Class 9th Biology — Unit 6

Biomolecules

Complete Study Booklet

✓ 36 Solved MCQs with Answer Key

✓ Descriptive (Long) Questions & Answers

✓ Short Answer Questions

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Part 1 — Multiple Choice Questions

1. What is the primary function of carbohydrates?

(A) ✓ Provide energy

(B) Act as enzymes

(C) Regulate processes

(D) Make membranes

2. How will you differentiate between monosaccharides and polysaccharides?

(A) ✓ Monosaccharides are single sugars

(B) Polysaccharides are sweet in taste

(C) Monosaccharides are present in plant cell wall

(D) Polysaccharides dissolve easily

3. What is true about cellulose?

(A) It is sweet in taste

(B) It is digestible by the human digestive system

(C) ✓ It provides structural support in plants

(D) It is soluble in water

4. Which of the following proteins is involved in oxygen transport?

(A) Insulin

(B) ✓ Hemoglobin

(C) Collagen

(D) Keratin

5. Which component of an amino acid determines its unique properties?

(A) Amino group

(B) Carboxyl group

(C) ✓ R group (side chain)

(D) Hydrogen group

6. Which proteins are involved in defense against pathogens?

(A) ✓ Antibodies

(B) Myosin

(C) Fibrinogen

(D) Keratin

7. Which of the following is the structural unit of lipids?

(A) Amino acid

(B) ✓ Fatty acids and glycerol

(C) Nucleotides

(D) Simple sugars

8. How do unsaturated fatty acids differ from saturated fatty acids?

(A) ✓ They contain double bonds in their hydrocarbon chains

(B) They have more hydrogen atoms

(C) They are solid at room temperature

(D) They are found only in animal fats

9. Which of the following is NOT a function of proteins?

(A) Transport oxygen in the blood

(B) ✓ Carry genetic information

(C) Help in digesting food

(D) Fight against pathogens

10. Which components make up a nucleotide?

(A) ✓ Sugar, phosphate, nitrogenous base

(B) Amino acid, sugar, nitrogenous base

(C) Fatty acid, phosphate, nitrogenous base

(D) Protein, sugar, nitrogenous base

11. Which nitrogenous base is found in RNA but not in DNA?

(A) Adenine

(B) Thymine

(C) ✓ Uracil

(D) Guanine

Additional Multiple-Choice Questions — Biomolecules

12. Biomolecules make up what percentage of the dry mass of living organisms?

(A) 73%

(B) 53%

(C) ✓ 93%

(D) 43%

13. Which of the disaccharides is also called transport sugar?

(A) ✓ Sucrose

(B) Maltose

(C) Fructose

(D) Lactose

14. Which is NOT a function of carbohydrates?

(A) Providing energy

(B) Serving as building blocks for complex carbohydrates

(C) ✓ Forming the primary structure of cell membranes

(D) Breaking down into glucose

15. Percentage of carbohydrates in dry mass of protoplasm:

(A) 93%

(B) 7%

(C) ✓ 15%

(D) 50%

16. Most abundant carbohydrate is:

(A) Glucose

(B) Starch

(C) ✓ Cellulose

(D) Chitin

17. Different amino acids differ from each other on the basis of their group:

(A) ✓ Alkyl (R group)

(B) Carboxylic

(C) Amino

(D) Phosphate

18. Percentage of protein in dry mass of protoplasm:

(A) 18%

(B) 15%

(C) ✓ 50%

(D) 10%

19. How many types of amino acids make proteins?

(A) 170

(B) ✓ 20

(C) 40

(D) 57

20. Proteins present in muscle cells:

(A) Fibrin

(B) Actin

(C) Myosin

(D) ✓ Both b and c

21. Most abundant biomolecule in a cell is:

(A) Carbohydrates

(B) ✓ Proteins

(C) Lipids

(D) Nucleic acids

22. Number of amino acids present in insulin:

(A) 574

(B) 95

(C) ✓ 51

(D) 47

23. The amount of energy obtained from one gram of fat is:

(A) 5 Kcal/g

(B) ✓ 9 Kcal/g

(C) 13 Kcal/g

(D) 17 Kcal/g

24. Percentage of lipids in dry mass of protoplasm:

(A) ✓ 10%

(B) 15%

(C) 50%

(D) 18%

25. During translation, the sequence of amino acids in the protein is decided on the basis of the sequence of nucleotides in:

(A) tRNA

(B) rRNA

(C) ✓ mRNA

(D) DNA

26. Both strands of DNA are held together by hydrogen bonds between:

(A) ✓ Adenine and thymine

(B) Cytosine and guanine

(C) Cytosine and thymine

(D) Adenine and guanine

27. Transcription takes place in the:

(A) Cytoplasm

(B) ✓ Nucleus

(C) Ribosomes

(D) Rough endoplasmic reticulum

28. All the nucleotides of RNA differ from the nucleotides of DNA in having different:

(A) Nitrogen base

(B) ✓ Pentose sugar and nitrogen base

(C) Phosphate group

(D) Carboxylic group

29. The type of RNA that brings amino acids to the ribosome is:

(A) snRNA

(B) ✓ tRNA

(C) rRNA

(D) mRNA

30. Genes are short segments of:

(A) Protein

(B) Carbohydrates

(C) ✓ DNA

(D) Lipids

31. Which of the following statements regarding genes is FALSE?

(A) Genes are located on chromosomes

(B) ✓ Genes consist of a long sequence of DNA

(C) A gene contains information for the production of a protein

(D) Each cell contains a single copy of every gene

32. Genes contain instructions for the synthesis of:

(A) Fats

(B) Carbohydrates

(C) Vitamins

(D) ✓ Proteins

33. Polynucleotide strands present in a DNA molecule are:

(A) ✓ 2

(B) 3

(C) 4

(D) 5

34. This is the hereditary material:

(A) ✓ DNA

(B) RNA

(C) tRNA

(D) rRNA

35. Percentage of nucleic acids in dry mass of protoplasm:

(A) 7%

(B) 90%

(C) 10%

(D) ✓ 18%

36. Essential part of nucleic acids are:

(A) ✓ Pentoses

(B) Heptoses

(C) Hexoses

(D) Trioses

Answer Key — MCQs

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	**A**	9	**B**	17	**A**	25	**C**	33	**A**
2	**A**	10	**A**	18	**C**	26	**A**	34	**A**
3	**C**	11	**C**	19	**B**	27	**B**	35	**D**
4	**B**	12	**C**	20	**D**	28	**B**	36	**A**
5	**C**	13	**A**	21	**B**	29	**B**		
6	**A**	14	**C**	22	**C**	30	**C**		
7	**B**	15	**C**	23	**B**	31	**B**		
8	**A**	16	**C**	24	**A**	32	**D**		

Part 2 — Descriptive Questions

Q.1 How would you define biochemistry and molecular biology?

Biochemistry: Biochemistry is the study of the chemical processes that occur within living organisms (e.g., photosynthesis, cellular respiration).

Molecular Biology: Molecular biology is the study of the structure and function of biomolecules (e.g., carbohydrates, proteins, nucleic acids).

Q.2 Define biological molecules. Explain in detail the major organic biomolecules, their location in the cell and main functions.

Definition: The molecules produced by organisms are called biomolecules or biological molecules. They include carbohydrates, lipids, proteins, and nucleic acids (DNA and RNA). They are mostly large in size and are called macromolecules.

Table 6.1: Major Biomolecules and their Function

Biomolecule	Location in the Cell & Main Functions
Carbohydrates	*Location:* Cytoplasm, cell membrane. *Functions:* act as a source of energy; act as energy storage molecules.
Proteins	*Location:* Cell membrane, cytoplasm, endoplasmic reticulum, Golgi apparatus. *Functions:* many proteins act as enzymes; some hormones are proteins; make membranes and many other cell structures; control cellular traffic.
Lipids	*Location:* Cell membrane, cytoplasm. *Functions:* act as energy storage molecules; act as heat insulators; make the structure of the cell membrane.
DNA (Deoxyribonucleic Acid)	*Location:* Nucleus (eukaryotes), nucleoid region (prokaryotes), mitochondria, chloroplasts. *Function:* carries genetic information for the development, functioning and characteristics of the organism.
RNA (Ribonucleic Acid)	*Location:* Nucleus, ribosomes, cytoplasm. *Function:* carries genetic information from DNA to the ribosomes for protein synthesis.

