some peptide-based products are marketed for **muscle recovery and wellness**, though their effects depend on the specific peptide and product.



- **Previous Scientific Assumptions –** Concentrated sulphuric acid is considered extremely harsh, as it destroys biological molecules and is therefore unlikely to support complex chemical processes.
- **Recent Research Findings –** In 98% concentrated H_2SO_4, certain peptides remain stable for several weeks.
- Peptide bonds are not readily hydrolyzed under these conditions.
- Peptides are able to fold into **specific three-dimensional structures, may potentially facilitate biological functions.**
- **Key finding**
- Peptides were observed to form an **omega-loop structure** in concentrated sulphuric acid.
- Sulphuric acid molecules functioned as a scaffold, stabilizing the peptide structure.
- This mechanism differs from protein folding in aqueous environments, where structures such as **α-helices and β-sheets are typically observed.**
- Peptide stability in concentrated sulphuric acid challenges prior assumptions, suggesting Venus' acid clouds may support complex chemistry and potential life.

Reference

The Hindu | Peptides