**Chapter 6 - Biochemistry**

**All Lectures Uploaded on YouTube:**

[**https://tinyurl.com/fkm9-biology**](https://tinyurl.com/fkm9-biology)



**Multiple Choice Questions:**

1. C
2. B
3. A (mRNA)-- there is a misprint in the book so consider either A or C as mRNA which is the correct answer
4. C – however, the perfect choice would be the R group which is not mentioned in any options
5. A
6. B
7. B
8. C
9. A
10. B

**Short Answer Questions**

1. Bioelements like carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur are present in all living organisms. Carbohydrates have Carbon, hydrogen, and oxygen present in a 1:2:1 ratio. Proteins have C, H, O and N and sometimes sulfur. Lipids consist of carbon, hydrogen and oxygen but less oxygen than carbohydrates
2. Carbohydrates and proteins have 4 kcal/g of energy whereas lipids have 9 kcal/g, making them a more dense energy source than the other two.
3. Biochemistry explains the molecular mechanisms behind bodily functions, cellular processes, and the structure-function relationship in tissues and organs. **Physiology**: Biochemistry explains the biochemical processes and reactions that drive functions like metabolism, muscle contraction, and neurotransmission.

**Cell Biology**: It provides insight into the molecular mechanisms inside cells, such as DNA replication, protein synthesis, and energy production, all of which are essential for cellular function. **Anatomy**: Understanding the biochemical makeup of tissues and organs, including proteins, lipids, and nucleic acids, allows for a better comprehension of how structure relates to function in the body.

1. A gene is a sequence of DNA that contains the instructions for making a specific protein or RNA molecule. Genes are the basic units of heredity and are located on chromosomes. Each gene carries the code for protein synthesis determining the traits and functions of living organisms.
2. Carbohydrates form the structural aspect of plant cells by making up the cellulose cell wall and chitin cell walls in arthropods. Carbs are broken down into glucose, providing energy via ATP.
3. Plant sources include legumes, nuts and seeds, whole grains, soy products, and vegetables like spinach and broccoli.
4. The primary structure of amino acids is the sequence of amino acids in a polypeptide chain. The specific order of amino acids dictates how the protein folds into its three-dimensional shape, directly influencing its function. The sequence of amino acids also determines how the protein interacts with other molecules (e.g., enzymes, DNA), and is key to its biological activity.

**Extensive Questions:**

1. Lipids are one of the most essential bio-molecules which play a variety of functions. Lipids are a rich source of energy, providing more than double the energy of carbohydrates or proteins. They are stored as fats in animals and oils in plants. Fat acts as an insulator to prevent heat loss and cushions vital organs like the heart and kidneys. Phospholipids form the structural framework of cell membranes, maintaining the integrity of cells. Lipids are precursors of steroid hormones and vitamin D.
2. Chromatin is the material that makes up chromosomes. They consist of DNA- genetic material consisting of instructions, histone proteins which form the basic units of chromosomes and the coiling of DNA around histones to form a bead-like structure called nucleosome.
3. Genes are specific sequences of DNA that act as units of heredity and are present on chromosomes. They carry instructions for the synthesis of proteins or RNA molecules, which determine the specific traits of an organism.
4. Genes play a crucial role in protein synthesis by providing the instructions to build proteins. 1) transcription- the gene's DNA sequence is transcribed into messenger RNA (mRNA) in the nucleus. 2) translation- The mRNA is transported to ribosomes in the cytoplasm, where its sequence is translated into a specific amino acid chain.
5. Each gene contains instructions to produce specific proteins that determine traits (e.g., eye colour, blood type). Then there are variations of a gene, called **alleles** which result in different forms of a trait. For example, dominant alleles mask recessive ones.
6. The central dogma of molecular biology describes the flow of genetic information:

**DNA → RNA → Protein**

* + **Replication**: DNA is copied during cell division.
  + **Transcription**: DNA is transcribed into mRNA in the nucleus.
  + **Translation**: mRNA is translated into a protein in the cytoplasm.

1. Lipids are composed of carbon, hydrogen and oxygen. The simple structure of lipids is called triglycerides which consist of glycerol and three fatty acids. Then a complex type is which consists of a phosphate group- in the case of phospholipids. Another type is steroids which have a ring structure.

Two sources of lipids; plants- olive oil, nuts, seeds etc. Animal- butter, cheese, fish oil etc

Functions: energy storage (long-term), phospholipids form cell membrane, protection and insulation of internal organs



