

Part-II

Section-I.

Q.No.3.

a. Why cells form Organelles?

Discuss mitochondria in a human cell.

Cells form organelles to perform different biological functions in an organized manner. Every cell is a complex factory where thousands of functions are performed simultaneously. If all these functions took place in a single part, they would interfere with each other and it will lead to inefficiency in functions. Therefore, the cell is divided into several membrane-bound structures called organelles.

This compartmentalization allows cells to maintain certain things like;

- proper internal conditions
- metabolic efficiency.
- regulation,
- specialization.

For example;

- Nucleus controls genetic activity.
- Ribosomes produce protein.
- Mitochondria generates energy.
- Lysosomes handle digestion.

MITOCHONDRIA - THE POWER-HOUSE OF CELL.

Among all the cell organelles, mitochondria are utmost importance. They are called "The power house of cell" because they produce energy in the form of ATP (Adenosine Triphosphate) through a process called oxidative phosphorylation.

Structure:

Mitochondria are double-membraned structure.

- The outer membrane
- The inner membrane

The outer membrane is smooth and semi-permeable. The inner membrane is folded into finger like projections called cristae. The space enclosed by inner membrane is called matrix, which contains enzymes.

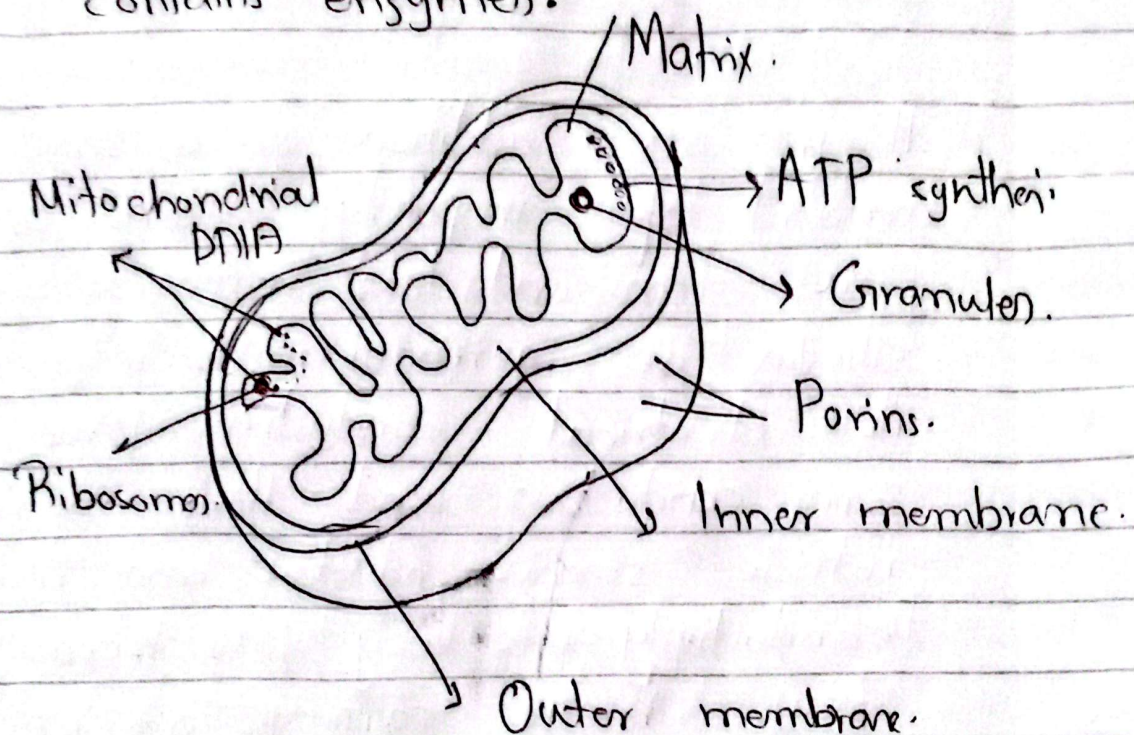


Diagram: Structure of Mitochondria.

Functions:

Mitochondria perform major functions of cells. Some are explained below.

1. Energy production..
2. Heat generation
3. Regulation of apoptosis.
4. Storage of calcium ions.

b. What is doping? Discuss Different types of Semi-conductors.

DOPING:

It is an addition of a small amount of impurity atoms to pure semiconductor material such as silicon or germanium, to improve its electrical conductivity. Pure semiconductor ~~and~~ they are called intrinsic semi-conductors and their conductivity is very low because only few charge carriers are available at room temperature. Doping modifies this by introducing extra electrons or holes, converting it into an extrinsic semiconductor.

TYPES OF SEMI-CONDUCTORS.

There are two types of semi-conductors.

1. Intrinsic Semi conductors.

2. Extrinsic Semi conductors.

Further extrinsic semi conductors are have 2 types.

