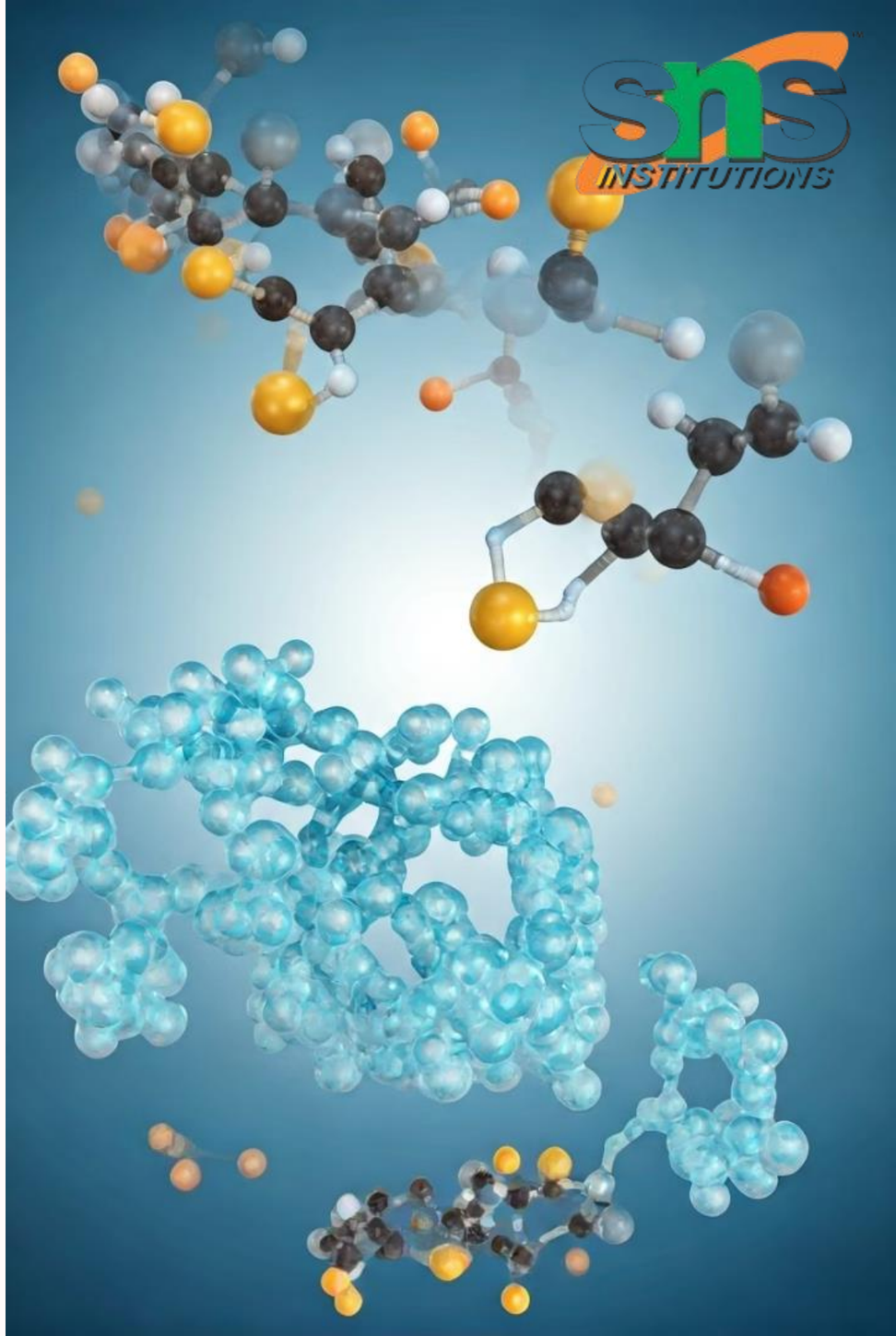
Introduction to Biomolecules

Biomolecules are essential building blocks of all living organisms.

There are four major classes: carbohydrates, lipids, nucleic acids, and proteins.

Their organized structure determines their specific functions.

