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B). Nephron is the basic functional unit of kidney. Explain its structure and functions.

## 1. Nephron: The Basic functional unit of the kidney

Nephron is the basic structural and functional unit of kidney, playing crucial role by purifying blood and excreting waste material, in human body. Each kidney contains millions of nephron that works collectively in the filtration process.

## 2. Structure of Nephron

Nephron consists of several distinct parts, each with specific roles:

### 1. Bowman's Capsule

A cup-shaped structure that encases the glomerulus

b). **Glomerulus**

A network of capillaries inside the Bowman's capsule where filtration begins.

c). **Proximal Convoluted Tubule (PCT):**

It is located after the Bowman's capsule.

d). **Loop of Henle**

1. **Descending Limb**  
permeable to water

2. **Ascending Limb**  
impermeable to water but allows sodium and chloride ions.

e). **Distal Convoluted Tubule**

Located between ascending limb and collecting duct.

f). **Collecting duct**

Enters into ureters.

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3. **FUNCTIONS OF NEPHRON**

Following paragraphs will highlight the functions of Nephron.

## a). Filtration

Filtration begins in glomerules. It allows water and small molecules

- to be absorbed and retain large molecules like proteins and red blood cells.

## b). Selective Reabsorption

Around 99% percent of filtrate is reabsorbed in proximal tubules, when filtrate leaves proximal tubules it mostly contains nitrogenous waste material. This is known as reabsorption which is achieved by active and passive transport.

## c). Secretion

The nephron secretes additional waste product in proximal convoluted tubule (PCT) and distal convoluted tubule (DCT), helping to maintain the body's chemical balance.

## d). Concentration of urine

DCT and collecting duct, work together for the concentration of urine.

## e). Excretion

The urine is transported to bladder where the excretion takes place.

## 4. Conclusion:

Thus, Nephron is the structural and functional unit of kidney which plays significant role in human body.

A). Cell is considered as a "basic unit of life". Explain the structure and functions of cytoplasm, plastids and nucleus.

## 4. CELL: THE BASIC UNIT OF LIFE

Cell, the basic structural and functional unit of life, is discovered by Robert Hooke in 1665. It carries all the necessary functions that sustain life.

### Major components of cell theory

1. Cell membrane
2. Cytoplasm
3. Nucleus

# Different types of Cell

Eukaryotes

Prokaryotes

## 2. Different Components of cell

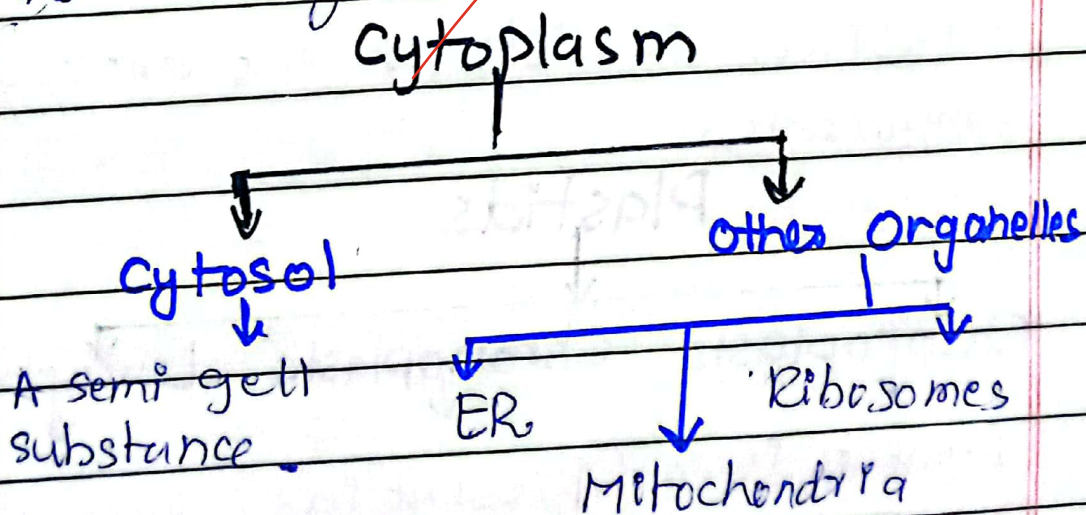
The cell contains different components each perform distinct function to maintain the life of cell.

