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Question No : 01

A- Cell (A Basic unit of life)

Cell is unit of structure and function of all living things. Cell was discovered by Robert Hooke in 1665. The word cell is derived from the Latin word "cellula" which means "a little room". Organisms can be classified as unicellular (single cell - bacteria) and multicellular (plant and animals). Cells are divided into two groups: prokaryotic and eukaryotic cells.

Cytoplasm

The living content between plasma membrane and nucleus is cytoplasm. The cytoplasm has two parts organelles and cytosol. It contains different cell organelles like

mitochondria, golgi bodies, endoplasmic reticulum, lysosomes etc. The soluble part of cytoplasm is called cytosol. It forms the ground substance of the cytoplasm. Chemically, it is about 90% water. It contains all fundamental molecules of the cell.

Function of Cytoplasm:

1- It acts as a storage house. Most important compounds like starch are stored in the cytoplasm.

2- Some metabolic processes like glycolysis (breaking of glucose) take place in the cytoplasm.

3- Cytoplasm shows streaming movements. Many free floating organelles like mitochondria move in the cytoplasm due to these streaming movements.

Nucleus:

Nucleus was discovered in 1831 by Robert Brown. It looks dark than that of surrounding.

cytoplasm. The shape of nucleus may be irregular or spherical. It is composed of four parts nuclear membrane, nucleoli, nucleoplasm and chromosomes.

Functions of Nucleus:

1- It controls all the activities of the cell.

2- It controls the transfer of hereditary characters from parents to offspring.

3- The three types of RNAs, i.e. mRNA, tRNA, rRNA are synthesized in the nucleus.

Plastids:

The membranous bound and pigment containing bodies present in the plant cells are called Plastids.

There are three types of plastids: Chloroplast, Chromoplast and Leucoplast.

Structure of Plastids:

The membrane bound structure, containing green

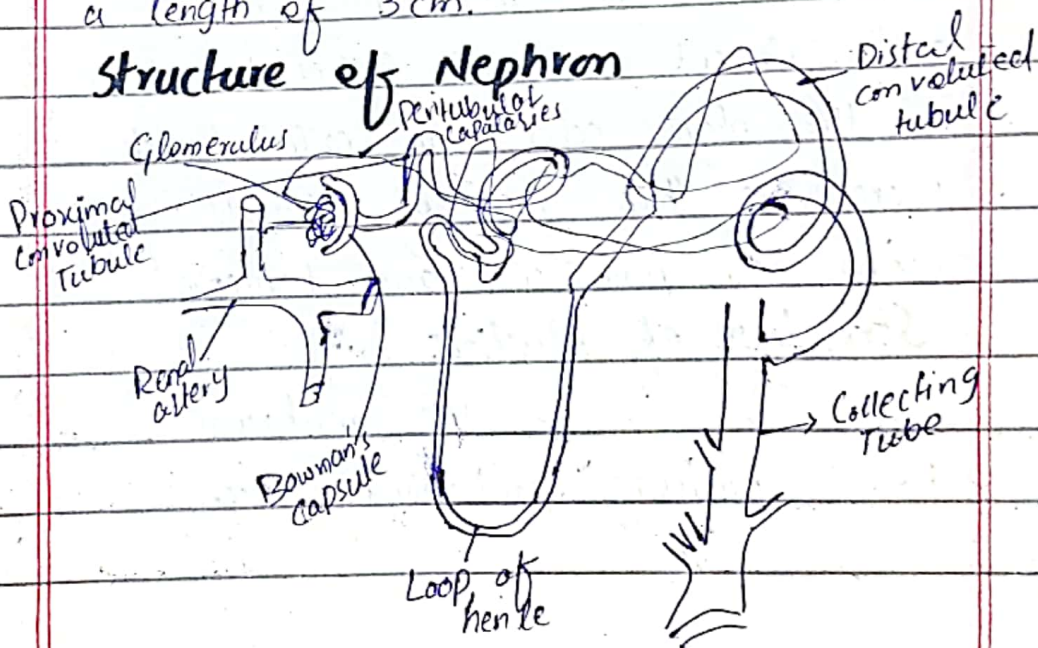
Pigment is called chloroplast. Chromoplasts give colour to plants other than green. They help in pollination and dispersal of seeds. Leucoplasts are colourless. their shape may be triangular, tubular or some other.

(B)

Nephron

The nephron or uriniferous tubule is the functional unit of the kidney. A nephron consists of a twisted tubule closed at one end, open at the other with a network of associated blood vessels. Each kidney of man is formed of about one million nephrons. Each nephron has a length of 3cm.

