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SANA BATOOL
Batch-400
GSA - Mock-1
PART - II
Section - I :-
(Question # 2)
(a)

Components of Cell :-

Cell is the structural and functional unit of living organisms. A cell consists of various organelles that work in coordination to perform important cellular activities. Following are some of the components of cell which are necessary for its functions.

Cell wall :- It is present only in plants, or some bacterial cells, but absent in animal cells. It helps in protection of cell and give shape.

Cell Membrane :- Cell membrane is the outer layer of cell which also helps in protection and also acts as permeable, semi-permeable or non-permeable membrane to various components, ions or elements.

Nucleus :- Nucleus is present in cell which consists of genetic material i.e chromosomes of cell.

Endoplasmic Reticulum :- Smooth endoplasmic reticulum are necessary for lipid

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synthesis. They are also involved in detoxification of toxins, carbohydrate metabolism, and storage and release of calcium ions.

Rough endoplasmic reticulum :- It is mainly involved in protein synthesis.

Golgi complex :- It is the organelle that helps in packaging and transfer of cellular components.

Mitochondria :- Mitochondria is involved in generating cell's energy supply in the form of ATP hence named as "powerhouse of cell". They are also involved in apoptosis (programmed cell death), cell growth and differentiation, heat generation and maintaining cell health.

Vesicles :- Vasicles consist of cellular fluid and it is involved in excretion of waste material from cell.

Cytoplasm :- It is a gel like fluid in the cell which gives place to rest of the organelles and it is a site for various cellular reactions.

Vacuole :- It is a fluid filled body that stores water, nutrients, and waste products. They are also important for waste disposal, detoxification and defense against pathogens.

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Chloroplast :- This organelle is absent in animals but present in plants and autotrophic bacteria i.e cyanobacteria. It is the site where photosynthesis takes place.

Difference Between Prokaryotic and Eukaryotic Cells :-

Prokaryotic Cell :-

A prokaryotic cell is a simple, single celled organism that lacks a true nucleus and other membrane bound organelles. Its genetic material is mostly circular called plasmid and movement is mostly done with the help of cilia or flagella.

e.g Bacteria, Cyanobacteria, Archea
Escherichia coli
Bacillus anthracis

Eukaryotic Cell :-

Eukaryotic cells are complex cells characterized by the presence of true, membrane bound nucleus that contains genetic material. It also consist of membrane bound organelles like mitochondria and chloroplasts. The genetic material can be linear, circular etc. For movement, most of them have proper well developed structures.

e.g Yeast cells
Human cells.

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Cells' Response to External Stimuli:-

Cells respond only to threshold stimuli. When there is a threshold stimulus, the receptor proteins on the surface of cell membrane respond by setting on the transduction pathway. This pathway converts the external signal into an internal cellular message such as activation of second messenger or intracellular proteins. This signalling leads to specific cellular responses such as changes in gene expression, enzyme production, or cell movement altering the cell's behavior.

Maintenance of Homeostasis:-

Cells maintain homeostasis by controlling their internal environment. The cell membranes are selectively permeable to various ions, molecules etc which maintain the internal environment of cell. Additionaley, cells have glands i.e sweat glands which regulate the water and nutrients contents. Skin itself and kidney ~~to~~ are a major organs for maintaining homeostasis that work by filtering the nutrients and water molecules, retaining essential salts and nutrients and excreting

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unnecessary by products. Cell signalling and communication initiates signalling cascades that regulate cellular activities and contribute to overall tissue and organ homeostasis. Cells are also involved in apoptosis which can also regulate homeostasis.

(b)

⇒ **Working of Mobile Phones:-**

Mobile phones work like two way radios, converting voice into digital signals that are transmitted as radio waves to a nearby cell tower. This signal then travels through the cellular network, which uses a system of cell towers and fiber optics, to reach a tower nearby recipient. The recipient's tower then sends the signal to their phones, which converts it back into sound or data for them to receive. Following is the step by step breakdown:-

1. **Signal Creation:-**

Phone's microphones convert voice into digital electrical signals. These signals are then packaged into electromagnetic waves by an antenna.

2. **Transmission to Cell Tower:-**

The phone sends these

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radiowaves to the closest cell tower.

3. Network Routing:-
The cell tower, acting as a relay station, sends the signal through the cellular network.

4. Wired Connection:-
The signal travels via fiber optic cables to a base transceiver box at the nearest cell tower to the destination.

5. Destination Cell Tower:-
The destination tower receives the signal and converts the light pulses back into radio waves.

6. Recepient's Phone:-
The signal is transmitted to the recipient's phone, which converts the digital signal back into sound waves so they can hear the voice.

