

Name: Aqsa Fatima

LMS ID: 39508

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SECTION: I

QUESTION: 2

(a)

* Main components of cell:

- i) Cell membrane
- ii) Cytoplasm
- iii) Nucleus (in eukaryotes)
- iv) Mitochondria
- v) Ribosomes
- vi) Cell wall
- vii) Chloroplasts
- viii) Golgi Apparatus
- ix) Endoplasmic reticulum

The main components of cell work together in a coordinated manner to maintain cellular functions,

responds to external stimuli and maintain homeostasis. Together, these components form an integrated system where each part plays a vital role, ensuring the cell can carry out essential functions like energy production, material transport, waste removal, and reproduction, all contributing to the overall maintenance of life.

* <u>Prokaryotic</u>	vs	<u>Eukaryotic</u>
<u>Cells</u>		<u>Cells</u>

i) lack a membrane-bound nucleus	i) possess a true nucleus ^(with nuclear membrane) .
ii) lack other membrane bound organelles	ii) contain various membrane bound organelles
iii) Genetic material is located in a nucleoid region	iii) Genetic material is compartmentalized
iv) Examples: bacteria and archaea.	iv) Examples: Animal, plant, fungal and protist cells

* Cellular response to External Stimuli and Homeostasis:

* External Stimuli: Cells detect changes in their external environment through receptors on their surface or within the cytoplasm. This triggers signal transduction pathways that lead to specific cellular responses such as changes in gene expression.

* Maintaining Homeostasis: Cells maintain a stable internal environment ('homeostasis') through feedback mechanisms. Negative feedback loops, for instance, counteract deviations from a set point, ensuring optimal conditions for cellular functions. Examples include regulating temperature, P.H and nutrient levels.

(b)

* Working of Mobile phones.

Mobile phones work by sending and receiving audios or messages through radiowaves to communicate with base stations which are connected to large networks.

When you make a call or send a message they are converted to digital signals, which are then transmitted as radiowaves to the nearest base station. The base station then routes these signals through the network to recipient's phone.

* Key technologies enabling mobile communication include:

- i) Cellular networks
- ii) Radio Frequency
- iii) Digital Signal Processing
- iv) Antennas
- v) Routers

* Advantages of using mobile phones.

- i) Facilitates quick and easy communication over long distance.
- ii) Access information.
- iii) Real-time navigation and location service.
- iv) Enables quick emergency service.
- v) Productivity tools.

These advantages leads to quick and easy social interactions further leading to mental peace.

* Disadvantages.

- i) Reduced face to face interaction and potential social isolation if overused.
- ii) Excessive use leads to screen addiction, anxiety, depression and sleep disturbances.
- iii) Distraction especially in studying and driving.
- iv) Privacy concerns.

* Mobile Phones have Changed communication and information access.

- i) Enabled constant connectivity, making communication possible any time, anywhere.
- ii) Democratization of information
- iii) Rise of social networking platforms.
- iv) Shifting communication methods (Text and voice).
- v) Mobile-first approach to services.

(())

* Different layers of Earth:

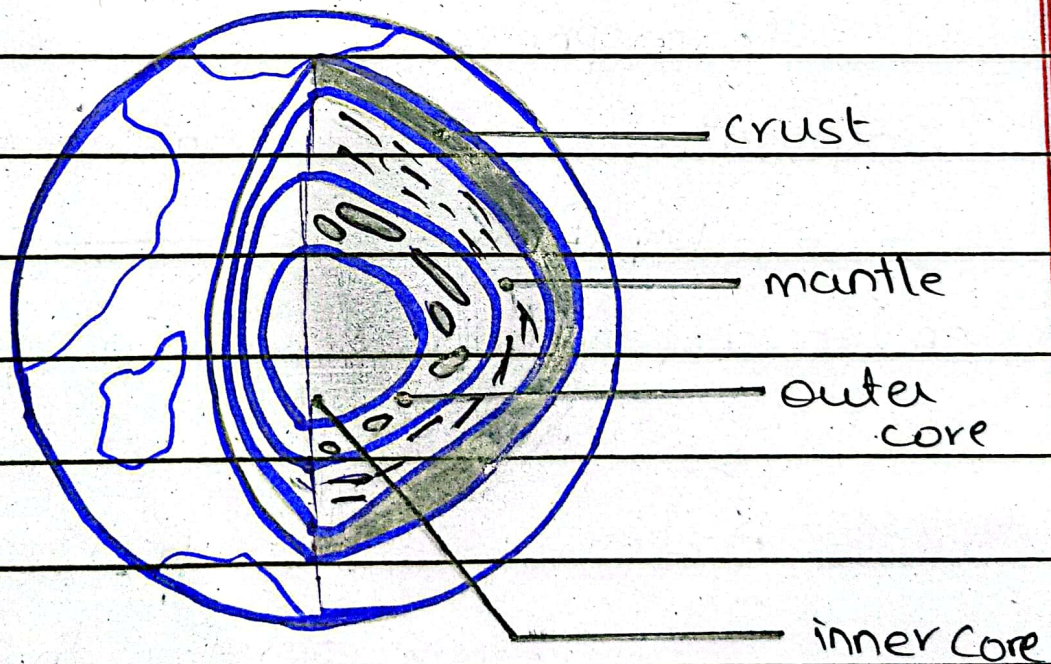
- Crust - outermost solid layer
- Mantle: beneath crust, convection currents drive tectonic plates.
- Outer Core: liquid layer, generates earth's magnetic field
- Inner Core: solid, extremely hot center of Earth, made of iron and nickel.

These layers interact dynamically.

* Interaction of Earth layers.

These layers interact through processes like tectonic plates (driven by mantle convection), which causes earthquakes, volcanic activities and mountain formation.

The liquid outer core's movement creates the magnetosphere, protecting Earth from solar radiation.



* layers of Earth

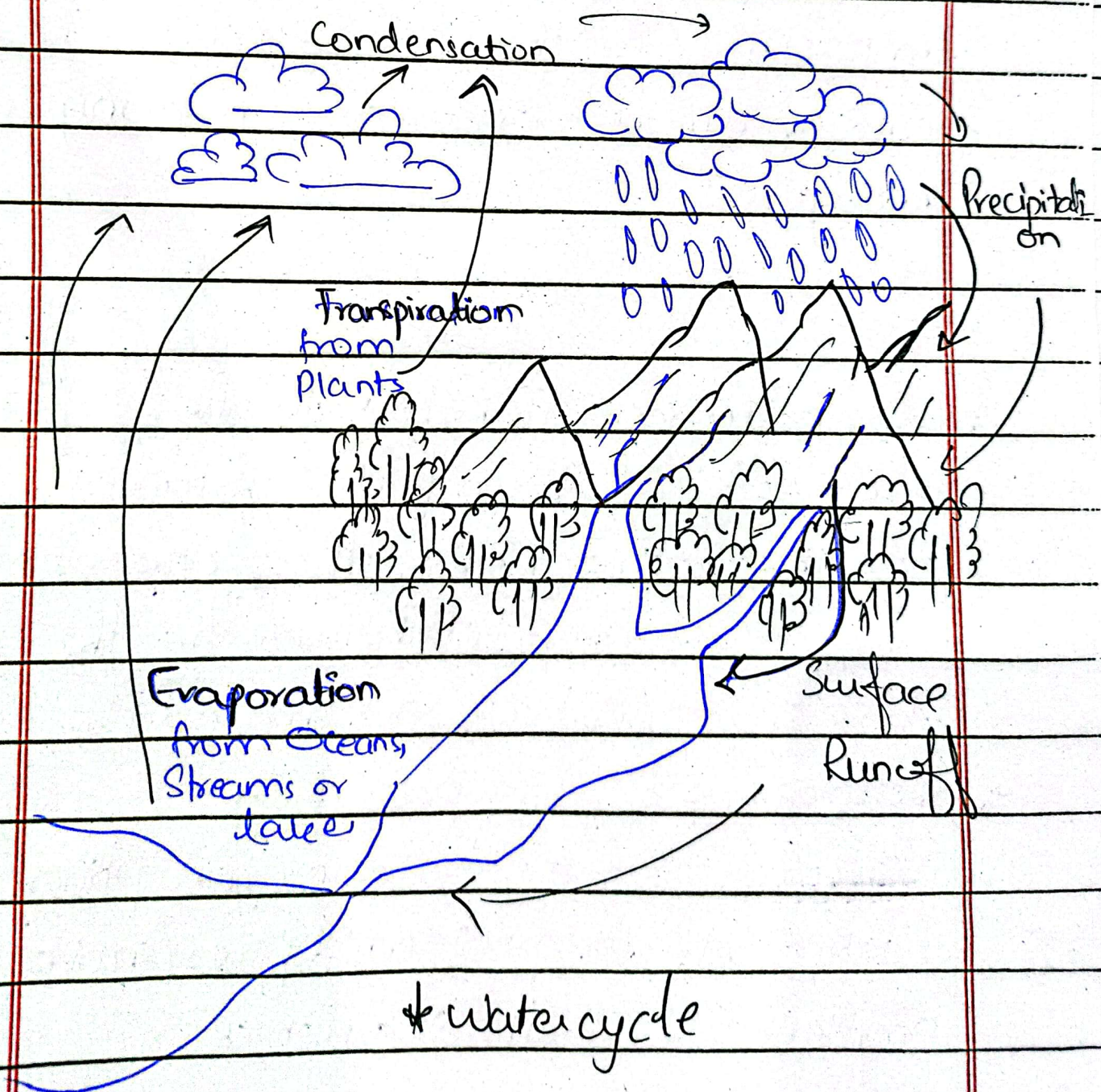
* Earth's water cycle and how it supports life on our planet?