SS **by SRI VIKRAM S**



Carbohydrates: Energy and Structure

Classification

Monosaccharides, disaccharides, polysaccharides

Chemical Nature

Composed of carbon, hydrogen, and oxygen in (CH2O)n format

Biological Role

Energy source, plant structure, cell signaling

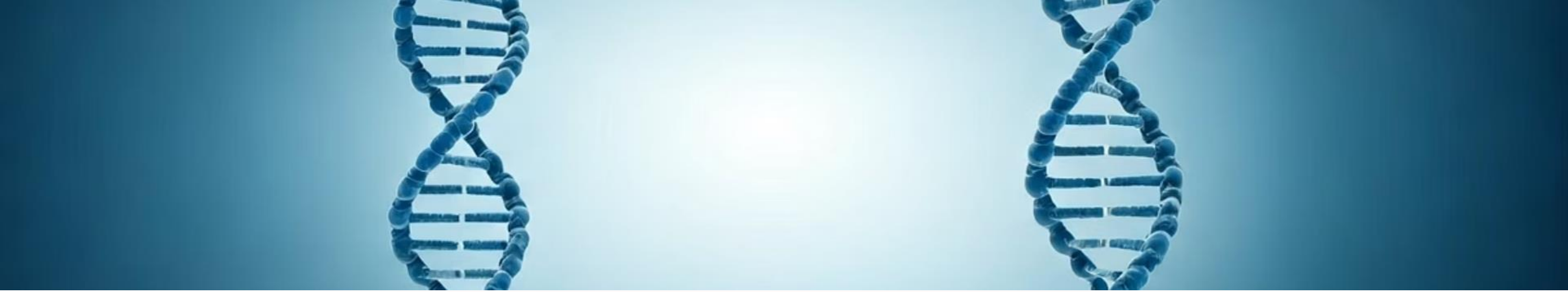
Lipids: Energy Storage and Cell Membranes

Types

- Fats
- Oils
- Phospholipids
- Steroids

Functions

- Long-term energy storage
- Membrane structure
- Hormone production
- Insulation



Nucleic Acids: Information Storage and Transfer

Classification

Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA)