Percentage Composition of Biomolecules in Protoplasm: Biomolecules make up 93% of the dry mass of protoplasm. The remaining 7% of dry mass comprises vitamins and inorganic substances like carbon dioxide, acids, bases and salts.

Table 6.2: Percentage of Biomolecules in the Dry Mass of Protoplasm

Biomolecule	% Dry Mass
Proteins	50%
Nucleic Acids	18%
Carbohydrates	15%

Biomolecule	% Dry Mass
Lipids	10%

Q.3 What is metabolism? Enlist its types.

Metabolism: The sum of all the chemical reactions that occur in an organism is collectively called metabolism.

- **Anabolism:** The type of metabolism in which simpler substances are combined to form complex substances. Energy is used in these reactions. *Example: photosynthesis.*
- **Catabolism:** The type of metabolism in which complex molecules are broken down into simpler ones. Energy is released in these reactions. *Example: respiration.*

Q.4 Write a comprehensive note on the structure and roles of the three classes of carbohydrates.

Introduction: Carbohydrate means hydrated carbons. They are organic compounds in which the ratio of H and O is 2:1 (same as in water). They are also known as "saccharides" (meaning sugar).

General Formula: They have the general formula $(CH_2O)_n$, where *n* is the number of carbon atoms, ranging from 3 to many thousands.

Classes of Carbohydrates: There are three classes of carbohydrates: monosaccharides, disaccharides, and polysaccharides.

- **1. Monosaccharides** (simple sugars) are made of a single sugar molecule. They are easily soluble in water and have a sweet taste. They may have 3 to 7 carbon atoms; pentoses (5C) and hexoses (6C) are most common. *Examples:* ribose ($C_5H_{10}O_5$) and deoxyribose ($C_5H_{10}O_4$) are pentoses; glucose, fructose and galactose ($C_6H_{12}O_6$) are hexoses.
- **2. Disaccharides** are made of two monosaccharide units. They are less soluble in water and less sweet in taste. *Examples:* sucrose (table sugar) is made of glucose + fructose; maltose is made of two glucose molecules.
- **3. Polysaccharides** are large molecules composed of hundreds to thousands of monosaccharide units. They are insoluble in water and tasteless — the most abundant carbohydrates in nature. *Examples:* **Starch** — a storage polysaccharide found in plants, composed of glucose units. **Glycogen** — the animal starch, mainly stored in the liver and muscles; broken down into glucose when energy is needed. **Cellulose** — a polysaccharide of glucose units found in plant cell walls. **Chitin** — a modified form of cellulose found in the exoskeletons of crabs, lobsters and insects, and in the cell walls of fungi.

Sources of Carbohydrates

Type	Sources
Monosaccharides	Glucose, fructose and galactose are found in fruits, vegetables, honey and cereals.
Disaccharides	Sucrose is found in sugar beet, sugar cane and fruits. Lactose is found in milk and dairy products. Maltose is found in cereals.
Polysaccharides	Starch is found in cereal crops — wheat, barley, maize, rice, etc.

Functions of Carbohydrates:

1. Carbohydrates are the primary source of energy. Glucose is used by cells to produce energy through cellular respiration.
2. Dietary fiber contains undigestible carbohydrates, e.g., cellulose. It helps maintain proper bowel movements.
3. Pentoses (ribose and deoxyribose) are essential parts of nucleic acids (RNA and DNA respectively).
4. Plants convert their monosaccharides to disaccharides like sucrose to transport monosaccharides between body parts.
5. Cellulose is the most abundant carbohydrate; it provides support to plant cells and ultimately to the whole plant.
6. Chitin is a polysaccharide found in the exoskeleton of insects and in the cell walls of fungi, providing them strength and support.

Q.5 What are proteins? Describe their structure, sources and functions.