### A. CYTOPLASM:

Cytoplasm is the semi fluid substance that fills the space between cell membrane and Nucleus.

### Structure of CYTOPLASM:

Cytoplasm consists of the following two parts:



## Functions of Cytoplasm:

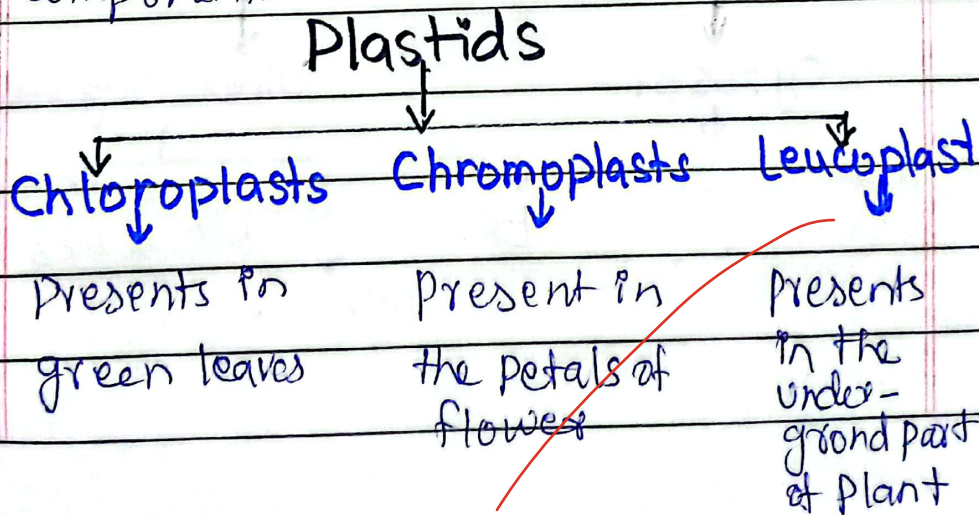
1. It maintains the shape of cell.
2. It also provides a platform for many chemical reactions.
3. Helps in the movement and transportation within the cell.
4. Play significant role in cell division and growth.
5. Serves as storage house for material like starch.

## B. PLASTIDS:

Plastids, one of the most important cell organelles. It is present in plant cell and some algae.

### Structure of Plastids.

Plastids consists of the following components.



## Functions of Plastids

### 1. Production of food.

Plastids play significant role in the production of storage of food.

### 2. Aids in Pollination and dispersal of seed:

Chromoplasts helps in aiding the pollination and dispersal of seed.

### 3. Storage of nutrients

Leucoplasts stores the nutrients especially in the non-photosynthetic part of plant.

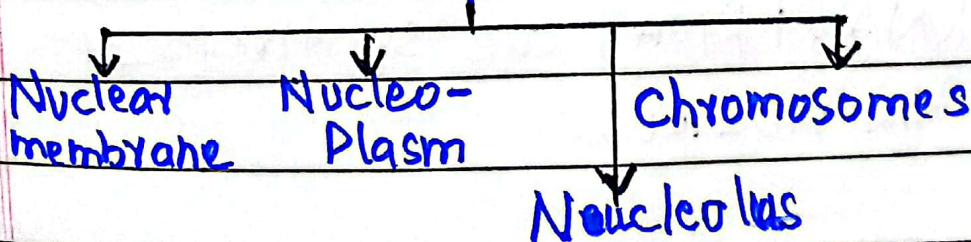
### 4. Give color to fruit and flower:

Chromoplasts helps in giving color to fruits and flowers.

## C. Nucleus

Nucleus is large-membrane organelle, found in eukaryotes cell, discovered by Robert in 1835.

### Structure of Nucleus



a). **Nuclear Membrane:**

It separates the nucleoplasm from cytoplasm.

b). **Nucleoplasm:**

It is the fluid present in the nuclear membrane.

c). **Nucleolus:**

A dark stained body present in the nucleus.

d). **Chromosomes:**

Nucleus contains chromatin, that is converted into chromosomes during cell division.