Chemical Structure

Polymers of nucleotides: sugar, phosphate, nitrogenous base

Biological Role

DNA stores, RNA transfers genetic information for protein synthesis

Amino Acids: The Building Blocks of Proteins

Quantity

20 common amino acids in living organisms

Chemical Nature

Central carbon with amino, carboxyl, and variable R groups

Linkages

Peptide bonds connect amino acids into chains

Proteins: Diverse Functions

Enzymes

Catalyze biochemical reactions

Antibodies

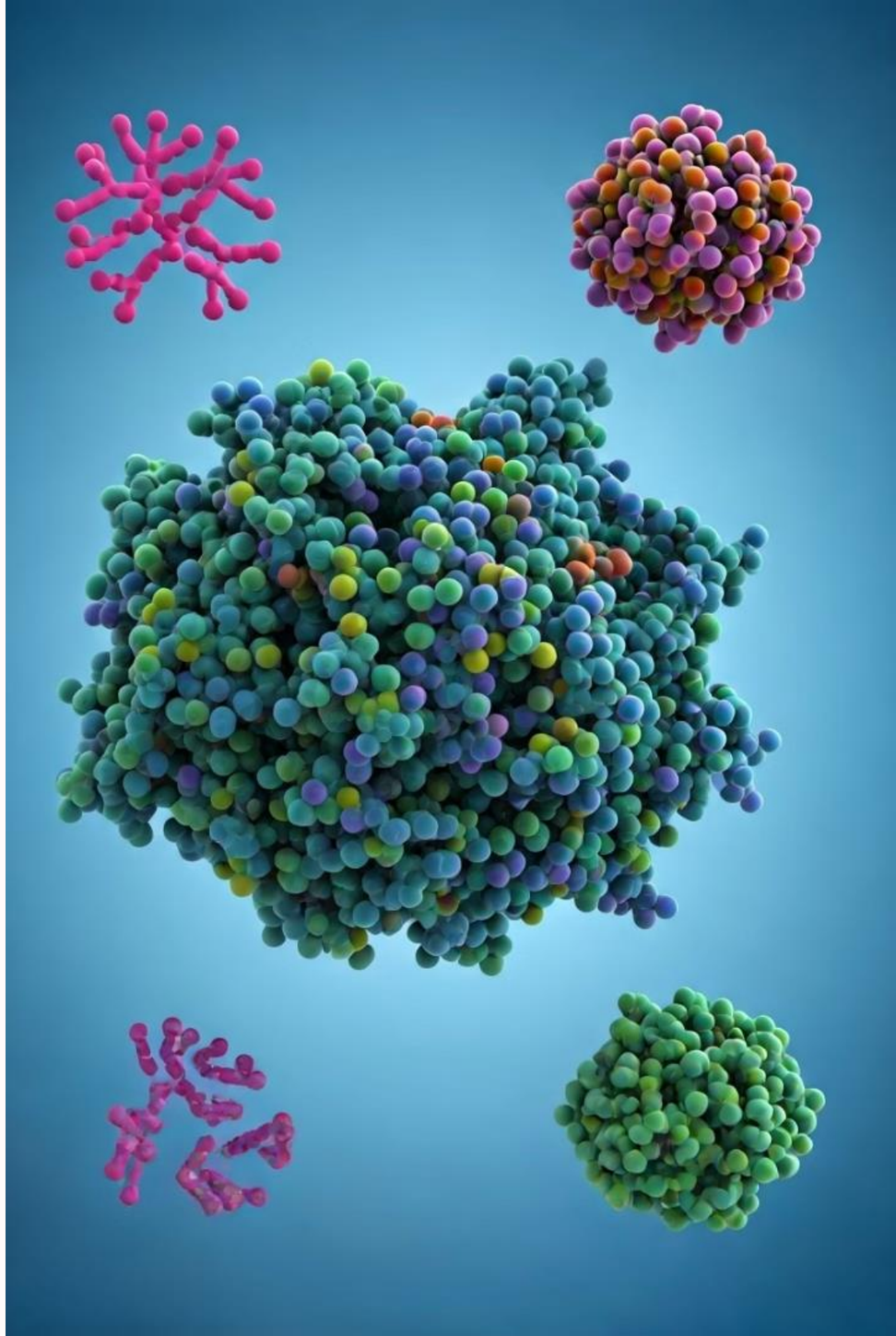
Defend against pathogens

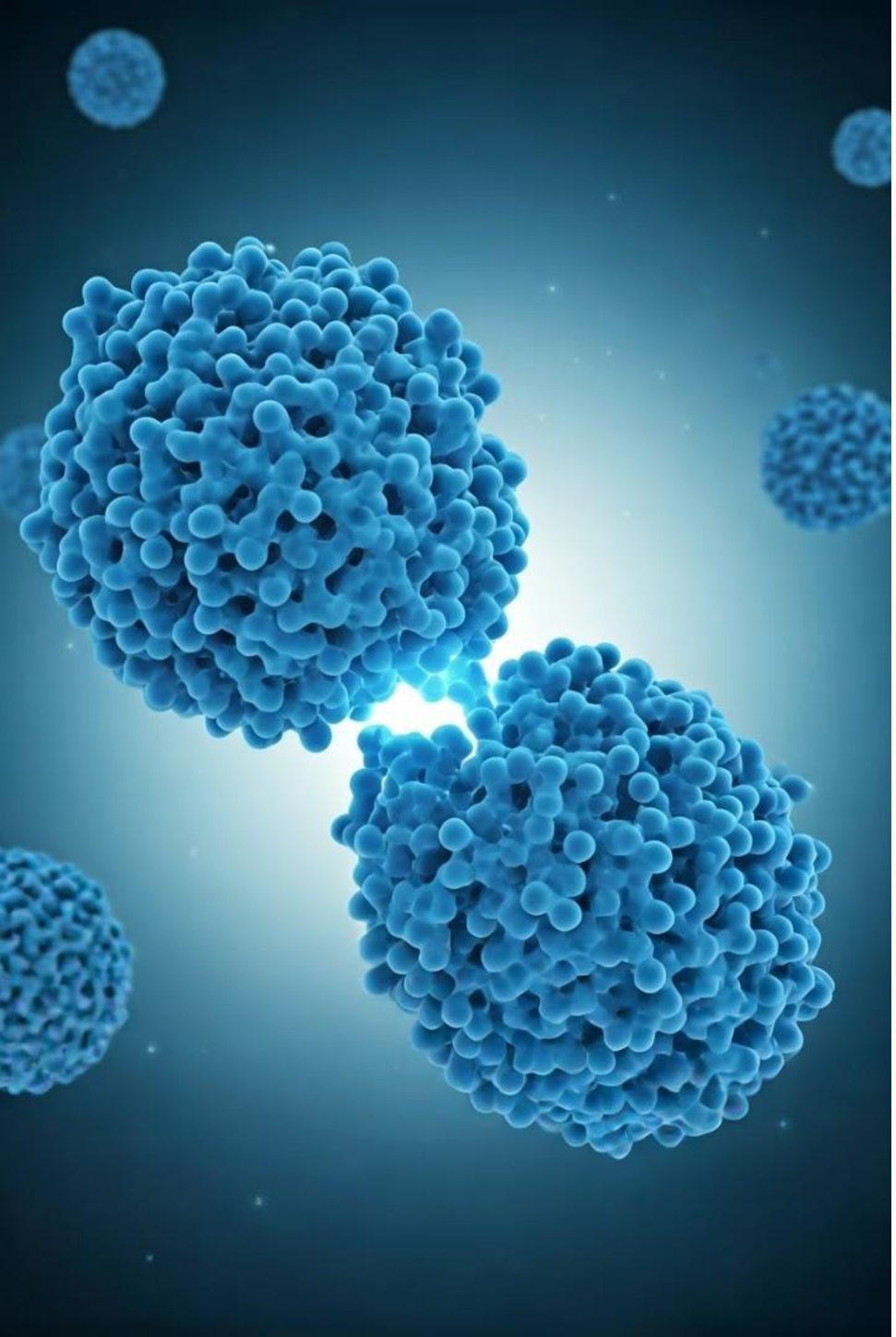
Structural

Provide support like collagen

Transport Proteins

Carry molecules such as oxygen via hemoglobin





Enzyme Function

Specific Catalysts

Each enzyme binds only specific substrates

Lower Activation Energy

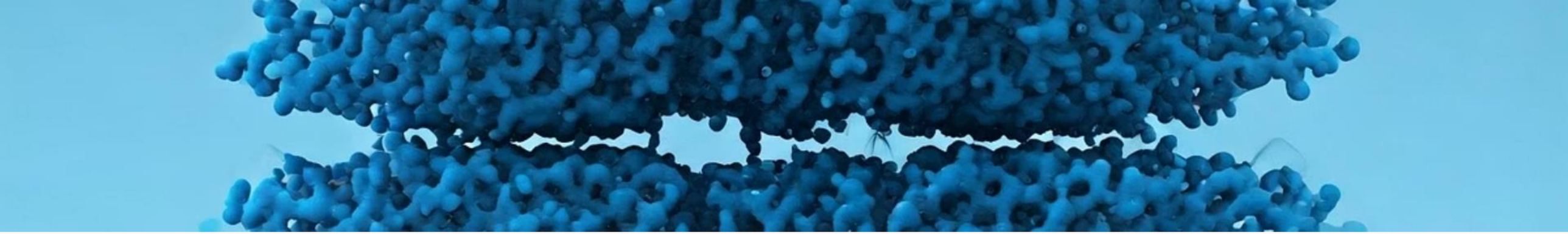
Smooth reaction pathways to speed up reactions

Active Site

Region where substrates bind precisely

Influencing Factors

Temperature, pH, and inhibitors affect activity



Protein Structure: Primary to Quaternary

1
Primary
Linear amino acid sequence

2
Secondary
Alpha helices and beta sheets form

3
Tertiary
3D folding of one polypeptide chain

4
Quaternary
Multiple chains arranged as a complex

Nucleic Acid Structure: DNA vs. RNA

DNA

- Double helix structure
- Deoxyribose sugar
- Thymine base

RNA

- Single-stranded
- Ribose sugar
- Uracil base replaces thymine

Base Pairing

A pairs with T (or U in RNA), C pairs with G

Conclusion: Importance of Biomolecules

Interconnected Roles

Biomolecules work together to sustain life

Crucial Understanding

Knowing biomolecules aids in disease prevention and treatment

Health Impact

Disruptions in biomolecules cause various diseases