

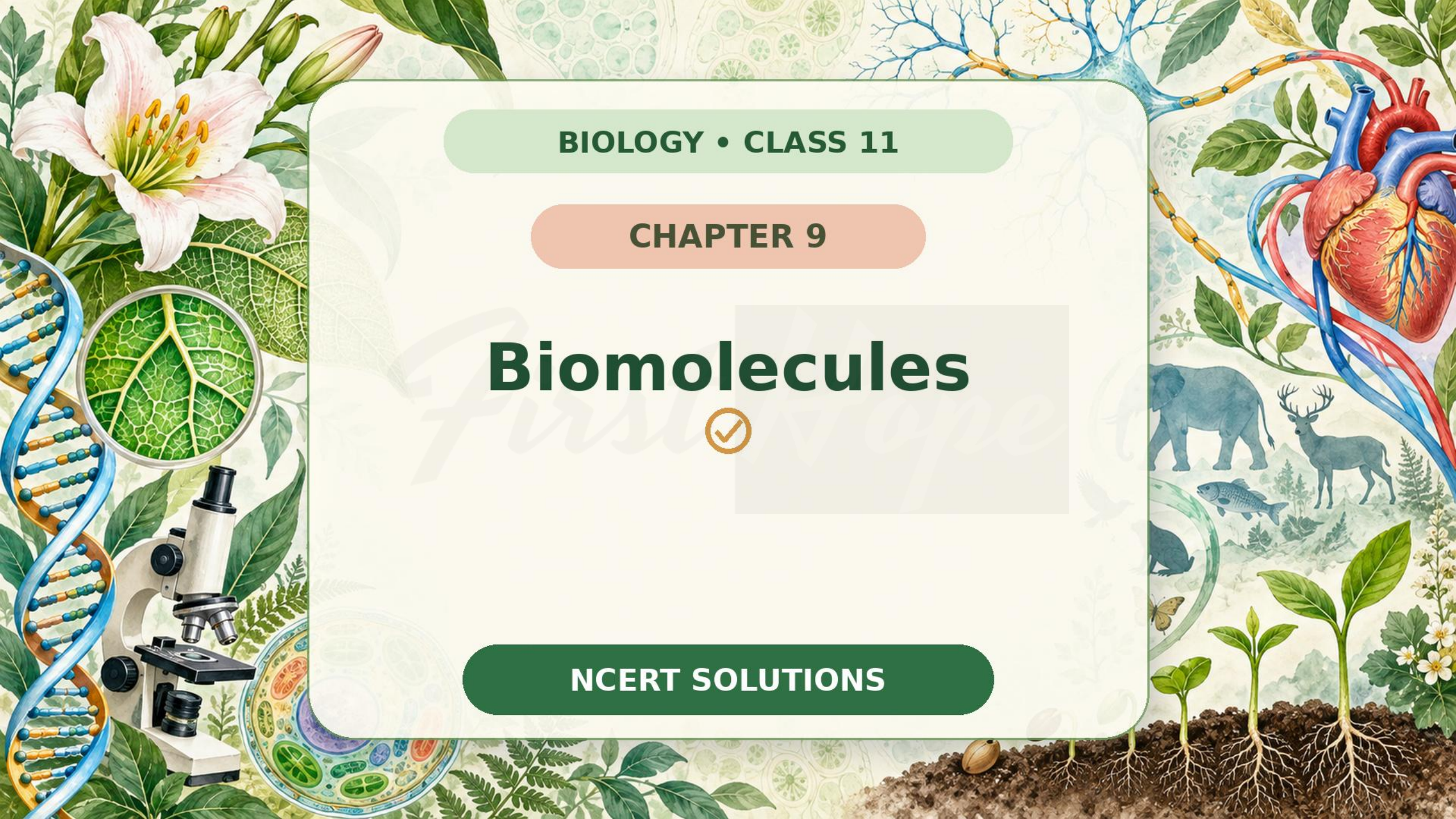
BIOLOGY • CLASS 11

CHAPTER 9

Biomolecules



NCERT SOLUTIONS



EXERCISE SOLUTIONS: QUESTIONS 1-2

1. What are macromolecules? Give examples.

Answer:

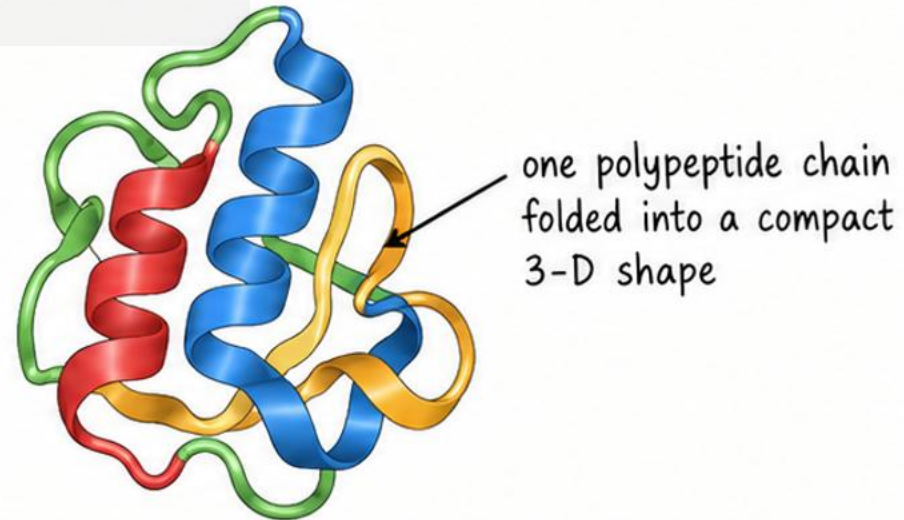
Macromolecules are very large molecules of high molecular mass, generally formed by joining many smaller units. In living cells the main macromolecules are proteins (polypeptides), nucleic acids (DNA and RNA) and polysaccharides such as starch, glycogen and cellulose.

Lipids are not true polymers and usually have lower molecular masses, but they occur in the macromolecular fraction because they are water-insoluble and associated with membranes.

2. What is meant by tertiary structure of proteins?

Answer:

The tertiary structure is the complete three-dimensional folding of one polypeptide chain. It forms when distant parts of the chain come together through interactions among R groups—hydrogen bonds, ionic interactions, hydrophobic interactions, van der Waals forces and disulphide bonds. This shape produces the protein's functional sites and is essential for its activity.



EXERCISE SOLUTION: QUESTION 3 (1–5)

3. Find and write down structures of 10 interesting small molecular weight biomolecules. Find whether any industry manufactures them by isolation and identify the buyers.

Answer:

Biomolecule	Condensed structure	Main industrial route	Main buyers
1. Glucose	$\text{CHO}-(\text{CHOH})_4-\text{CH}_2\text{OH}$ (open-chain)	starch hydrolysis	food, beverage and pharmaceutical industries
2. Fructose	$\text{CH}_2\text{OH}-\text{CO}-(\text{CHOH})_3-\text{CH}_2\text{OH}$ (open-chain)	corn syrup or sucrose processing	food and beverage industries
3. Ribose	$\text{CHO}-(\text{CHOH})_3-\text{CH}_2\text{OH}$ (open-chain)	fermentation or synthesis	pharmaceutical and nutrition industries
4. Glycerol	$\text{HOCH}_2-\text{CHOH}-\text{CH}_2\text{OH}$	fats/oils or biodiesel processing	pharmaceutical, cosmetic and food industries
5. Glycine	$\text{NH}_2-\text{CH}_2-\text{COOH}$	chemical synthesis	pharmaceutical, food and animal-feed industries

Note: Industrial products may be obtained by extraction, hydrolysis, fermentation or synthesis; not all are isolated directly from organisms.

EXERCISE SOLUTION: QUESTION 3 (6-10)

Biomolecule	Condensed structure	Main industrial route	Main buyers
6. Alanine	$\text{CH}_3 - \text{CH}(\text{NH}_2) - \text{COOH}$	microbial fermentation	food and pharmaceutical industries
7. Serine	$\text{HOCH}_2 - \text{CH}(\text{NH}_2) - \text{COOH}$	microbial fermentation	pharmaceutical and cosmetic industries
8. Pyruvic acid	$\text{CH}_3 - \text{CO} - \text{COOH}$	fermentation or synthesis	pharmaceutical, chemical and research users
9. Lactic acid	$\text{CH}_3 - \text{CH}(\text{OH}) - \text{COOH}$	microbial fermentation	food, cosmetic and biodegradable-plastic industries
10. Urea	$\text{H}_2\text{N} - \text{CO} - \text{NH}_2$	$\text{NH}_3 + \text{CO}_2$ under industrial conditions	fertiliser, resin and pharmaceutical industries

Answer: Buyers choose purity grades suited to food, medicine, research or bulk industrial use.

EXERCISE SOLUTION: QUESTION 4

4. Find out and make a list of proteins used as therapeutic agents. Find other applications of proteins (for example, cosmetics).

Answer:

THERAPEUTIC PROTEINS

Protein	Therapeutic use
Insulin	diabetes mellitus
Human growth hormone	growth hormone deficiency
Erythropoietin	some forms of anaemia
Factor VIII	haemophilia A
Interferons	selected viral diseases and cancers
Monoclonal antibodies	selected cancers and autoimmune diseases
Asparaginase	acute lymphoblastic leukaemia

OTHER APPLICATIONS

- Proteases and lipases — detergents
- Amylases and proteases — food processing
- Collagen and keratin — cosmetic and personal-care products
- Gelatin — food, capsules and photographic materials
- Casein — adhesives and coatings
- Enzymes — leather, textile and diagnostic uses

Therapeutic proteins are used only under medical supervision.



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