

Aina Shafiqat - 084

Q No 2:

(a)

Why cells form organelles? Discuss mitochondria in a human cell.

Answer:

The presence of organelles is one of the distinctive feature of eukaryotic cells. Cells make organelles to compartmentalize various biochemical reactions and organization of the cell.

Explanation: Imagine a cell as a tiny city with essential parts like power plants, factories, and waste disposal systems. These parts, called organelles, keep the cell running smoothly. Just like a cell relies on its infrastructure, a cell depends on its organelles to function and grow.

Example: Mitochondria

Mitochondria is a double-membrane organelle found in almost all eukaryotic cells.

Function of Mitochondria:



Mitochondria convert raw material (like Food) into energy (ATP) that powers everything in the cell.

Lack of proper functioning of mitochondria can lead to fatigue and other health issues.

Additional role: Mitochondria also regulates cell apoptosis, heat production, calcium storage, and vital for cellular metabolism.

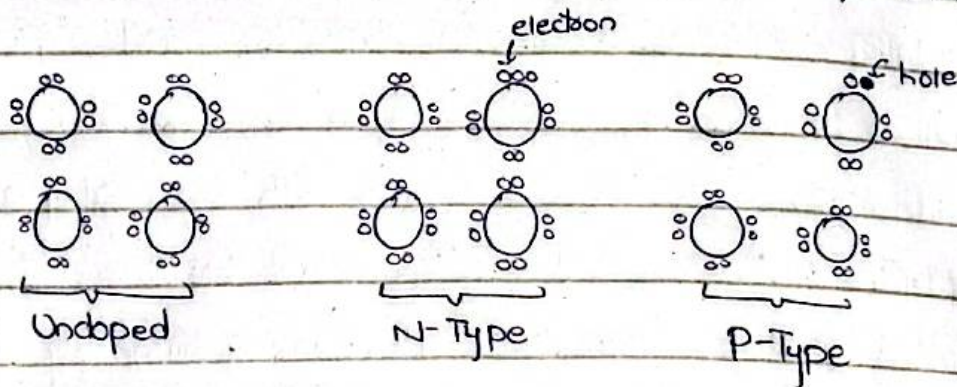
(b)

What is doping? Discuss different types of semiconductors.

"Doping is the process of adding impurities into the pure semiconductor to change its electrical properties."

Purpose:

The purpose of doping is to enhance conductivity, electrical, structural, and optical properties of semiconductors.



Common Dopants: Phosphorus, arsenic, Boron, Gallium

N-Type Semiconductor

* N-Type semiconductors formed by adding more electrons (e.g. phosphorus in silicon) producing extra electrons as majority carriers.

For example: Phosphorus

P-Type Semiconductor

P-Type semiconductors formed by adding fewer valence electrons resulting in holes as majority carriers.

For example: Boron in silicon

(c)

Volcanic Eruption Merits | Volcanic Eruption demerits

* Volcanic ash is rich of highly fertile minerals

Eruption of volcano causes destruction and

for agriculture purposes

* Geothermal Energy

For power generation, volcanic regions can be utilized to produce geothermal energy.

loss of property

Air Pollution

Volcanic eruption causes air pollution that is harmful for human health and biodiversity.

* New landmass formation

New landmass and Islands are formed when lava solidifies on earth's surface.

Climate disruption

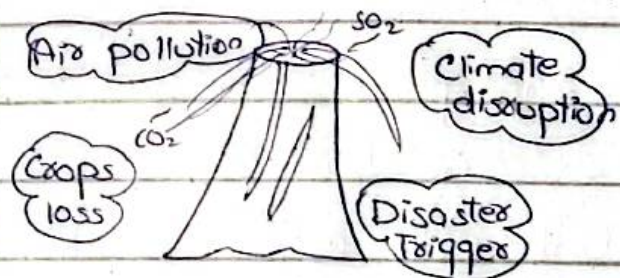
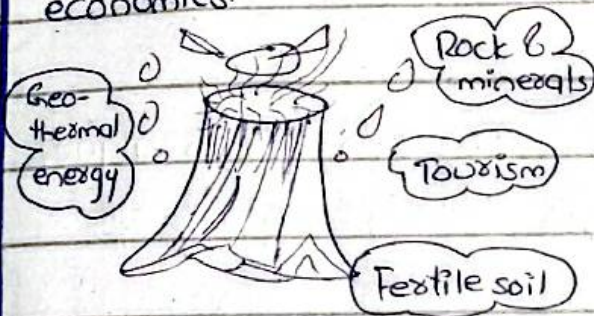
Climate disruption occurs as volcanic gases (like SO_2) block sunlight.

* Tourism Boosting

Volcanic eruption attract tourism, boosting local economies.

Natural Disasters

Eruption triggers earthquakes, Tsunamis, and landslides - worsening disasters.