The Earth's water cycle also known as hydrologic cycle describes the continuous movement of water on, above and below the surface of Earth. Key processes include:

- i) **Evaporation:** water turning into vapor and rising into the atmosphere.
- ii) **Transpiration:** Water vapor released by plants.
- iii) **Condensation:** Water vapor forming clouds.
- iv) **Precipitation:** Water falling back to Earth as rain, snow etc.
- v) **Collection / Runoff:** water gathering in bodies of water or flowing over the land.

Date

The cycle is crucial for life as it distributes water globally, replenishes freshwater sources, regulates climate and facilitates nutrient cycling all essential for ecosystem and natural resources along with human survival.



* Impact of human activities.

- i) Deforestation
- ii) Pollution
- iii) Overexploitation of resources
- iv) Climate change
- v) Urbanization and land use

All these activities are significantly impacting Earth's ecosystem and natural resources in many ways.

(d)

* Air pollution: It refers to the presence of harmful substances in the atmosphere that can negatively impact human health, the environment and materials.

* Sources of Air pollution.

- Natural sources: volcanic eruptions (ash, sulphur dioxide), wild fires (smoke, particulate matter), dust storms, pollen, natural decay of organic matter.

- Human sources, Industrial Emissions:
(factories, power plants) burning fossil fuels, releasing sulfur dioxide, nitrogen oxides, particulate matter.
- Vehicle Emissions: Cars, Trucks, buses (burning gasoline/diesel release carbon monoxide, nitrogen oxides, volatile organic compounds etc.)
- Agricultural activities: livestock (methane), fertilizers (ammonia), pesticide spraying.
- Residential activities: burning of coal/wood for heating; cooking etc.

* Effects of Air Pollution:

• On Human Health:

- ↳ Respiratory problems
- ↳ Cardiovascular diseases
- ↳ Lung Cancer
- ↳ Neurological issues
- ↳ Eye Irritation
- ↳ Skin Problems

• On Environment:

- Causes Acid rain
- Smog
- Climate change
- Damage to ecosystem.

* Primary Air Pollutants Vs Secondary Air Pollutants

→ emitted directly into atmosphere

→ e.g CO, SO₂, NO_x, PM and VOCs.