Introduction: Proteins are the most abundant biomolecules in the cell. They are defined as polymers of amino acids and are important for the structure of cells.

a) Monomers of Proteins: Proteins are made up of monomers called amino acids. Different proteins contain different numbers of amino acids — for example, insulin has 51 amino acids and hemoglobin has 574 amino acids.

b) Nature of Amino Acids: Amino acids are organic molecules that join in a specific number and sequence to make proteins.

c) Types of Amino Acids: About 170 types of amino acids occur in organisms; however, 20 types participate in making most proteins.

d) Essential Amino Acids: There are 9 amino acids that cannot be synthesized by our body and must be supplied by food.

e) Non-essential Amino Acids: There are 11 amino acids that can be synthesized in our body.

f) Chemical Composition of Amino Acids: An amino acid is an organic molecule made of an amino group (NH_2), a carboxyl group (COOH), a hydrogen atom (H), and a side group (R), all attached to a central carbon atom.

General structure of an amino acid

```
        H
        |
H2N — C — COOH
        |
        R
```

Glycine (R = H)

```
        H
        |
H2N — C — COOH
        |
        H
```

Alanine (R = CH3)

```
        H
        |
H2N — C — COOH
        |
        CH3
```

Different amino acids contain different R groups. For example, in glycine the R group is H, and in alanine the R group is CH_3.

Sources: Good sources of protein include meat (mutton, chicken), fish, eggs, milk, pulses and beans.

Functions of Proteins:

1. Proteins are an important part of all cell membranes.
2. Some proteins, e.g., collagen and keratin, make up almost the whole structure of cartilage, hair and nails.
3. Enzymes are proteins that catalyse all biochemical reactions occurring in organisms.
4. Some proteins are hormones; they regulate body processes.
5. Hemoglobin transports oxygen in the blood.
6. Actin and myosin proteins are the main components of muscle cells, responsible for muscular contractions.
7. Fibrin is a blood-clotting protein that makes blood clot to prevent loss of blood after an injury.
8. Some proteins, called antibodies (part of the immune system), defend the body against harmful pathogens.

Q.6 What are lipids? Describe their chemical composition, structure, sources and role.

Introduction: Lipids are organic compounds that are insoluble in water but soluble in organic solvents (e.g., alcohol, ether and benzene).

Chemical Composition: Lipids are composed of glycerol and fatty acids.

a) Glycerol is an alcohol with 3 carbon atoms; each carbon has a hydroxyl group.

Glycerol

```
        H
        |
H — C — OH
        |
H — C — OH
        |
H — C — OH
        |
        H
```

b) Fatty acids are long hydrocarbon chains with a carboxyl group (COOH) at the end.

Types of Fatty Acids:

1. **Saturated Fatty Acids** have internal carbon atoms bonded with the maximum number of hydrogen atoms; no double bonds between carbon atoms. Solid at room temperature. *Example: fats.*
2. **Unsaturated Fatty Acids** have one or more double bonds between carbon atoms. Liquid at room temperature. *Example: oils.*

Saturated fatty acid

```
                                                                    O
                                                                    ||
CH3–CH2–CH2–CH2–CH2–CH2–CH2–CH2–C–OH
```

Unsaturated fatty acid

```
                                                O
                                                ||
CH3–CH2–CH=CH–CH2–CH2–CH2–CH2–C–OH
```

Main Groups of Lipids:

- **1. Fats and Oils** — the most familiar lipids; contain one glycerol and three fatty acids. Fats contain saturated fatty acids and are solid at room temperature (e.g., animal fats). Oils contain unsaturated fatty acids and are liquid at room temperature (e.g., olive oil, corn oil, coconut oil).
- **2. Phospholipids** — make the core of all membranes. A phospholipid molecule consists of one glycerol, two fatty acids and a phosphate group.

Sources: Sources of lipids from animals are meat and dairy products; sources from plants are nuts, seeds and olive oil. Plants synthesize oils and store them in seeds, such as sunflower oil, coconut oil and corn oil.

