

## Unit 1 –

**To Life Processes****Content :**

- \* **Metabolism.**
- \* **Environment and ecosystem.**
- \* **Processes of metabolism through the plasma membrane.**
- \* **Photosynthesis and nutrients.**
- \* **Importance and conservation of plants.**

**Lesson Summary :**

The fundamental components of life are found in cells, where vital metabolic processes that sustain life occur. **Biomolecules** called enzymes, along with other cellular components, carry out crucial metabolic activities, revealing the characteristics of life. Such activities are collectively known as **metabolism**. Enzymes, hormones, and other biomolecules regulate metabolism. Metabolism involves both anabolic processes, which build molecules (anabolism), and catabolic processes, which break down molecules (catabolism).

Maintaining a stable internal environment is essential for metabolism to proceed smoothly. In organisms, extra-cellular fluid surrounding cells and intracellular organelles play crucial roles in maintaining internal stability, known as **homeostasis**.

Metabolism requires the transport of essential molecules into cells from the external environment. Processes such as [osmosis](#), [diffusion](#), [facilitated diffusion](#), and [active transport](#) promote the exchange of substances across cellular membranes.

Plants predominantly synthesize a few biomolecules essential for metabolism through photosynthesis. Others are formed within the plant and animal cells. During photosynthesis, the **light phase** (anabolic process) and the **dark phase** (catabolic process), occur within the chloroplasts.

Besides the nutrients and oxygen plants provide various economically important things too. Moreover, plants assist in reducing global warming, preventing natural disasters, and serving as a reservoir of biodiversity, making them crucial guardians of ecosystems.

It is our responsibility to ensure the continued protection of plants, which serve as guardians of the biosphere.

**Questions & Answers :**1. **Signs of living things?**

Movement, reaction, respiration, growth, reproduction etc.

2. **Structural and vital functional units of life?**

Cells.

3. **Through genetic engineering Cambridge researchers artificially created which organism?**

E.coli type bacteria.

4. **What are Biomolecules ?**

Carbohydrates, lipids, proteins and nucleic acids necessary for cell structure and life processes and are called as biomolecules. These are the basic building blocks of life.

5. **Examples for biomolecules ?**

- Carbohydrate : Glucose, Fructose, Sucrose, Starch, Cellulose.
- Lipid : Fats, Oils.
- Protein : Enzymes, Hormones, Antibodies.
- Nucleic Acids : DNA, RNA.

[Vitamins, amino acids, haemoglobin, myoglobin, chlorophyll, lactose, maltose, glycerol, fatty acids, albumin, bilirubin etc, are biomolecules ]

6. **Define metabolism.**

The signs of life are manifested through the actions of building blocks called biomolecules and other chemical elements. All these activities are known as metabolism (eg:- Photosynthesis, Cellular respiration)

## 7. The 2 types of metabolism ?

**Anabolism** – Activities that join molecules. (eg:- Synthesis of glucose using  $\text{CO}_2$  and water)

**Catabolism** - Activities that break down molecules.

(eg:- Amino acids are available through breakdown of protein)

## 8. Name the biomolecules formed in cells to aid and regulate metabolism. How does each of these help?

Enzymes and Hormones.

Enzymes help speed up various chemical reactions in the body.

Hormones regulate and coordinate life functions.

## 9. Examples for metabolic enzymes ?

Salivary amylase in the saliva, Pepsin in the gastric juice.

## 10. Examples for hormones that promote metabolic activities?

Testosterone, Estrogen and Progesterone that regulates sexual function.

## 11. All enzymes are basically ----- .

Proteins.

## 12. ----- glands secrete hormones.

Endocrine glands.

## 13. Which elements required for metabolism are obtained from the external environment of organisms?

Water, salts, oxygen, carbon dioxide etc.

## 14. How do substances from the external environment enter the cell membrane in unicellular and multicellular organisms?

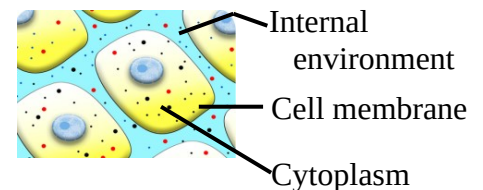
-Substances enter the amoeba directly through the cell membrane.

-Substances from the external environment reach the inter cellular fluid(extra cellular fluid) and then enter through the cell membrane.

-In plants, substances enter through the cell wall, the intercellular space, the cytoplasmic pathways called *plasmodesmata*, and the plasma membrane.