⇒ **Key Technologies Enabling Mobile Communication:-**

Key technologies enabling mobile communication include cellular networks, which divide geographic areas into cells for signal reuse, and seamless handover, and wireless communication protocols like 4G LTE and 5G NR, which provide high speed data and low latency connections.

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Cellular Networks :-

Cellular structure :-

The land is divided into small cells, each with a radio base station. This structure allows for frequency reuse in different cells, significantly increasing network capacity.

Handover :-

As a user moves between cells, their device seamlessly connects to the next base station, ensuring uninterrupted communication.

Wireless Communication Protocols :-

4G LTE

A widespread standard for high speed data transfer and improved connectivity.

4G (New Radio)

The latest generation, offering enhanced mobile broadband, ultra low latency, greater device connectivity, and higher reliability.

Advanced Network Technologies :-

MIMO

Multiple Input Multiple Output

Uses multiple antennas to send and receive signals, increasing data capacity and improve signal quality.

Beamforming

A technique that directs wireless

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signals towards specific devices, improving efficiency and reducing interference.

Small cells

Denser deployment of smaller base stations to enhance capacity and coverage, especially in congested areas.

mmWave

Utilizes higher frequency bands to achieve much greater bandwidth, enabling faster data rates.

⇒ **Advantages of Mobile Phone Use :-**

Following are some of the advantages of mobile phone use

i) Enhanced communication
ii) Entertainment access
iii) Productivity tools
iv) Information and education
v) Convenient navigation
vi) Emergency assistance
vii) Financial convenience.

⇒ **Disadvantages of Mobile Phone Use:-**

i) Physical ailments.
ii) Sleep disruption
iii) Radiation exposure
iv) Cyberbullying
v) Privacy and security risks
vi) Social isolation
vii) Reduced attention span
viii) Environmental impact.

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⇒ **Impacts of Mdaie phone Usage on Social Interactions and Mental Health :-**

Social Isolation

Depression and anxiety

Overuse of phones, particularly social media, is linked to increased feelings of envy, social isolation, depression and anxiety.

Despite connecting people, virtually, excessive use can decrease face to face interactions, weaken real world relationships and contribute to a sense of disconnect.

⇒ **Mobile Phones and Their Role in**

a) **Communication :-**

Instant and Global Communication :-

People can now communicate with anyone, anywhere at anytime breaking down geographical barriers and fostering real time interactions across continents.

Versatile Channels :-

Communication is no longer limited to voice calls. Mdaie phones offer a wide range of platforms, including text messages, video calls, and social media catering to diverse communication needs.

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Personal and Accessible :-

Mobile phone serve as a personal communication device, making communication more direct and accessible to individuals, which has helped bridge the digital divide in many developing countries.

Social and Political Impact :-

Mobile phones have become tools for social and political tools, enabling the organization of social movements, raising awareness, and advocating for change.

b) **Access to Information :-**

On-Demand Information :-

Mobile phones provide instant access to a vast array of information, from news and educational content to entertainment and practical information, whenever and wherever it is needed.

Personalized Information Consumption :-

User can customize their information intake through news apps, social media, and streaming services, shifting away from one size fits all approach to information.

Educational & Financial Inclusion :-

Mobile platforms have opened up new avenues for education and financial services, such as mobile

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money platforms, bringing essential services to underserved populations.

Contextualized knowledge:-

With the ability to search and access information on the go, mobile phones allow for more contextualized learning and decision making, whether for travel, work or daily life.

(C)

Layers of Earth:-

The earth is structured by its chemical layers and mechanical layers.

a) Chemical layers:-

Crust:- The outermost, thin, rocky layer where life exists.

Mantle:- A thick- dense, semi solid layer of rock beneath the crust that behaves like a very slow fluid due to intense heat.

Outer Core:- Liquid layer of molten metal, primarily iron and nickel, surrounding the inner core.

Inner Core:- Extremely hot, solid, dense ball of iron and nickel at the Earth's centre.

b) Mechanical layers:-

These layers are defined by

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their physical strength and elasticity.

Lithosphere :- Rigid, outermost layer, which includes the crust and the uppermost part of the mantle.

Asthenosphere :- The semi solid, weaker layer beneath the lithosphere, upon which tectonic plates rest.

Mesosphere (Lower Mantle) :- The stronger, deeper part of the mantle beneath the asthenosphere.

Outer Core :- A molten liquid layer.

Inner Core :- A solid dense layer.

How the Layers Interact :-

a) Tectonic Activity :-

The convection currents in the mantle's asthenosphere cause the rigid lithosphere plates to move, leading to processes like earthquakes, and volcanic activity.

b) Magnetic Field :-

The swirling molten metal in the outer core generates Earth's magnetic field, which protects the planet from harmful solar radiations.

c) Heat Transfer :-

Heat from the Earth's inner core is transferred outward through the mantle to the crust, a process that drives the convection responsible for plate tectonics.