**Functions of Nucleus:**

It controls all the activities of cell such as cell growth and division.

It controls the transfer of hereditary characteristics from parents to offspring.

Three types of RNA's, rRNA, mRNA, tRNA, are synthesized in the nucleus.

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d). What is SWM? Highlight the weaknesses in SWM of Pakistan.

## 1. Introduction to Solid Waste Management Material (SWM)

Solid Waste Management refers to the systematic control of generation, storage, transfer, collection and disposal of waste material. Effective SWM is crucial for maintaining health and protecting environment.

## 2. WEAKNESSES IN THE SWM OF Pakistan:

Following paragraphs will shed light on the weaknesses of SWM of Pakistan.

### A. Inadequate Infrastructure:

Limited collection service:

Many areas especially, rural

and peri-urban areas lack regular collection services.

**Shortage of disposal sites:**

There is shortage of disposal sites which leads to prevalence of open dumping.

## B. Financial Constraints

**Limited budget allocation**

Insufficient budget allocation for SWM, also hinders the effectiveness

**High operational cost**

Inefficient resource management leads to high operational cost.

## C. Regularity and Institutional challenges:

**Weak implementation of laws:**

Weak implementation of already existing laws on SWM, is also a major challenge.

## Lack of coordination

Lack of coordination and cooperation between municipal authorities and other stakeholders.

## d). Over-reliance on traditional methodologies and techniques

Over-reliance over outdated technologies instead of composting and waste-to-energy technologies.

## e). Lack of Segregation

Issue of lack of separation

Another major issue is the lack of separation between recyclable and non-recyclable waste material.

## Inadequate recycling facilities

Limited infrastructure for recycling and processing waste material.

## Conclusion:

Though SWM of Pakistan has been

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facing numerous challenges. However, these challenges can be addressed by taking pragmatic measures.

c). **Discuss the causes and preventive measures to smog.**

Smog, a combination of smoke and fog, is the type of air pollution, that causes various health and environmental issues. It mostly occurs in urban areas.

### **CAUSES OF SMOG**

Following paragraphs will highlight the causes of smog.

a). **Industrial emissions:**

Industries and power plants emit nitrogen oxides and sulfur dioxide, which are the primary contributors of smog formation.

b). **Vehicle emissions:**

The combustion engine of vehicles like cars and trucks also release hydrocarbon, nitrogen

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which contributes to smog.

c). **Burning of fossil fuels**

Over-reliance on fossil fuels such as coal and oil, for electricity generation and heat, is one of the main causes of smog.

d). **Agriculture activities**

Usage of synthetic fertilizers and burning of agriculture waste, is the major contributor of smog.

e). **Rapid Urbanization**

Rapid urban growth has become a major cause of increased energy demand and vehicle usage, which in turn contribute to smog.

3. **Preventive Measures:**

Following paragraphs will shed light on preventive measures.

a). **Regulating industrial emissions**

Enforcing stricter regulations and promoting cleaner production technologies.

4.

### Utilization of modern technologies

#### Adapting electric Vehicles (EV)

Shifting from traditional combustion engine vehicle to electric vehicle.

#### Implementing Smart grid systems

Implementation of smart grid system for energy distribution and consumption, reducing the reliance on fossil fuels

#### Deployment of Air Purification systems

Modern air purification systems such as large-scale outdoor air purifiers and building integrated air cleaning system, can reduce airborne pollutants

#### Use of drone for monitoring air quality

Ensuring the usage of drone for monitoring air quality, will provide valuable data for identifying pollutions hotspot.

c). **Increasing green cover**

Increasing the growth of trees and green places in urban areas would help in absorbing pollutants.

d). **Shifting to renewable energy sources**

Shifting from non-renewable energy sources to renewable energy sources such as solar and geo-thermal would help in reduction of air pollution.

e). **Promoting Public vehicle and carpooling**

Government must take initiative to promote public transport and carpooling to reduce the vehicle emission.