Functions of Lipids:

1. Lipids are the most energy-rich biomolecules; they serve as a long-term energy reserve in the form of fats in adipose tissue. When the body requires energy, stored lipids are broken down to release fatty acids and glycerol, used as fuel.
2. Lipids are essential components of cell membranes.
3. Lipids act as insulators and protect vital organs — e.g., adipose tissue around organs provides cushioning and heat insulation.
4. Some lipids help in the synthesis of hormones; steroid hormones are derived from a lipid, cholesterol.
5. Lipids help in the absorption of fat-soluble vitamins (A, D, E and K) in the digestive system.

Q.7 Write a note on nucleic acids.

Introduction: Nucleic acids are biomolecules composed of units called nucleotides. A nucleotide is made up of three components: (1) a pentose sugar (ribose or deoxyribose), (2) a nitrogenous base, and (3) a phosphate group (PO_4).

Types of Nucleic Acids: There are two types — DNA and RNA.

1. Deoxyribonucleic Acid (DNA): DNA is made of deoxyribonucleotides. In this nucleotide, the pentose sugar is deoxyribose, while the nitrogenous base may be adenine (A), thymine (T), cytosine (C), or guanine (G).

Double Helix Model of DNA: In 1953, US biologist James Watson and British biologist Francis Crick proposed the double helix model of DNA. According to this model:

- DNA is a double helix molecule, made of two strands of nucleotides.
- Both strands are coiled around each other.
- The nitrogenous base of one strand makes hydrogen bonds with the nitrogenous base of the opposite strand.

- The pairing of nitrogenous bases is specific: adenine of one strand pairs with thymine of the opposing strand, and cytosine pairs with guanine.
- There are two hydrogen bonds between adenine and thymine, and three hydrogen bonds between cytosine and guanine.

Function of DNA:

- **Hereditary Information:** DNA contains hereditary information in the form of a sequence of nucleotides, which determines the order of amino acids during protein synthesis.
- **Gene:** The segment of DNA in which the sequence of nucleotides determines the synthesis of a protein is called a gene. During reproduction, DNA is passed from one generation to the next, carrying hereditary information forward.

2. Ribonucleic Acid (RNA): RNA is a single-stranded molecule composed of ribonucleotides. A ribonucleotide contains ribose sugar instead of deoxyribose, and its nitrogenous base may be adenine (A), uracil (U), cytosine (C), or guanine (G).

Types of RNA:

- **Messenger RNA (mRNA):** Carries the genetic information from DNA to the ribosomes during protein synthesis.
- **Transfer RNA (tRNA):** Transfers specific amino acids to the ribosomes, ensuring the correct sequence during protein synthesis.
- **Ribosomal RNA (rRNA):** Constitutes the structural and functional components of ribosomes, the cellular machinery for protein synthesis.

Q.8 Explain how the information in DNA is converted to information in RNA and then into proteins.

Introduction: The DNA molecule in a chromosome consists of thousands of nucleotides. Along its length are specific segments called genes; each gene consists of a specific sequence of nucleotides that carries information for the synthesis of a specific protein.

Gene Expression (Central Dogma):

- **i. Transcription:** During the working of a gene, the specific sequence of DNA nucleotides is copied in the form of messenger RNA (mRNA). This process is called transcription.
- **ii. Translation:** The mRNA carries the sequence of its nucleotides to the ribosome. The ribosome reads this sequence and joins specific amino acids accordingly to form a protein. This step is known as translation.

Part 3 — Short Answer Questions

Q.1 What are the main functions of carbohydrates in the body?

- Carbohydrates are the primary source of energy. Glucose is used by cells to produce energy through cellular respiration.
- Dietary fiber contains undigestible carbohydrates, e.g., cellulose. It helps maintain proper bowel movements.
- Pentoses (ribose and deoxyribose) are essential parts of nucleic acids (RNA and DNA respectively).
- Plants convert their monosaccharides to disaccharides like sucrose to transport monosaccharides between body parts.
- Cellulose provides support to plant cells and ultimately to the whole plant.
- Chitin is a polysaccharide that provides strength and support to insects.

Q.2 How do the three groups of carbohydrates differ in taste?

Monosaccharides have a sweet taste; disaccharides are less sweet; polysaccharides are tasteless. So sweetness decreases as the complexity of carbohydrates increases.

Q.3 Name two common monosaccharides and two disaccharides.

