

Introduction to Biochemistry

Q.1. Define the terms.

- i. *Biochemistry*: Biochemistry is the study of chemistry of living organism and deals with structure of tissues, cells, organelles and individual biomolecules.
- ii. *The cell*: The cell is the basic, living, structural and functional unit of living organism.
- iii. *Biomolecules*: The living cell is composed of few elements like C, H, O and N that combine to form a great variety of molecules are called biomolecules, e.g. carbohydrates, proteins, fats, nucleic acids, lipids.

Q.2. Give the aims, objectives and importance of biochemistry.

- i. Biochemistry is helpful for detailed study of structure and functions of biomolecules like carbohydrates, proteins, lipids, minerals and DNA.
- ii. Biochemistry is useful for study of various interactions of different biomolecules.
- iii. Biochemistry is useful for study of nature and working of enzymes and study of different types of enzymes.
- iv. Study of the energy transformations in living cells and organisms is another objective of study of biochemistry.
- v. Heredity and variations possess rational molecular basis. The study of this molecular basis is one of the main aims of biochemistry.
- vi. Study of self-replication and duplication processes which maintains the genetic continuity from cell to cell, is main objective of biochemistry.
- vii. Knowledge of biochemistry is used to control diseases, abnormal deficiency and treatment of deficiencies.
- viii. Metabolic abnormalities can be studied by the knowledge of biochemistry.

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- ix. Knowledge of biochemistry is helpful for understanding the dynamic changes of cellular systems and corresponding need of nutrients.

Q.3. Define biochemistry and state significance of biochemistry in pharmacy.

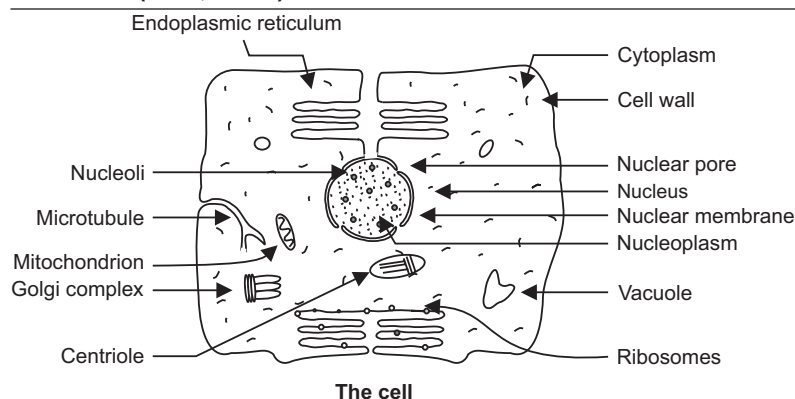
Biochemistry

The study dealing with the chemistry of living organism in its different phases of activity, is called biochemistry.

Significance

1. It deals with study of living system and its working.
2. Study of nature and working of molecules
3. Diagnosis of various metabolic disorders
4. Study of various deficiency diseases
5. Helps in synthesizing new molecules.

Q.4. Discuss major intracellular organs and their functions. OR Describe various parts of cell, draw and label diagram of cell. (S.23, W.23)



Parts/Components of Cell/Major Intracellular Organs/Organelles

1. **Nucleus:** It is a spherical and largest part of the cell. It contains nuclear membrane, nucleoplasm, nucleoli and genetic material DNA. Nuclear membrane is continuous with endoplasmic reticulum.
 - **Functions:**
 - i. It controls all cellular activities.
 - ii. It contains DNA, RNA and proteins.
 - iii. RNA helps in protein synthesis.

- iv. DNA helps in production of chromosomes.
 - v. Marker enzyme is DNA polymerase which is a site of DNA to RNA synthesis.
2. *Endoplasmic reticulum*: It is a network of membrane continuous with nuclear membrane.
- *Functions*:
 - i. It provides surface area for number of chemical reactions.
 - ii. It helps in synthesis of steroids, proteins, etc.
 - iii. It provides a pathway for transporting various chemical substances.
 - iv. It helps to concentrate the products of synthetic activities of cell.
3. *Ribosomes*: These are tiny granules present in cytoplasm as well as on surface of endoplasmic reticulum. It contains special type of RNA called RNA.
- *Function*: Ribosomes are the main sites for protein synthesis.
4. *Lysosomes*: These are membranous vesicles, contain powerful digestive enzymes which are capable of breaking down many kinds of molecules.
- *Functions*:
 - i. It helps for intracellular digestion
 - ii. Autolysis
 - iii. Phagocytosis.
5. *Golgi apparatus*: It consists of 4–8 flattened bag-like channels stacked upon each other. It is located near the nucleus.
- *Functions*:
 - i. It helps in intracellular sorting of proteins
 - ii. It helps in packaging of secretory products.
6. *Mitochondria*: There are small intracellular organelles and are known as powerhouse of cells. Each one is bounded by inner folded and other smooth membrane. Inner surface have many cristae and are covered with F_1 particles.
- *Functions*:
 - i. It is the main site for synthesis and storage of ATP.
 - ii. It is the site of citric acid cycle, β -oxidation, urea cycle and ETS.
 - iii. It contains special DNA and is self-replicative.
 - iv. Mitochondrion performs the main function of conversion and transfer of cellular energy.