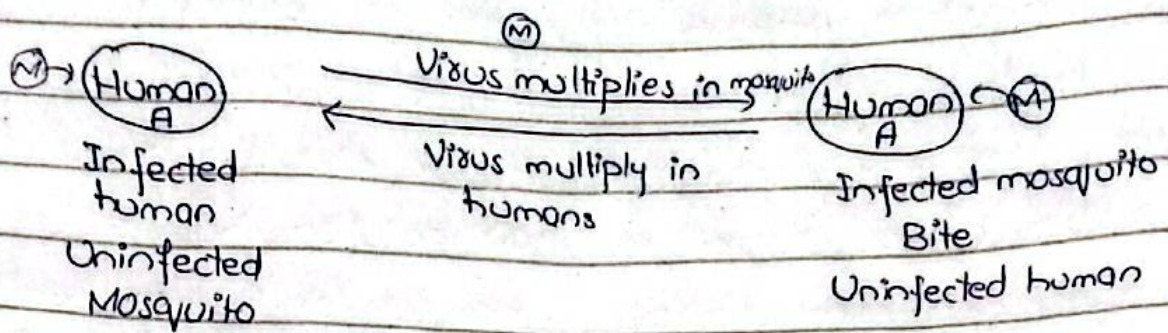


(d)

What is Dengue?

Dengue is a mosquito-borne viral disease that spread mainly through the bite of *Aedes Aegypti* mosquito.

It is caused by the Dengue virus (DEN), belonging to the Flavivirus genus.



Symptomology:

High fever, severe headache, joint and muscle pain, rash, and nausea.

Remedies:

Supportive care includes hydration, rest, using mosquito nets, and community awareness (prevention).

Q No 3:

(a)

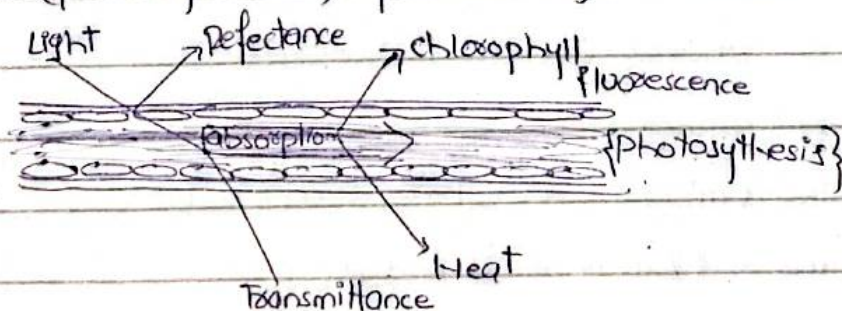
Chlorophyll

Chlorophyll is the green pigment found in plants, algae, and some bacteria. It is present in chloroplast of plant cells where it performs photosynthesis.

Function:

Absorb sunlight → Chemical energy

This process (photosynthesis) produces glucose and oxygen.



There are several types of chlorophyll.

a, b, c

Chlorophyll a is the most essential type.

Without chlorophyll, entire food chain would collapse.

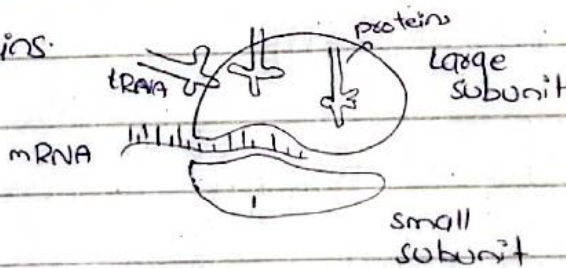
(b)

Role of Ribosomes in Protein Synthesis

Ribosomes are cellular organelles composed of RNA and proteins. They are often called as protein factories of cell as they serve as the site of protein synthesis.

How protein is synthesized?

During translation, ribosomes read mRNA code and link amino acids together using tRNA, forming a polypeptide chain. These chains fold into functional proteins.



(Ribosomes)

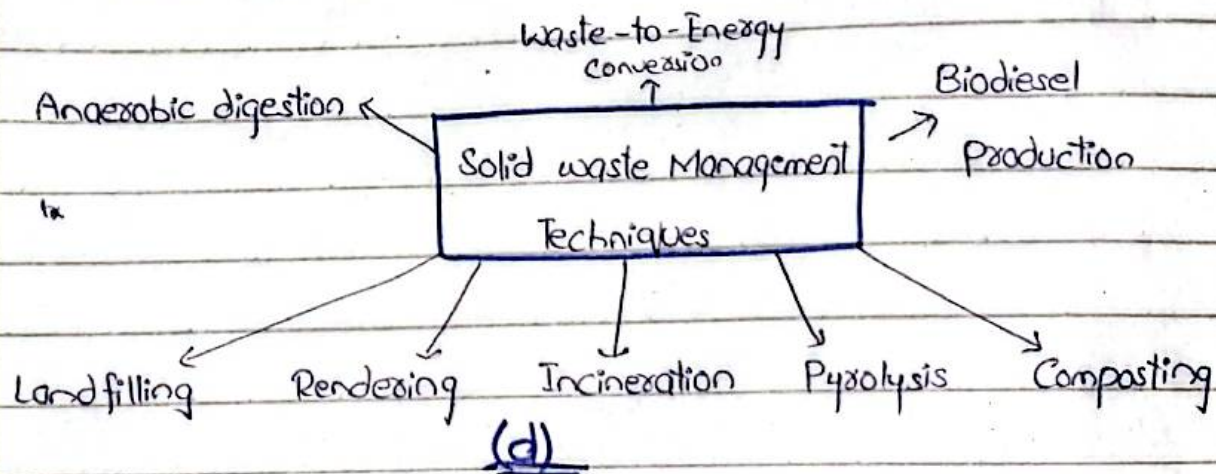
(c)