Structure of Nephron



It is differentiated into four regions having different anatomical features and different physiological roles.

- 1- Bowman's Capsule
- 2- Proximal convoluted Tubule (PCT)
- 3- Loop of Henle
- 4- Distal convoluted Tubule (DCT)

Each of the nephrons contains a filter called the glomerulus which consists of a network of tiny blood vessels known as capillaries. The fluid filtered from the blood by the glomerulus travels down a tiny tube like structure called a tubule.

Function of Nephron

The main functions of nephron are related to filtering, reabsorbing and secreting glutamate, carbohydrates and solutes. The glomerulus has two cell layers as well as a basement membrane that separates it from the Bowman's

Capsule. This basement contains collagen and glycoprotein fibers. These fibers have a mesh like structure that uses ultrafiltration to filter the blood. It also filters some useful substances including amino acids and glucose but selective reabsorption allows the body to reabsorb them and keep the electrolyte levels balanced.

After fluid is filtered, it goes into proximal tubule where it is reabsorbed into the peritubular capillaries. This is the point at which any essential substances get transported back to the blood. This means that a great deal of water must go back into the blood while in the proximal tubule using osmosis as this will balance electrolyte levels. The loop of henle concentrates the salts which are added to urine for excretion, creating a high solute concentration found in the medulla. These substances

(certain solutes, ions and water) is drained so that it enters the distal convoluted tubule, a feature which is responsible for maintaining balanced pH levels of both blood and urine. After this, the fluid continues on its way to the collecting duct for another process of ultrafiltration before going to the ureters followed by the bladder.

(c)

Causes of Smog:

Smog:

Smog is a type of air pollution that results from a combination of pollutants and atmospheric conditions. It is categorized into photochemical smog (common in urban areas) and Industrial smog (common in industrial areas). The causes of smog can vary but generally fall into following

categories.

Primary Causes

Vehicle Emissions:

Cars, trucks, and other vehicles release nitrogen oxides (NO_x) and volatile organic compounds (VOCs), which are precursors to photochemical smog.

Industrial activities:

Factories and power plants emit large quantities of sulphur dioxide (SO_2), Nitrogen oxides (NO_x) and burning fossil fuels like coal and oil for energy contributes significantly to smog.

Burning of Biomass and waste:

Burning agriculture residues, wood and other organic materials releases particulate matter, carbon dioxide and other pollutants.

Construction and mining

Activities:

Dust particles generated by construction and mining activities can contribute to smog formation.

Natural resources:

wildfires, volcanic eruptions and natural VOC emissions from vegetation can also contribute to smog under certain atmospheric conditions.

Preventive Measures for

Smog Combating:

Reduce vehicle Emissions:

It can be reduced by promoting public transportation, adopting electric and hybrid vehicles, encouraging non-motorized transport.

Control Industrial Emissions:

Smog can be prevented by adopting cleaner technologies, replacing coal and heavy oil with cleaner alternatives like natural gas and renewable energy resources. It should comply with air quality standards for industrial emissions.

Reduce Biomass Burning:

Prohibit the open burning of agricultural residues by encourage the use of methods like mulching and composting to manage crop residues.

Raise Public Awareness

Inform the public about the sources of smog and how their actions can contribute to cleaner air. Promoting the habits of turning off idling engines, conserving energy and using eco-friendly products.

Conclusion:

Smog is a major issue that threatening human health and worsens atmospheric conditions. A lot of causes are there in vehicle emissions and industrial activities with anthropogenic factors. Preventive measures should be taken for combating smog by reducing vehicle emission, controlling industrial emission and raising public awareness.

(D)

SWM:

Solid Waste Management refers to the systematic management of the generation, collection, transfer, treatment, recycling, recovery and disposal of waste management.

Weaknesses in the SWM of Pakistan

Increase in household size:

The increase in household size in major cities like Karachi, Hyderabad, Faisalabad, Rawalpindi, Peshawar, etc, is the foremost factor affecting the solid waste and its management at different stages.

Improper scientific solid waste Management:

Unfortunately, there is no single city in Pakistan which has a proper scientific SWM.

right from collection of solid waste. up to disposal. Waste collection and transportation system is in very bad condition in outskirts.

Unplanned urbanization and Poor Sanitation:

Pakistan's population is increasing blindly and public move towards urban areas. Government is not capable of providing clean environment and a planned settlement in urban areas.

Inadequate Human Resources:

Pakistan is lacking in provision of adequate human and capital resources for collection and disposal of waste.