## 15. Cellular pathway that connects a cell to adjacent cells?

Plasmodesmata.



## 16. Things that act as internal environment in animals and plants?

The extra cellular fluid acts as the internal environment in animals, while in plants, the extra cellular fluid, the components of cell wall and air chambers serve as their internal environment.

## 17. What is meant by homeostasis ?

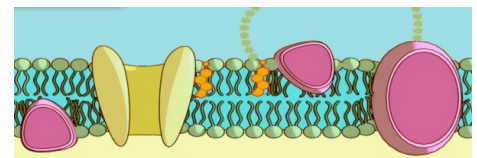
Keeping the composition of the environment constant is called homeostasis.

18. The reason why the cell membrane/plasma membrane where metabolism takes place is called *selectively permeable membrane* ?

Only certain molecules can pass through the plasma membrane.

## 19. Major components of plasma membrane ?

Phospholipid layers and proteins.



## 20. Processes that facilitate transport of materials across cell membrane ?

Osmosis, Diffusion, Facilitated Diffusion and Active Transport.

## 21. What is osmosis ?

Osmosis is the process by which water molecules move from their higher concentration to low concentration across a semi-permeable membrane. It does not require energy.

## 22. What is the reason why cells in salt water shrink? And dried grapes soaked in fresh water become swelled ?

Osmosis.

[Water molecules move from the cells to the salt water (exosmosis).

Water molecules enter the cells of dried grapes (endosmosis)].

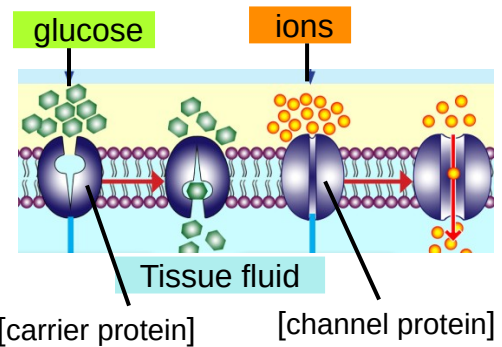
**23. What is diffusion ?**

Diffusion is the process by which molecules spread from their higher concentration to low concentration. It does not require energy. Diffusion will also occur without a semi-permeable membrane. Diffusion of oxygen and CO<sub>2</sub> are examples.

**24. What is facilitated diffusion?**

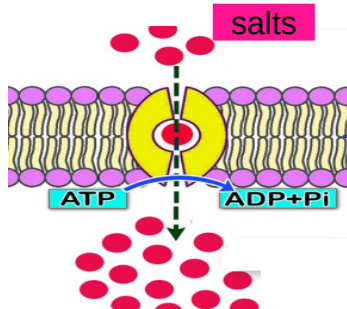
Facilitated Diffusion is the process by which molecules or ions diffuse from their higher concentration to their lower concentration with the help of certain proteins (carrier proteins and channel proteins) in the plasma membrane. It does not require energy.

Transport of glucose is an example.

**25. What is active transport ?**

[carrier protein]

[channel protein]



Active transport is a process of transport of molecules with the help of certain carrier proteins, using energy from ATP, from their lower concentration to higher concentration.

Through this, the necessary salts reach the cells.

**26. How are biomolecules available for metabolism?**

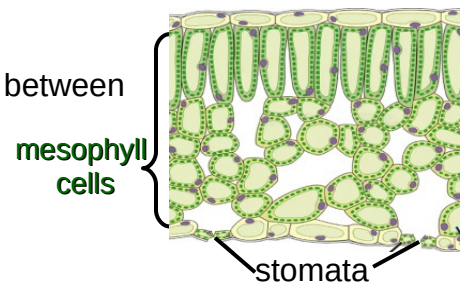
Biomolecules are mainly produced by plants through photosynthesis. Others are made within the cells.

**27. Structure of a photosynthetic leaf:**

Mesophyll cells with chloroplasts containing chlorophyll are seen in between the upper and lower epidermal layers. Stomata are present in the epidermis.

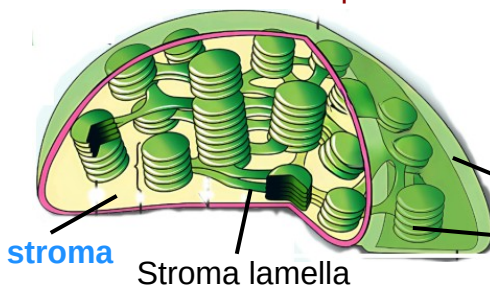
**28. Photosynthesis occurs within the ----- cell organelles.**

Chloroplasts.