Methods of Solid ^{waste} Management

Solid Management refers to the collection, treatment, and disposal of solid materials. The major methods include:

1. Land filling - Disposing of waste in designated land

- areas, later cover with soil.
2. Incineration- Burning waste at high temperature to reduce volume and produce energy.
 3. Recycling- Reusing materials like glass, paper, and plastic to conserve resources.
 4. Composting- Decomposing organic waste into nutrient-rich manure.
 5. Pyrolysis- Thermal decomposition of organic material in the absence of oxygen.
 6. Rendering- Thermal process that converts animal by-products into usable materials.
 7. Anaerobic digestion- Chemical process in which microorganisms break down organic matter in the absence of oxygen, which results in CO_2 and CH_4 .



(d)

i) Biofuel

A renewable energy source made from biological materials like ~~cereals~~ crops, algae, or animal waste.

Example. Ethanol, biodiesel

(ii) Adulteration:

The mixing of impure/inferior or harmful substances in food or medicine to reduce cost and increase profit is known as adulteration.

(iii) Hydrosphere

The total amount of water on Earth is called as Hydrosphere that includes oceans, seas, rivers, lakes, underground water, and ice-caps.

(iv) Troposphere

The lowest layer of atmosphere, where weather changes occur and life exists; it extends upto about 12km.

(v) Isotopes

Atoms of the same element having the same number of protons but different number of neutrons.

Example: C-12, C-14

Q No 4: Section II

(4)

Data: Apple = 3

Berry = 6

Cherry = 2

Date = 5

Find: Find Berries, if Apple exceeds Date candies !
by 35.

Solution:

Let's suppose: Berry = $6x$, Apple = $3x$, Date = $5x$

Date exceeds Apple by 35:- $\text{Date} - \text{Apple} = 35$

$$5x - 3x = 35$$

$$2x = 35$$

$$\text{value of } x = 17.5$$

Berries = $6x = 6 \times 17.5 = 105$ Berry candies

(b)

Data: Price of camera = \$200

Discount = 25% Tax = 6%

Find: Total amount paid = ?

Solution: Price after discount = $200(1 - 25\%)$

$$= 200(1 - 0.25) = 0.75 \times 200$$

$$= \$150$$

$$\text{Add } 6\% \text{ Tax} = 150 \times (1 + 0.06) = \$159$$

(c)

Data: Distance = 36 km, Speed = 18 km/h, Start at 1pm

Find: Time = ?

Solution: $\text{Time} = \frac{\text{distance}}{\text{Speed}}$

$$= \frac{36 \text{ km}}{18 \text{ km/h}} = 2 \text{ hours}$$

Start 1:00pm, arrives 3:00pm

(d)

(i) STATISTICS

(ii) ALGEBRA

Q No 4:

(a)

Data: Diameter = 14cm $\pi = \frac{22}{7}$

Find: Volume of a sphere = ?

Solution: $V = \frac{4}{3} \pi r^3$

$$V = \frac{4}{3} \times \frac{22}{7} \times (7)^3 = \frac{4}{3} \times \frac{22}{7} \times 343 = \frac{4}{3} \times \frac{22}{1} \times 343$$

$$V = \frac{4}{3} \times 22 \times 49 = \frac{4312}{3} \text{ cm}^3 = 1437.33 \text{ cm}^3$$

(b)

Total savings = Rs. 25000

$$\text{ratio} = 1:2:3:4:5 = 1+2+3+4+5=15$$

Find smallest one = ?

$$\text{Smallest} = \frac{1}{15} \times 25000 = 1666.67 \text{ (approx)}$$

(c)

(i) 2, 6, 18, 54, 162, 486

$$\begin{array}{ccccccc} 2 & , & 6 & , & 18 & , & 54 & , & 162 & , & 486 & , & 1458 \\ \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} & \underbrace{\quad \quad} \\ x3 & x3 & x3 & x3 & x3 & x3 & x3 & x3 & x3 & x3 & x3 & x3 & x3 \end{array}$$

(ii) 3, 5, 7, 11, 13

3, 5, 7, 11, 13, 17

sequence of prime numbers.

(d)

Triangle with sides 5, 12, 13

Find ~~right~~ angles (all three)

(1) Check right angle:

$$(5)^2 + (12)^2 = 25 + 144 = 169 = (13)^2$$

$$\text{Angle } C = 90^\circ$$

$$(2) \sin A = \frac{5}{13} = \sin^{-1} \frac{5}{13} = 22.6^\circ$$

$$\text{Angle } A = 22.6^\circ$$

$$(3) B = 90^\circ - 22.6^\circ = 67.4^\circ$$

$$\text{Angle } B = 67.4^\circ$$