1. **Monosaccharides:** Glucose and fructose are common monosaccharides (hexoses). Ribose and deoxyribose are common pentoses.
2. **Disaccharides:** Sucrose and maltose are common disaccharides.

Q.4 Which monosaccharides make a sucrose molecule?

Sucrose (table sugar) is made of two monosaccharides, i.e., glucose and fructose.

Q.5 Give an example of a storage polysaccharide in plants.

Starch is a storage polysaccharide found in plants. It is composed of glucose units and exists in two forms: amylose and amylopectin.

Q.6 Define amino acid and draw its structure.

Proteins are made up of monomers called amino acids. Different proteins contain different numbers of amino acids. *Example:* insulin has 51 amino acids and hemoglobin has 574 amino acids.

Structure: An amino acid is an organic molecule made of an amino group ($–NH_2$), a carboxyl group (–COOH), a hydrogen atom (–H), and a side chain (R), attached to a central carbon atom.

```
        H
        |
H2N — C — COOH
        |
        R
```

Q.7 What are the basic components of lipids? Draw their structure.

Lipids are composed of glycerol and fatty acids.

1. **Glycerol** is an alcohol having three carbons; each carbon has a hydroxyl group (–OH).
2. **Fatty acids** are long hydrocarbon chains with a carboxyl group (–COOH) at the end. Fatty acids may be saturated or unsaturated.

Glycerol

```
CH2OH
  |
CHOH
  |
CH2OH
```

Saturated fatty acid

```
CH3–(CH2)14–COOH
```

Unsaturated fatty acid

```
CH3–(CH2)7–CH=CH–(CH2)7–COOH
```

Q.8 What are the types of RNA? Write their functions.

- **Messenger RNA (mRNA):** Carries the genetic information from DNA to the ribosomes during protein synthesis.
- **Transfer RNA (tRNA):** Transfers specific amino acids to the ribosomes, ensuring the correct sequence during protein synthesis.
- **Ribosomal RNA (rRNA):** Constitutes the structural and functional components of ribosomes, the cellular machinery for protein synthesis.

Q.9 Briefly describe the function of DNA.

DNA contains the hereditary information, in the form of a sequence of nucleotides that determines the order of amino acids during protein synthesis. The segment of DNA in which the sequence of nucleotides determines the synthesis of a protein is called a gene. During reproduction, DNA is passed from one generation to the next, carrying the hereditary information forward.

Q.10 Differentiate between the following:

i. Biochemistry and molecular biology ii. Structure of DNA and RNA iii. Composition of DNA and RNA iv. Monosaccharides and disaccharides v. Glycogen and starch vi. Saturated and unsaturated fatty acids vii. Fats and oils

i) Biochemistry and Molecular Biology

Biochemistry	Molecular Biology
The study of chemical processes that occur within living organisms (e.g., photosynthesis).	The specialized branch of biochemistry concerned with the structure and functions of biomolecules, e.g., carbohydrates, proteins and lipids.
Related to both biology and chemistry; solves the problems of living organisms using the knowledge and techniques of chemistry.	Studies the interaction of biomolecules within cells and biochemical processes like DNA replication, transcription and translation.

ii) Structure of DNA and RNA

Structure of DNA	Structure of RNA
DNA is made of deoxyribonucleotides. The pentose sugar is deoxyribose, and the nitrogenous base may be adenine (A), thymine (T), cytosine (C), or guanine (G).	RNA is single-stranded, made of ribonucleotides. The pentose sugar is ribose, and the nitrogenous base may be adenine (A), uracil (U), cytosine (C), or guanine (G).

iii) Composition of DNA and RNA

DNA	RNA
Composed of deoxyribonucleotides: deoxyribose sugar + phosphate + a nitrogenous base (A, T, C, or G).	Composed of ribonucleotides: ribose sugar + phosphate + a nitrogenous base (A, U, C, or G); single-stranded.