→ formed in atmosphere through chemical reaction.

→ These reactions occurs between primary pollutants and other atmospheric components.

→ E.g O₃ formation.

* Reducing Air Pollution through Individual and Collective Actions.

o Individual Actions

- Reduced vehicle use
- Turning off extra appliances
- Reuse and recycle
- Planting trees.

◦ Collective Actions.

- Governmental regulations
- Promotion of renewable energy
- Public awareness campaigns
- Technological advancements
- International cooperation.

QUESTION: 3

(a)

◦ Big Bang Theory:

It is the prevailing cosmological model for the universe's earliest known **periods** and **subsequent** large scale **evolution**. It posits that Universe began from extremely **hot, dense singularity** and has been expanding and **cooling** ever since, leading to formation of stars, galaxies and cosmic structures. It was first proposed in **1927** by **George Lemaitre**.

* Role of Dark matter and dark energy in universe expansion:

Dark matter is hypothetical form of matter that does not interact with electromagnetic radiation, making it invisible to direct observation, but its gravitational effects are inferred from galaxy rotation curves and gravitational lensing. Dark energy is hypothetical form of energy that permeates all of space and is responsible for the observed accelerated expansion of universe.

* Key evidence supporting Big Bang Theory:

It includes the observed expansion of the Universe (Hubble's law) and cosmic microwave background radiation, the abundance of

light elements and large scale structure of universe.

(b)

* Galaxy: It is a gravitationally bound system of stars, stellar remnants, interstellar gas, dust and dark matter.

* Classification: Galaxies are primarily classified by their visual morphology, including spiral (barred and unbarred), elliptical and irregular galaxies.

* Structure and Composition of Milky way galaxy:

Milky way is a barred spiral galaxy consisting of a central bulge, a disk with spiral arms, and a halo. It is composed of stars, gas, dust and significant amount of dark matter.

* Evolution of Galaxies: Galaxies

are thought to form from the gravitational collapse of large clouds of gas and dark matter in the early universe.

They evolve through the process of star formation, merger with other galaxies and environmental interactions.

(C)

* Remote sensing and its use:

Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object, typically by using sensors to detect and record energy reflected or emitted from Earth's surface. In Earth observation it is used to monitor and study various aspects of Earth's environment and surface.

* The way remote sensing monitors environmental and natural disasters: Remote sensing can be used to monitor this by comparing images over taken over time. It is also crucial for natural disaster management providing data for flood mapping, earthquakes damage assessment and wild fire tracking.

(d)

* Main Functions of Human Brain:

The human brain is responsible for controlling

- Thoughts
- Emotions
- Memory
- Learning
- Sensory Processing
- Motor Control
- Regulating vital bodily functions like breathing and heart rate.

• Working of different brain regions together:

Different brain regions like cerebrum, cerebellum, brainstem specialize in various functions but work in an integrated networks through neural pathways to enable complex cognitive and physical activities.

• Factors affecting brain functions:

- Sleep quality
- Nutrition
- Stress levels

SECTION: II

QUESTION: 5

(a)

Approximate average = 187

$$= \frac{3}{62.33} \approx$$

Considering nearest prime numbers
Near 60 = 59, 61, 67 etc.

Testing and adding these
three prime numbers.

$$\text{Sum} = 59 + 61 + 67 \\ = 187$$

Hence the three consecutive prime
numbers are 59, 61 and 67

(b)

Formulating equation

$$x + 17 = 60 \times \frac{1}{x}$$

Multiplying x to clear denominator:

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

expanding and rearranging
quadratic equation

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

factorizing:

