

Section - I

Question No. 03

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

Cells form organelles primary through a process called compartmentalization to increase efficiency.

Why Cells form Organelles:

1. Specialization:

Each organelles is specialized for a particular function (e.g., energy production, digestion), allowing complex task to be performed efficiently.

2. Increase efficiency:

Enzymes and reactant for a specific metabolic pathway can be concentrated within a small area, increasing the rate of reaction.

3. Isolation of harmful processes:

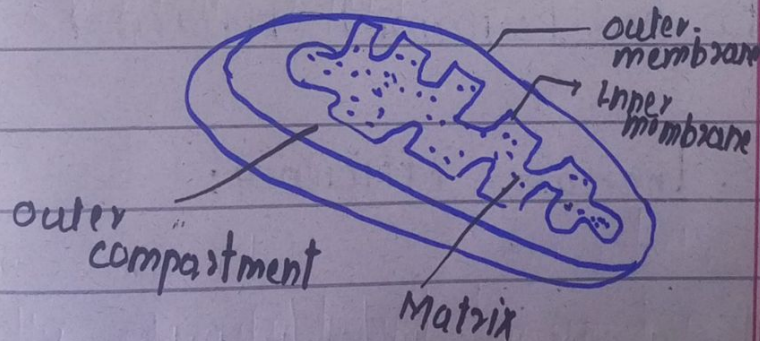
Potentially harmful processes, such as a digestive breakdown of materials by acidic enzymes in lysosomes, are safely contained within a membrane.

4. Creation of unique microenvironment:

Organelles maintain distinct internal environment (e.g., specific pH) necessary for their specialized enzyme to function correctly.

- Mitochondria in Human cell:

Mitochondria are double membrane-bound organelles in human cells, called "powerhouse of the cell."



Mitochondria

- Primary function: ATP Production:

Their main role is to

Generate the majority of the cell's energy in form of ATP.

- structure of efficiency:

The inner mitochondrial is highly folded into structures called cristae, which increase ^{surface} area for many embedded proteins.

- Role of cell signaling and death:

Mitochondria are involved in regulating cell metabolism, storing calcium ion, and initiating apoptosis (programmed cell death).

- ~~the possess their~~ own DNA

b. What is doping? Discuss different type of semiconductors.

• Doping:

Doping can be defined as;

"The process of adding impurity atoms to the pure semiconductor is called Doping."

• Purpose:

It is essential for transforming a pure semiconductor into a controllable material for application.

• Method:

- i) Thermal diffusion
- ii) Ion implantation
- iii) Chemical doping

- Different type of semiconductors:

Semiconductors are broadly classified into ^{two} main types based on their purity: Intrinsic and Extrinsic semiconductors.

Extrinsic semiconductor are further divided

into N-type and P-type.

Intrinsic semiconductors:

Intrinsic semiconductor are the purest form of a semiconductor material, such as a silicon (Si) or Germanium (Ge).

- They contain virtually no impurities.
- low electrical conductivity

Extrinsic semiconductors:

Extrinsic semiconductors are created by deliberately adding a small amount of impurity atoms to an intrinsic semiconductor to significantly increase its conductivity. The added impurity called a dopant.

- They are impure semiconductors with controlled level of dopants
- higher conductivity

- Extrinsic semiconductor $\begin{cases} \text{N-TYPE} \\ \text{P-TYPE} \end{cases}$

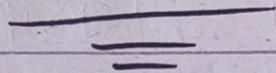
• n-type semiconductors:

Formation: Created by

doping with pentavalent impurities into a Group IV semiconductor, like Si.

• P-type semiconductors:

Formation: Created by doping with trivalent impurities into a Group IV semiconductor.



c. state some of the merits and demerits of volcanic eruption.

Volcanic eruption:

"It is the sudden and forcible expulsion of magma, gases, and ash through a vent or fissure in the Earth's crust onto the surface."

Volcanic eruptions have significant merits and demerits affecting the environment, economy, and human life.

Merits of Volcanic Eruptions:

The long term and constructive effects of volcanic activity include:

- **Fertile soils:** Volcanic ash and lava break down over time to form some of the most fertile soil.
- **Geothermal Energy:** The internal heat associated with volcanic systems can be harnessed to produce geothermal energy, a clean and sustainable source of electricity and heat. (e.g., in Iceland and the Philippines)
- **Mineral resources:** Volcanic processes bring valuable mineral deposits to the surface (e.g., copper, gold, silver, and zinc).
- **Tourism:** Dramatic landscapes attract tourism, boosting local economies and providing employment.

Demerits of Volcanic Eruptions:

- Loss of life and property:

Lava flow and lahars can cause instant death and widespread destruction.

- Health Hazards:

Eruptions release toxic gases (like sulfur dioxide and CO_2) that can cause severe respiratory problems, eye, and skin irritation.

- Environmental impact:

Large eruption can inject massive amount of ash and gases into atmosphere, which can temporarily impact global climate.

- Economic loss:

The destruction of crops, livestock, infrastructure, and disruption of local business.

d. What is dengue? Discuss symptomology, causative agents and remedies.

• Dengue:

"Dengue (also known as break-bone fever) is a viral infection transmitted to humans primarily through the bite of infected *Aedes* mosquitoes, particularly *Aedes aegypti*"

• **Symptomology:** Appear 4 to 10 days after the mosquito bite. Most people infected with dengue are experience only mild illness.