iv) Monosaccharides and Disaccharides

Monosaccharides	Disaccharides
Simple sugars made of a single sugar molecule; easily soluble in water; sweet taste; 3–7 carbon atoms. *Pentoses (5C):* ribose (C5H10O5), deoxyribose (C5H10O4). *Hexoses (6C):* glucose, fructose, galactose (C6H12O6).	Made of two monosaccharide units; less soluble in water; less sweet. *Examples:* sucrose (glucose + fructose); maltose (two glucose molecules).

v) Glycogen and Starch

Glycogen	Starch
The animal starch, mainly stored in the liver and muscles; broken down into glucose when energy is needed.	A storage polysaccharide stored in plants; composed of glucose units (amylose and amylopectin).

vi) Saturated and Unsaturated Fatty Acids

Saturated Fatty Acids	Unsaturated Fatty Acids
Internal carbon atoms bonded with the maximum number of hydrogen atoms; no double bonds; solid at room temperature. *Example: palmitic acid* — CH3—(CH2)14—COOH	One or more double bonds between carbon atoms; liquid at room temperature. *Example: oleic acid* — CH3—(CH2)7—CH=CH—(CH2)7—COOH

vii) Fats and Oils

Fats	Oils
Contain saturated fatty acids; solid at room temperature. *Example: animal fats.*	Contain unsaturated fatty acids; liquid at room temperature. *Example: olive oil, corn oil, coconut oil.*

Q.11 Compare the energy level of carbohydrates, proteins, and lipids.

Energy Comparison

Nutrient	Energy Value
Proteins	One gram of protein provides 4 Kcal of energy. Proteins can also be used for gaining energy.
Carbohydrates	One gram of carbohydrates provides 4 Kcal of energy when glucose is broken down in the cell. Carbohydrates are a major source of usable and stored energy in the cells of living organisms.
Lipids	One gram of lipids provides 9.1 Kcal of energy — double that of carbohydrates or proteins. Lipids act as energy storage in fat cells, the liver, and in blood.

Q.12 How is biochemistry important for the study of physiology, cell biology, and anatomy?

Biochemistry is the study of different chemical compounds and the chemical processes taking place within living organisms.

Importance: Biochemistry is related to both biology and chemistry; it solves the problems faced by living organisms using the knowledge and techniques of chemistry. Knowledge of biochemistry is essential to study the physiology, cell biology and anatomy of organisms, because life processes such as photosynthesis, respiration, digestion and inheritance are explained in biochemical terms.

Q.13 What are different plant sources of proteins?

Plant seeds are the most common source of proteins, like beans, lentils, peas and nuts. Soybean is one of the richest sources of plant protein.

Q.14 How is the primary structure of protein important?

The primary structure of a protein is important because it determines the protein's three-dimensional shape, which in turn determines its function.

Q.15 Name two types of proteins that provide structure in the human body.

Keratin (in hair and nails) and collagen (in tissues) provide structure to various parts of the body.

Q.16 How does the structure of fatty acids determine whether a fat is saturated or unsaturated?

Fatty acids in triglycerides can be either saturated or unsaturated. A fatty acid is saturated if there are no double bonds between the carbon atoms of its chain. An unsaturated fatty acid has one or more double bonds, formed by the removal of hydrogen atoms from the carbon skeleton.

Q.17 Why are lipids insoluble in water?

Lipids are organic compounds made up mainly of carbon, hydrogen and oxygen. They have little or no affinity for water (they are hydrophobic) due to their largely hydrocarbon composition — which is why they are insoluble in water but soluble in organic solvents such as alcohol.

Q.18 Define gene.

A small piece of a huge DNA molecule in the chromosome is called a gene. Genes store and control hereditary information. Each chromosome is made up of a large number of genes.

Q.19 How does molecular biology relate to the understanding of DNA and genetic information?

Molecular biology looks at the molecules related to genetic information, particularly DNA. It seeks to understand how DNA is made, copied and used, providing insight into heredity, genetic variations, and the basics of life.

Q.20 Differentiate between transcription and translation.

Transcription	Translation
A process in which a specific sequence of DNA nucleotides is copied in the form of messenger RNA (mRNA). Takes place in the nucleus.	The mRNA carries the sequence of its nucleotides to ribosomes. Ribosomes read this sequence and join specific amino acids accordingly to synthesize proteins. Takes place in the cytoplasm.