(i) n-type

(ii) p-type

1. Intrinsic Semi conductors. (pure semi conductors)

They are made up of a single pure element such as silicon (Si) or germanium (Ge) without any impurity added.

→ At absolute zero (0K), they behave like an insulator because no free charge carriers are available.

→ When temperature increases, electrons pump to gain energy & jump from valence band to conduction band.

→ Number of free electrons = number of holes.

→ Conductivity increases with rise in temperature.

Example: Pure Silicon, Pure Germanium.

2. Extrinsic Semi Conductors. (Impure Semi conductors).

They are obtained by adding small amount of impurity to pure semi conductors. This process is called DOPING. It greatly increases conductivity. Depending on the type of impurity added, they are of 2 types.

1. n-type semi conductors
2. p-type semi conductors.

1. n-type Semi Conductors.

It is formed by doping a pure semi conductor with pentavalent element (having 5 valence electrons). such as phosphorus, arsenic, antimony.

2. p-type Semi Conductors.

It is formed by doping a pure semi conductor with trivalent semi conductor (having 3 valence electrons). such as boron, gallium and Indium.

c. State Some Merits and Demerits of Volcanic eruption.

Volcanic Eruption:

Volcanic eruptions are considered as natural disasters having both beneficial and harmful effects.

Merits:

1. Formation of fertile soil from volcanic ash which when weathered becomes rich in minerals like potassium and phosphorus.
2. Provide mineral resources such as copper, gold, sulfur.
3. They are source of geothermal energy which is helpful in generating electricity.
4. They contribute to new land formation when lava cools & solidifies.
5. They attract tourists and researchers benefiting local economies.

Demerits:

1. Eruptions cause loss of life, destruction

- of property and ashfall disrupts air travel.
2. Toxic gases like SO_2 are released which can lead to acid rain & respiratory diseases.
 3. They cause temporary global cooling.
 4. They affect weather pattern and food production.
 5. They cause long term economic loss and displacement of people.

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

Dengue is an acute, mosquito-borne viral infection that affects millions of people in tropical and sub-tropical regions every year. The dengue virus belongs to Flavivirus genus of Flaviviridae family.

There are 4 distinct serotypes of dengue virus.

- DENV-1.
- DENV-2
- DENV-3
- DENV-4

Symptomatology:

Symptoms of dengue usually appear 3-7 days after mosquito bite. The disease progresses through three stages.

1. Febrile
2. Critical
3. Recovery.

1. Typical Dengue fever symptoms.

1. Sudden high fever. (upto 104°F)
2. Severe headache.
3. Muscle and joint pain.
4. Nausea, vomiting & fatigue.
5. Skin rash.
6. Mild bleeding from nose and gums.

2. Severe Dengue symptoms.

1. Severe abdominal pain & vomiting.
2. Rapid drop in platelet count.
3. Bleeding under skin.
4. plasma leakage.
5. Enlargement of liver.

Causative Agents.

The causative agent of Dengue is Dengue Virus. It is transmitted by *Aedes aegypti* mosquito. breeds in stagnant clean waters.

Remedies (Treatment & Prevention)

There is no specific antiviral drug for dengue, treatment is mainly supportive and symptomatic. Early detection and proper medical care reduce the risk of complications.

Q. No. 4.

a). Write note on the plant pigment "Chlorophyll".

Chlorophyll is the green pigment found in plants, algae, and some bacteria that enables them to perform Photosynthesis, the process by which light energy is converted into chemical energy. Chlorophyll molecules are located within thylacoid membrane of chloroplasts. The pigment has a porphyrin ring with magnesium ion at the center and long hydrophobic tail called phytol which helps anchor it into the membrane.

There are several types of chlorophyll, but the 2 most important in higher plants are chlorophyll a and chlorophyll b. Chlorophyll a acts as main pigment that ~~part~~ participates in photosynthesis and chlorophyll b functions as an accessory pigment, absorbing light at wavelength that chlorophyll a cannot and transferring that energy for

use in Photosynthesis. The functions of absorption spectrum of chlorophyll are to capture light, transfer absorbed energy and convert light into ATP and NADPH.

Strong absorption $\rightarrow$ blue & red light
Weak absorption $\rightarrow$ green light. (reflected and gives plants green colour).

Thus, chlorophyll is vital for sustaining life on earth because it enables plants to produce food and release oxygen.

b). Describe role of Ribosomes in Protein Synthesis.

Ribosomes are small granular structures made of rRNA and proteins. They are found freely floating in the cytoplasm or attached to rough endoplasmic reticulum (RER). They serve as sites of protein synthesis in all living cells.

Process of Protein Synthesis.

mRNA from nucleus → binds to ribosome.



Initiation: Initiator tRNA brings methionine.



Elongation: tRNA brings amino acids one by one



Termination: polypeptide chain released.



Protein folds into functional shape.

Ribosomes have three active sites.

1. A sites receives new tRNA carrying an amino acid.
2. P site: holds the growing peptide chain.
3. E sites release empty tRNA after amino acid transfer.