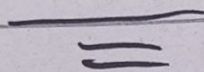
- High fever
- severe Headache and pain behind eye.
- Muscle, joints, or bone pain.
- Nausea and vomiting.
- Rash

• Causative Agent:

• Dengue is caused by the Dengue virus (DENV), an RNA virus. There are four distinct, but closely related, serotypes of the virus: DENV-1, DENV-2, DENV-3, DENV-4.

Remedies:

- Rest and hydration
- Pain relief (Acetaminophen)
- Avoid NSAIDs
- Hospital care for severe cases
- Preventions: Take measure to avoid mosquito bites, such as using repellents, wearing protective clothing, and eliminating standing water where mosquito breed.



Section - II

Q. No. 07

a. Calculate volume of a sphere with diameter 14 cm. (Use $\pi = 22/7$)

- radius is half of diameter.

$$r = d/2$$

$$r = \frac{14 \text{ cm}}{2}$$

$$r = 7 \text{ cm}$$

The formula of (v) of a sphere

$$V = \frac{4}{3} \pi r^3 \text{ . Using}$$

$\pi = 22/7$ and $r = 7 \text{ cm}$.

$$V = \frac{4}{3} \times \frac{22}{7} \times (7 \text{ cm})^3$$

$$V = \frac{4}{3} \times \frac{22}{7} \times 7 \times 7 \times 7 \text{ cm}^3$$

$$V = \frac{4312}{3} \text{ cm}^3$$

$$V \approx 1437 \text{ cm}^3$$

b. Five friends' total savings = 25,000
Rs, ratio 1:2:3:4:5. Find the smaller
share.

Sum the ratio parts:

$$1+2+3+4+5 = 15$$

value of one part:

$$\text{value of one part} = \frac{\text{Total saving}}{\text{sum of parts}}$$

$$= \frac{25000}{15} = 1666.67$$

$$\text{Smallest share} = 1 \times \frac{25000}{15} = 1666.67 \text{ Rs}$$

c. spot the error / complete the series

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

The series 2, 6, 18, 54, 162, 486

$$\bullet 6 \div 2 = 3$$

$$\bullet 18 \div 6 = 3$$

$$\bullet 54 \div 18 = 3$$

$$\bullet 162 \div 54 = 3$$

$$\bullet 486 \div 162 = 3$$

All terms fit the pattern $\times 3$. Therefore,

there is no error.

ii) 3, 5, 7, 11, -

~ prime number sequence.

3, 5, 7, 11, 13.

d) A triangle with sides 5cm, 12cm, 13cm. Find all three angles.

By pythagorean theorem

$a^2 + b^2 = c^2$, where $a = 5$, $b = 12$, $c = 13$

$$5^2 + 12^2 = 25 + 144 = 169$$

$$13^2 = 169$$

Q. No. 6

a. A store has ~~some~~ packets of candies in flavours Apple, Berry, cherry and Dates in the ratio 3:6:2:5 if apple candies exceed Dates candies by 35, how many Berry candies are there?

Number of Apple candies: $3x$

Number of Berry candies: $6x$

Number of cherry candies: $2x$

Number of Date candies: $5x$

Apple candies exceeds Date candy 35

$$\text{no. of date candies} - \text{no. of Apple candies} = 35$$

$$\text{No. of Apple candies} - \text{no. of date candies} = 35$$

$$3x - 5x = 35$$

$$2x = 35$$

$$x = \frac{35}{2} \quad x = 17.5$$

$$\text{No. of Berry candies} = 6x$$

$$= 6 \times 17.5$$

$$\text{Number of Berry candy} = 105$$



b. A camera priced at 200\$ get 25% off plus 6% tax. Calculate the amount paid.

\$ 200 with 25% discount

Discount amount

$$\$ 200 \times 0.25 = \$ 50$$

Number of Apple candies: $3x$

Number of Berry candies: $6x$

Number of cherry candies: $2x$

Number of Date candies: $5x$

Apple candies exceeds Date candy 35

$$\text{No. of date candies} - \text{no. of Apple candies} = 35$$

$$\text{No. of Apple candies} - \text{no. of date candies} = 35$$

$$3x - 5x = 35$$

$$2x = 35$$

$$x = \frac{35}{2} \quad x = 17.5$$

No. of Berry candies = $6x$

$$= 6 \times 17.5$$

Number of Berry candy = 105



b. A camera priced at 200\$ get 25% off plus 6% tax. Calculate the amount paid.

\$ 200 with 25% discount

Discount amount

$$\$ 200 \times 0.25 = \$ 50$$

Price after discount

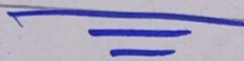
$$\$200 - \$50 = \$150$$

- 6% tax applied to

$$\$150 \times 0.06 = \$9$$

• Total paid amount paid:

$$\$150 + 9 = \$159$$



c. A bicycle covers 36 km at 18 km/hr starting at 1 pm. What time does it reach?

$$\text{Time} = \frac{\text{Distance}}{\text{speed}}$$

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

• start time: 1 pm

• Time taken: 2 hours

• Arrival time: 1:00 pm + 2 hours = 3:00 pm



ol. Unscramble these math terms

i) STSTAICTS

ii) LGEBMAR

STSTAICTS $\rightarrow$ STATISTICS

LGEBMAR $\rightarrow$ ALGEBRA