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⇒ **Process of Water cycle :-**

i) Evaporation :-

Solar energy heats water from oceans, lakes and rivers, turning it into water vapor, which rises into the atmosphere.

ii) Transpiration :-

Plants and trees release water vapour from their leaves into the atmosphere.

iii) Condensation :-

Water vapour in the atmosphere cools and turns back into liquid water, forming clouds.

iv) Precipitation :-

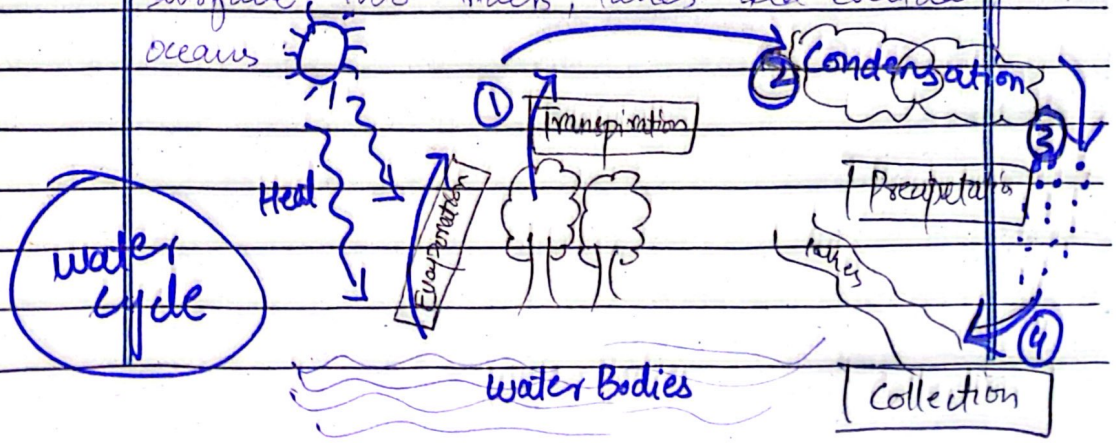
When clouds become too full, water falls back to Earth as rain, snow, sleet or hail.

v) Infiltration :-

Precipitation seeps into the ground becoming ground water.

vi) Runoff :-

Water flows over the land's surface, into rivers, lakes and eventually oceans.



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How water cycle supports life:-

i) Provision of Freshwater:-

Water cycle is primary way freshwater is renewed, making it available for drinking, agriculture, support ecosystems.

ii) Temperature Regulation:-

Helps regulate temperature by absorbing and releasing heat energy

iii) Supports Plant Growth:-

Plants need water for photosynthesis and nutrient uptake, and the water cycle ensures a continuous supply of agricultural and natural vegetation.

⇒ Other ways by which water cycle supports life are:

- Transporting nutrients
- Maintaining ecosystems
- Connecting global systems.

Impact of Human Activities on Earth's Ecosystem and Natural Resources:-

Human activities impact the ecosystems and natural resources in following ways

i) Pollution
ii) Deforestation and habitat loss
iii) Resource depletion
iv) Climate change
v) Biodiversity loss

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vii) land degradation
viii) Introduction to invasive species
ix) Ecosystem disruption

Consequences for the Environment and Society:-

i) Environmental Degradation
ii) Harm to human health
iii) Resource scarcity and conflict
iv) Mass extinction.

SECTION - II

Q#5

a) let,

3 consecutive prime numbers are

$x+3$, $x+5$, $x+7$.

So, $x+3+x+5+x+7 = 187$.

$3x + 15 = 187$.

$x = \frac{187-15}{3} = \frac{172}{3}$

$x = 57.33$

$\Rightarrow x+3 = 57.33+3 = 60.33$

$\Rightarrow x+5 = 57.33+5 = 62.33$

$\Rightarrow x+7 = 57.33+7 = 64.33$

Hence the consecutive nubers are

60.33, 62.33, 64.33

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(b)

Let the positive number be x

reciprocal of the number $= 1/x$

$$x + 17 = 60\left(\frac{1}{x}\right) \rightarrow (1)$$

$$x(x+17) = 60$$

$$x^2 + 17x - 60 = 0$$

~~$x^2 + 12x + 5x - 60$~~

$$x^2 + 20x - 3x - 60 = 0$$

$$x(x+20) - 3(x+20) = 0$$

$$(x-3)(x+20) = 0$$

$$x = 3$$

$$x = -20$$

Hence the positive number is 3