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7. *Cell membrane/plasma membrane*: It surrounds the cell and separates it from other cells and external environment. It is composed of proteins, phospholipids, carbohydrates, minerals, etc.

- *Functions*:

- i. It involves in transport of molecules in-and-out of the cells.
- ii. It gives shape to the cell.
- iii. It covers and protects the cell and organelles.
- iv. It helps in intracellular adhesion and communication.
- v. It forms channels of ER.
- vi. It forms boundaries to the cytoplasm.
- vii. It can act as a physiological sieve.

Q.5. Explain physiology of cell wall.

Physiology of Cell Wall

The cell wall forms the boundary of the cell, inside which various organelles and protoplasm are present. The cell wall is mainly composed of proteins, carbohydrates, phospholipids, minerals, etc. The cell wall is a semipermeable membrane which acts as a sieve through which certain substances are allowed to enter the cell in the form of excreta.

The substances pass through semipermeable membrane and it depends upon their:

- i. Particle size
- ii. Concentration
- iii. Lipid solubility
- iv. Electrical charges
- v. Presence of carrier molecules.

Q.6. Why lysosomes are known as 'suicide bags'/suicide packets/digestive apparatus of the cell?

- Lysosomes are membranous vesicles containing powerful digestive enzymes which are capable of breakdown of many kinds of molecules.
- Lysosomes are known as suicide bags of cell because they contain lytic enzymes capable of digesting cells and unwanted materials when lysosomes burst, the lytic enzymes within it spill all over the cell, rupturing the cell membrane or cell wall and inducing the death of cell. This is also known as autolysis.

Q.7. Why mitochondria are called powerhouse/storehouse of cell (energy coin/storehouse of energy)?

- Mitochondria are tiny organelles present inside the cell.
- They are involved in release of energy from food. This is known as cellular respiration.

- They generate energy rich molecules ATP from cellular respiration which are later used for other processes.
- The energy is stored in the form of ATP.
- It is the main site for citric acid cycle, β -oxidation, urea cycle, ETS, etc. where, ATP is generated.

Hence, mitochondria are called the powerhouse of the cell.

Q.8. What are various stages of cell reproduction or cell division?

Stages of Cell Reproduction

1. Prophase
2. Metaphase
3. Anaphase
4. Telophase

Q.9. Differentiate between eukaryotic and prokaryotic cells.

<i>Eukaryotic cell</i>	<i>Prokaryotic cell</i>
1. Cell wall is absent.	1. Cell wall is present.
2. They contain true nucleus, nucleolus and nuclear membrane.	2. They do not contain true nucleus, nucleolus and nuclear membrane.
3. Nuclear material is bounded by nuclear membrane.	3. Nuclear material is scattered.
4. Contains mitochondria or chloroplast	4. Mitochondria or chloroplasts are absent.
5. Capable of pinocytosis	5. Not capable of pinocytosis
6. They are found in almost all plants, animals, fungi and protozoa.	6. They are found in bacteria and blue green algae.

OBJECTIVE QUESTIONS WITH ANSWERS IN BOLD LETTERS

1. The spherical and largest part of cell is **nucleus**.
2. **RNA** helps in protein synthesis.
3. **Ribosomes** are the main sites for protein synthesis.
4. **Lysosomes** are called suicidal packets of the cell.
5. Powerhouse/storehouse/energy coin of the cell is **mitochondrion**.
6. **Mitochondria** are the main sites for synthesis and storage of **ATP**.
7. ATP means **adenosine triphosphate**.
8. The **cell** is the basic, smallest, living, structural and functional unit of the living organisms.
9. The tiny granules present on the surface of endoplasmic reticulum are called **ribosomes**.
10. Autolysis and phagocytosis are the functions of **lysosomes**.