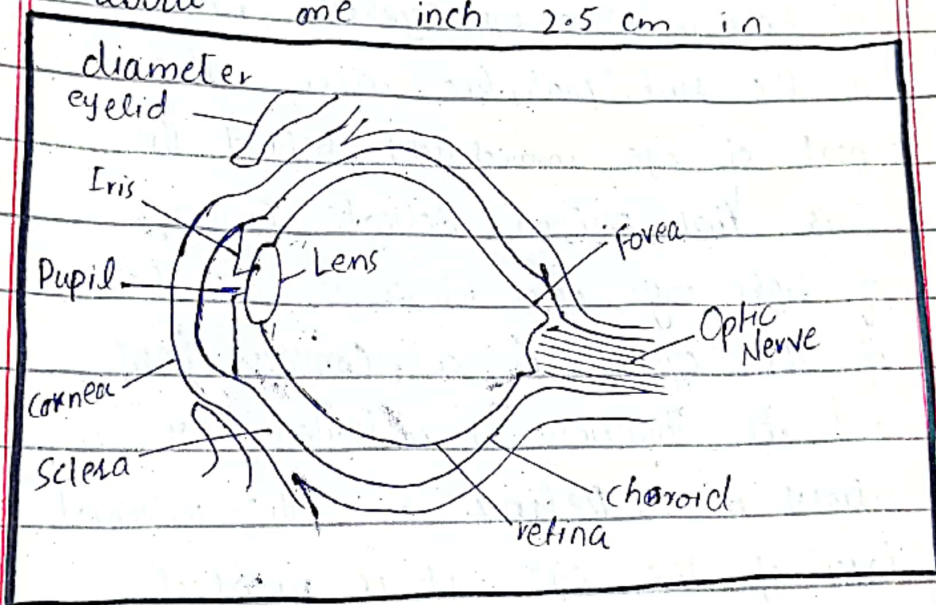
Conclusion:

Solid waste management system in the country has many issues as mentioned above. The government has to work on the development and implementation of a standardized SWM system.

Question No: 03

Eye: A

Human Eye is vital for seeing the world around us, but vision can be impaired by a number of medical conditions, as well as ageing process. The eye is slightly asymmetrical globe, about one inch 2.5 cm in



Human Eye

Working of Human Eye

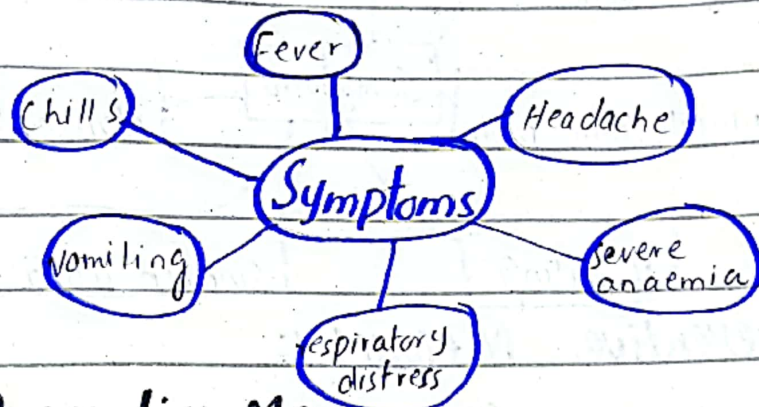
Iris is the coloured part of eye. It is important because it controls the size of the **pupil**

(dark circle inside the centre of the eye). The pupil is large when light is low or it is dark outside and tiny when it is very sunny or bright. **Cornea** is the clear covering over pupil and Iris. It is focusing what we see by bending light. **Sclera** is the white part of the eye that we see in the mirror. This is protective outer layer of eye. The eye ball is held in place by **eyelid**, which is the first protective layer. The part of eye immediately behind the Iris that performs delicate focusing of light rays upon retina is the lens of the eye. It's a **convex lens** and its thickness is controlled by ciliary muscles. **Retina** is the innermost layer of the eye. It is located near optic nerve directly at the back of the eye and responsible for colour vision. **Optic Nerve** takes the information from retina as electrical signals and deliver it to brain that interpret as a visual image.

Malaria (B)

Malaria is caused by Plasmodium Parasites. The parasite spread to people through the bites of infected female Anopheles mosquitoes called "malaria vectors". According to the latest WHO estimates, in December 2015, there were 214 million cases of malaria and 438 000 deaths.