Ribosomes attached to RER synthesize proteins for secretion or membrane use, while free ribosomes synthesize proteins for use inside the cell.

c. Discuss different methods of Solid Waste management.

Solid waste management involves the collection, treatment, and disposal of solid materials generated by human activities in an environmentally safe way. Its goal is to protect public health, reduce pollution, and recover useful resources.

Methods of Solid Waste Management

1. Source Reduction and Reuse.

Minimizing waste generation and reusing items. It is cost effective and environment friendly.

2. Recycling:

Converting waste material into new products (paper, glass, plastic, metal). It conserves energy and saves energy.

3. Composting.

Biological decomposition of organic

waste into compost. It produces fertilizer and reduce landfill load.

4. Incineration

Burning waste at high temperature and produce electricity. It reduces waste volume and generates energy.

5. Sanitary landfilling.

Engineered disposal with liners, leachate treatment and gas recovery. It is simple and controlled method.

6. Anaerobic digestion

Microbial breakdown of organic waste without oxygen, producing biogas. It is renewable energy and reduces methane emission.

d). Define Following Terms.

1. Biofuel.

They are derived from biological sources such as waste of animals and plants. They are renewable and can replace fossil fuels. For example; ethanol from sugarcane, biodiesel from organic waste. It reduces greenhouse gas emissions and dependence on petroleum.

2. Adulteration

It is the mixing of inferior, harmful, or cheaper substance with food, drink or medicines to increase profit. For example: adding water to milk, artificial dyes to food items and spices or chalk powder to flour.

3. Hydrosphere:

It includes all form of water present on earth, lake, oceans, seas, rivers, glaciers, groundwater, and water vapour in atmosphere.

4. Troposphere:

It is the lowest layer of Earth's atmosphere, extending up to about 8-15 km from the surface.

All weather phenomena like, rain, clouds, and storms occur here.

5. Isotopes.

Isotopes are atoms of same element having same number of protons but different number of neutrons. Therefore they have the same atomic number but different mass numbers.

Section-II.

Q. NO. 6.

a).

Ratio Apple: Berry: Cherry: Date = 3:6:2:5

Let common factor be = k .

$$\text{Apple} = 3k$$

$$\text{Date} = 5k$$

$$\text{Apple} < \text{Date}$$

Let's assume date exceed apple by 35.

So,

$$\rightarrow 5k - 3k = 35$$

$$\rightarrow 2k = 35$$

$$\rightarrow k = 17.5$$

Berry

$$6k = 6 \times 17.5 = 105.$$

Answer = 105 berry candian.

b).

→ Original price = \$ 200

→ Discount = 25% of 200.

$$200 \times \frac{25}{100} = 50$$

→ $200 - 50 = 150$ (price after discount).

→ add tax.

Tax = 6% of 150.

$$150 \times \frac{6}{100} = 9.$$

→ Total amount.

$$150 + 9 = 159.$$

→ Total amount paid = \$ 159.

c).

Distance = 36 km

Speed = 18 km/h

Starting time = 1:00 pm.

Formula = $\frac{\text{Distance}}{\text{Speed}}$

Solution.

$$\text{Time} = \frac{36}{18} = 2 \text{ hour.}$$

Now,

Start time = 1:00 pm.

add 2 hour.

$$1:00 + 2:00 = 3:00 \text{ pm.}$$

The bicycle reach at 3:00 pm.

d).

i. STSTAICTIS → Statistics.

ii. LGEBMAR. → Gramble.

h)

Q. No. 7.

a)

Calculate volume of sphere with diameter of 14 cm.

→ Use $\pi = 22/7$.

Given data:

Diameter = 14 cm

Radius = 7 cm.

Formula.

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

Solution.

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

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

$$\text{Volume} = 1437.33 \text{ cm}^3$$

b).

5 friends total saving = 25000 RS;
ratio = 1:2:3:4:5.

find smallest share.

Given data.

→ Sum of ratio = $1+2+3+4+5 = 15$.

→ total = 25,000.

Solution.

$$\text{Volume of 1 part} = \frac{25000}{15} = 1666.67$$

$$\boxed{\text{Smallest share} = 1666.67}$$

c).

i). No error.

ii). 3, 5, 7, 11, 13 → series of odd prime numbers.

$$\boxed{\text{Next number} = 17}$$

d).

Triangle has sides: 5 cm, 12 cm, 13 cm.

find all angles.

Given data.

Sides: 5 cm, 12 cm, 13 cm.

$$\Rightarrow 5^2 + 12^2 = 13^2$$

$$\Rightarrow 25 + 144 = 169.$$

It's right triangle.

Solution.

Right angle = 90° .

$$\sin \theta = \frac{5}{13} \Rightarrow \theta = \arcsin\left(\frac{5}{13}\right) = 22.62^\circ$$

$$3^{\text{rd}} \text{ angle} = 90 - 22.62 = 68$$

Angles =

i) 90°

ii) 22.62°

iii) 68°