**29. Structure of a chloroplast :**

mesophyll cells

stomata



Inside the chloroplast, which has a double membrane (outer membrane, inner membrane), there is a liquid part called **stroma**, and **grana** stacked with membrane sacs called thylakoids. The stroma lamellae connect the grana and are also found.

outer-inner membranes

grana

stroma

Stroma lamella

**30. Factors needed for photosynthesis?**

- Sunlight – (provides energy for splitting water to hydrogen and oxygen)
- Chlorophyll – (to absorb the sunlight)
- Water, Carbon dioxide – (to become food/glucose).

**31. Two steps in the process of food formation (photosynthesis) that take place in chloroplasts ?**

Light phase, Dark phase.

**32. The parts of chloroplast that appear as stacks of thylakoids containing chlorophyll and light phase of photosynthesis occur are ----- ?**

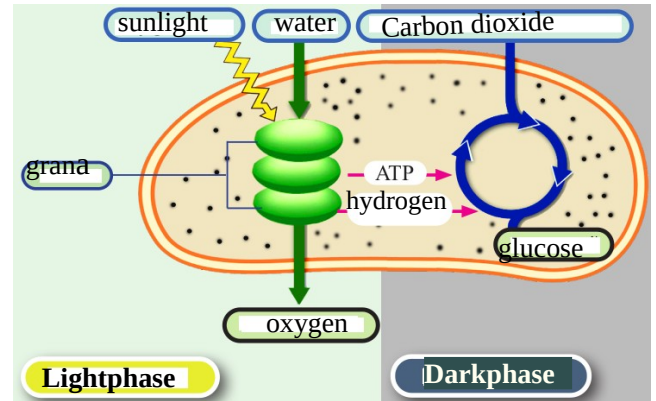
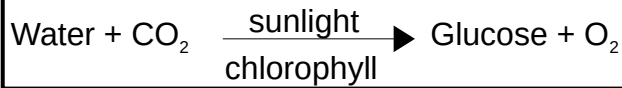
Grana.

**33. Changes during photosynthesis:**

- a) – **Light phase** (Light dependent phase)

With the help of sunlight, photosynthesis, water molecules are split into hydrogen and oxygen, within the grana of chloroplast. In this phase, oxygen is released while hydrogen enters the stroma fluid, contributing to the production of energy in the form of ATP.

- b) – **Dark phase** (light independent phase)  
In the stroma, hydrogen and carbon dioxide combine to form glucose using the energy in ATP.



34. Who won the Nobel Prize in Chemistry for explaining the functions of the dark phase ?

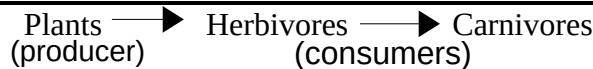


Melvin Calvin (1961)

35. Why the plants convert glucose produced as a result of photosynthesis into starch?  
Water soluble glucose is converted into insoluble starch for storage.
36. In what form does starch, which is produced from glucose, go to different parts of the plant?  
In the form of sucrose.
37. What are the different substances that are produced when glucose undergoes metabolism?  
Carbohydrates (starch, sucrose, fructose, etc.), proteins, lipids (fats), vitamins.

38. How do animals get the nutrients that plants produce?

Through the food chain.



39. Who are the primary producers in the oceans and other water bodies?

Algae and phytoplankton.

40. What are the main services that plants provide to the living world?

- Provide food.
- Provide oxygen.
- Reduce global warming by absorbing CO<sub>2</sub>.
- Help prevent natural disasters.
- Serve as a repository of biodiversity.
- Economically important resources are also available.

41. Give an example of economically important resources obtained from plants.

- Medicines like tulsi and aloe vera.
- Beverages like coffee and tea.
- Biopesticides like neem and garlic.
- Rubber latex.

42. What is the ecological importance of mangrove forests?

- They are a repository of biodiversity.
- They are a source of fish wealth.
- They protect the soil of coastal areas.
- They reduce global warming by absorbing CO<sub>2</sub>.
- They prevent tsunamis.

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43. Who is the Keralite environmental activist who made us aware of the ecological importance of mangrove forests?

Kallen Pokudan.

Video class links:

Part 1: <https://youtu.be/WgpeMY3c7jc>

Part 2: <https://youtu.be/IITpoQUJ9JI>