Symptoms of Malaria



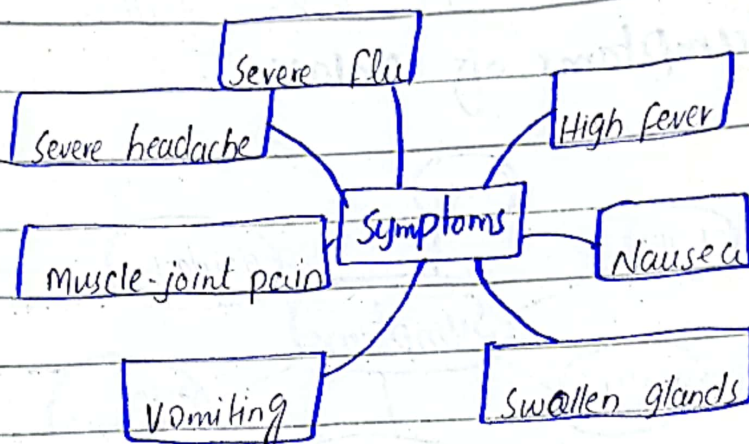
Preventive Measures:

Vector control is the main way to prevent and reduce malaria transmission. Two forms of vector control are insecticide treated mosquito nets and indoor residual spraying. Antimalaria medicines can also be used to prevent malaria.

Dengue

Dengue is a mosquito borne viral disease that has rapidly spread in all regions. Severe Dengue was first recognized in the 1950s during dengue epidemics in the Philippines and Thailand.

Symptoms of Dengue:



Preventive Measures:

Preventing mosquitoes from accessing egg-laying habitats, disposing of solid waste properly, applying appropriate insecticides to water storage outdoor containers, and improving community participation and mobilization for sustained vector control.

(C)

Eutrophication:

Eutrophication is the process by which water bodies become enriched with excessive nutrients, particularly nitrogen and phosphorus, leading to the over growth of algae and aquatic plants. This phenomenon disrupts the natural balance of aquatic ecosystems and can result in harmful environment and economic consequences.

Causes of Eutrophication

Nutrient Runoff: Agricultural runoff containing fertilizers rich in nitrogen and phosphorus.

Waste water Discharge: Untreated or poorly treated sewage from households and industries.

Industrial Pollution:

Industrial pollution discharges from food processing, textiles and other industries that contain nutrient rich effluents.

Aquaculture: Waste and fecal from fish farming contribute to nutrient build up in water.

Natural Resources:

Weathering of rocks and natural soil erosions release nutrients into water bodies.

Effects of Eutrophication:

Algae Blooms:

Rapid growth of algae forms dense mats on the water surface, blocking sunlight. It can harm aquatic life and humans.

Oxygen Depletion (Hypoxia):

Decomposition of excessive organic matters consumes dissolved oxygen, creating "dead zones" where aquatic life cannot survive.

Loss of Biodiversity:

Oxygen depleted waters and changes in habitat disrupt ecosystems, leading to the decline of sensitive species.

Water quality degradation:

Eutrophication causes unpleasant odors, tastes and water discoloration. It can make water unsafe for drinking, recreation and fishing.

Economic impacts:

It reduces tourism and recreational activities due to poor water quality. It negatively affects aquaculture industries.

Conclusion:

Eutrophication is a major environmental challenge, especially in agriculture and urbanized regions. Eutrophication is due to ill-human practices such as industrial pollution, wastewater discharge without treating it properly and some natural resources. Its effects are lethal for aquatic life in form of loss of Biodiversity.

(D) GIS and GPS

Geographic Information System and Global Positioning System (GPS) are both technologies used to work with local based data, but they serve different purposes and have different functionalities.

Characteristics GIS GPS

	GIS	GPS
Definition	It designed to capture, store, analyze, manage present spatial data.	A satellite based navigation system that provides time and location to a GPS receiver.
Purpose	Used for making spatial analysis and decision making in urban planning, environmental management and disaster response.	Used for pin-pointing an exact location and providing directions, typically in navigation, tracking and time synchronization.
Components	Comprises of software hardware, data and personnel.	Composed of a network of satellites, ground stations and receivers.

Data output	Generates complex maps, spatial patterns and analytics to support decisions.	Provides precise coordinates and information about speed, distance, direction
Usage Example	Identifying the best location for a new hospital by analyzing population density, road accessibility, and proximity to other facilities	Helping a driver to navigate hospital by providing turn-by-turn directions
Functionality	Analyzes spatial relationships and can handle both static and dynamic data over time	Focus solely on determining precise locations and movements using satellite signals

Conclusion:

GIS is a comprehensive tool for spatial analysis and mapping, useful for decision making and large scale planning. GPS is a specialized system for location tracking and navigation, providing real-time positional data.