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

solving for x

$$x = -20 \text{ or } x = 3$$

Since the no. should be positive
we will choose 3, hence the
answer is $x = 3$

(C)

calculating total increase in population:

$$\Rightarrow 262,500 - 175,000 \\ = 87,500$$

Calculating total percentage increase over decade:

$$\left(\frac{87,500}{175,000} \right) \times 100\%$$

$$= 0.5 \times 100\%$$

$$= 50\%$$

Calculating average percent increase per year (over 10 years)

$$= \frac{50\%}{10} = 5\%$$

(d)

$$\text{Total cost price} = 20 \text{ dozens} \times \text{Rs } 375/\text{dozen} \\ = \text{Rs } 7500$$

$$\text{No. of eggs purchased} = 20 \text{ dozen} \times \\ 12 \text{ egg/dozens} \\ = 240 \text{ eggs}$$

$$\text{Total selling price} - \text{Total cost price} = \text{Profit}$$

305

$$\text{Total selling price} = 240 \text{ eggs} \times \text{Rs } 33/\text{egg} \\ = \text{Rs } 7920$$

$$\text{Profit} = \text{Rs } 7920 - \text{Rs } 7500 \\ = \text{Rs } 420.$$

%age profit:

$$\left(\frac{\text{Profit}}{\text{Cost price}} \right) \times 100\% = \frac{420}{7500} \times 100\% \\ = 0.056.$$

$$\text{Avg profit \%age} = 5.6\%.$$

QUESTION: 6

(a)

$$\text{product of two no.} = 120$$

$$\text{Sum of their squares} = 289$$

$$\text{let the two no. be } x \text{ and } y$$

$$\text{Given } xy = 120 \rightarrow \text{eq. 1}$$

$$x^2 + y^2 = 289 \rightarrow \text{eq. 2}$$

$$\text{Substituting values} = (x+y)^2 = 289 + 2(120)$$

$$\text{Calculating} = (x+y)^2 = 289 + 240 \\ = 529.$$

Taking square root on both sides.

$$x + y = \pm \sqrt{529} \\ = \pm 23$$

As the problem say "sum"
we will consider positive value
which will be **23**.

(b)

let Kamran's present age be k
and Salmans be s .

$$\text{Six years ago} \quad k - 6 \\ s - 6$$

$$\text{ratio } k - 6 : s - 6 \\ = 6 : 5$$

This gives

$$5(k - 6) = 6(s - 6)$$

$$5k - 30 = 6s - 36 \rightarrow \text{eq 1)}$$

$$5k - 6s = -6 \rightarrow \text{eq 1)}$$

Four years

$$k + 4 \text{ and } s + 4$$

$$k + 4 : s + 4 = 11 : 10$$

This gives

$$10(k+4) = 11(s+4)$$

$$10k + 40 = 11s + 44$$

$$10k - 11s = 4 \rightarrow \text{eq 2)}$$

×ing eq 1) by eq 2)

$$10k - 12s = -12 \rightarrow \text{eq 3)}$$

Subtracting eq 3) from eq 2)

$$(10k - 11s) - (10k - 12s) = 4 - (-12)$$

simplifying

$$\boxed{s = 16}$$

Salman's present age is 16 years.

(C)

let three numbers be A, B, C.

Given .

$$A : B \quad \text{and} \quad B : C$$

$$2 : 3$$

$$5 : 8$$

Combining ratios, common

multiple. LCM of 3 & 5 is 15.

$$A : B = 2 \times 5 : 3 \times 5 = 10 : 15$$

$$B : C = 5 \times 3 : 8 \times 3 = 15 : 24$$

$$A : B : C = 10 : 15 : 24$$

Let numbers be $10x$, $15x$, $24x$
their sum is 98,

$$= 10x + 15x + 24x$$

$$= 98$$

Combining terms.

$$49x = 98$$

$$x = \frac{98}{49} = 2$$

Second number is $B = 15x = 15(2)$

$$= 30$$

Second number is 30.

(d)

Let's the cost price be C

expectation in gain of 22.5% on C

So, Selling Price:

$$SP = CP + 0.225 \times CP$$

$$= 1.225 \times CP$$

Given, his sale was = Rs 392

$$\Rightarrow 1.225 \times C = 392$$

$$C = \frac{392}{1.225} = 320$$

$$\text{Profit} = SP - CP \Rightarrow 392 - 320 = 72$$

His profit was **Rs 72**