CHAPTER

9 BIOMOLECULES

CLASS 11TH

NCERT EXERCISE AND SOLUTIONS - BIOLOGY

Q. 1. **What are macromolecules? Give examples.**

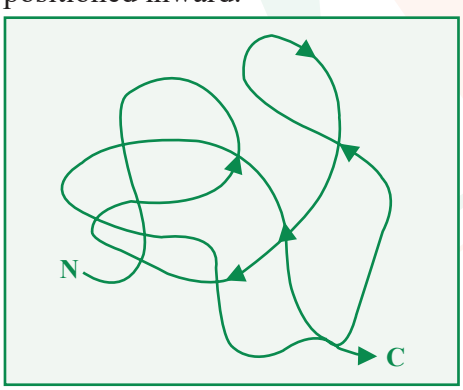
ANSWER:-

Macromolecules are large biomolecules formed by the polymerization of numerous smaller micromolecules, resulting in a high molecular weight. Due to their insoluble nature, micromolecules exist in a colloidal state within intercellular fluid. An example of a macromolecule is protein.

Q. 2. **What is meant by tertiary structure of proteins?**

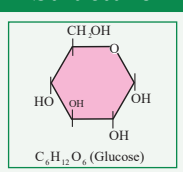
ANSWER:-

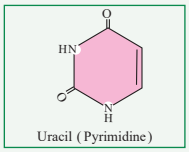
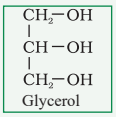
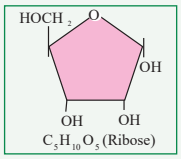
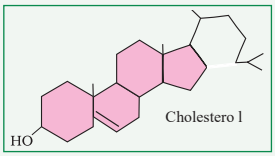
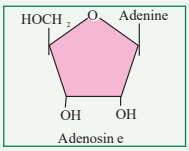
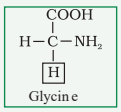
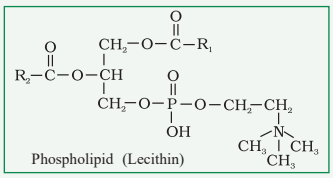
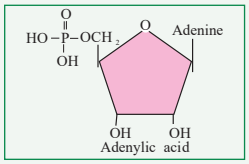
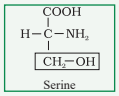
It is a structure formed when secondary coiled polypeptides fold to create a hollow, ball-like shape. The folding arranges the functional side groups on the surface, while the inactive side groups are positioned inward.



Q. 3. **Find and write down structures of 10 interesting small molecular weight biomolecules. Find if there is any industry which manufactures the compounds by isolation. Find out who are the buyers.**

ANSWER:-

Name of Biomolecules	Structure
Glucose	

Uracil	 Uracil (Pyrimidine)
Glycerol	 Glycerol
Ribose	 $C_5H_{10}O_5$ (Ribose)
Cholesterol	 Cholestero l
Adenosine	 Adenosin e
Glycine	 Glycin e
Phospholipid	 Phospholipid (Lecithin)
Adenylic acid	 Adenylic acid
Serine	 Serine

Compound	Manufacturer	Buyer
Starch	Premier starch products private limited	Research institutes and laundries
Liquid Glucose	Imperial liquid glucose	Used in making flavoured drinks and in research
Enzymes like amylase, protease, and cellulase	Planet Biotech India	Used in research

Q. 4. Find out and make a list of proteins used as therapeutic agents. Find other applications of proteins (e.g., Cosmetics etc.)

ANSWER:-

Insulin, Oxytocin, Immunoglobulin, Antidiuretic Hormone (ADH), Thrombin, Fibrinogen, Renin, and Streptokinases.

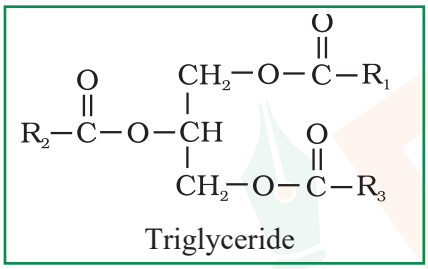
Additional applications include:

- Used as artificial sweeteners, such as Thaumatin, a low-calorie sweetener.
- Proteins are utilized as dietary supplements to support health.
- Employed in creams and shampoos.

Q. 5. Explain the composition of triglyceride.

ANSWER:-

When glycerol reacts with three fatty acids at each of its hydroxyl (OH) groups through ester bonds, it forms a triglyceride.



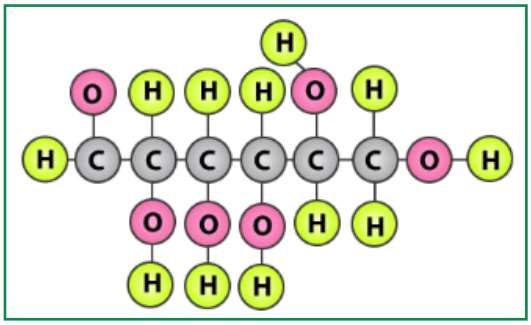
Triglyceride

All three fatty acids of triglyceride in pure fat are similar, while in mixed fat, they are dissimilar.

Q. 6. Can you attempt building models of biomolecules using commercially available atomic models (Ball and Stick models).

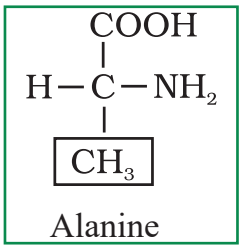
ANSWER:-

Yes, biomolecules can be depicted using the ball and stick model. In this model, the sticks represent the bonds holding the atoms together, while the atoms themselves are shown as balls. The image below illustrates D-glucose, where hydrogen atoms are represented by green balls, oxygen atoms by Black balls, and carbon atoms by grey balls.



Q. 7. **Draw the structure of the amino acid alanine.**

ANSWER:-



Alanine

Q. 8. **What are gums made of? Is Fevicol different?**

ANSWER:-

Gums are heteropolysaccharides composed of various monosaccharide units linked by glycosidic bonds. In contrast, Fevicol differs from gums as it is made from synthetic polymers.

Q. 9. **Find out a qualitative test for proteins, fats and oils, amino acids and test any fruit juice, saliva, sweat and urine for them.**

ANSWER:-

Here are qualitative tests for proteins, fats and oils, and amino acids:

1. **Test for Proteins:**

   Biuret Test:

   - Add a few drops of sodium hydroxide (NaOH) solution to the sample (e.g., fruit juice, saliva, sweat, or urine).
   - Add a few drops of copper sulphate ($CuSO_4$) solution.
   - If proteins are present, the solution will change to a violet or purple color.

2. **Test for Fats and Oils:**

   Sudan III Test (for Lipids):

   - Take a small amount of the sample and add a few drops of Sudan III stain (fat-soluble dye).
   - Shake well.
   - If fats and oils are present, the sample will turn red or orange due to the dye dissolving in the fat.

3. **Test for Amino Acids:**

   Ninhydrin Test:

   - Add a few drops of Ninhydrin reagent to the sample.
   - Heat gently.
   - If amino acids are present, a purple or blue color will develop.

Application on Samples:

- **Fruit Juice:** Perform the tests on fruit juice by adding appropriate reagents to small samples of the juice.
- **Saliva, Sweat, and Urine:** Similarly, use small amounts of these fluids for each of the tests above to check for the presence of proteins, fats, and amino acids.

By conducting these tests, you can qualitatively determine the presence of proteins, fats, and amino acids in the samples.

Q. 10. Find out how much cellulose is made by all the plants in the biosphere and compare it with how much of paper is manufactured by man and hence what is the consumption of plant material by man annually. What a loss of vegetation!

ANSWER:-

The biosphere generates around 100 billion tonnes of cellulose from a total of 170 billion tonnes of organic matter. The production of paper alone uses approximately 0.5 billion tonnes of wood. Trees also serve other purposes, such as providing food, medicine, timber, and spices. An estimated 1.5 billion tonnes of food is required, and the wood needed for various uses amounts to 2 billion tonnes. Consequently, determining the annual consumption of plant material by humans is challenging. As a result, the extensive use of cellulose has contributed significantly to the depletion of vegetation.

Q. 11. Describe the important properties of enzymes.

ANSWER:-

Enzymes are primarily proteins with the following key characteristics:

- They are complex macromolecules with a high molecular weight.
- They catalyse biochemical reactions in cells, helping break down large molecules into smaller ones or combining smaller molecules to form larger ones.
- Enzymes do not initiate reactions but speed them up.
- They influence the rate of biochemical reactions without altering the direction of the reaction.
- Enzymes are specific to their actions.
- A higher turnover of enzymes enhances reaction efficiency, with most enzymes having a high turnover number.
- Enzymes are sensitive to temperature, with activity decreasing as the temperature rises. Maximum activity occurs at 30-40°C.
- Maximum enzyme activity is typically observed at a pH level of 6-8.
- As substrate concentration increases, enzymatic velocity rises until it reaches its maximum velocity.