

Date: ___/___/20___

Day: _____

Name: Faxah Noor

Batch # ISB OB 83

Mock Exams "General Science and Ability"

Part-II

— (SECTION-I) —

QUESTION #3

— Q. No. —

Why cells form organelles? Discuss Mitochondria in "Detail human cell."

Cells Form Organelles:-

An organelle is a subcellular structure. Organelles are compartments inside cells that perform different functions for cell. Cells form organelles to compartmentalize functions, creating specialized compartments which allow cells to function normally with greater efficiency. These organelles help in regulation, and coordination of functions within cell.

- This separation prevents incompatible chemical reactions from interfering with each other and allows for the creation of specific internal environments, such as acidic environment inside of a lysosome.
- This division of labour is necessary for carrying out complex chemical reactions. For example **Nucleus** stores genetic information and controls the cell functioning whereas **Mitochondria** generates ATP through cellular respiration which is critical for all life processes. Similarly all other organelles perform distinct functions.

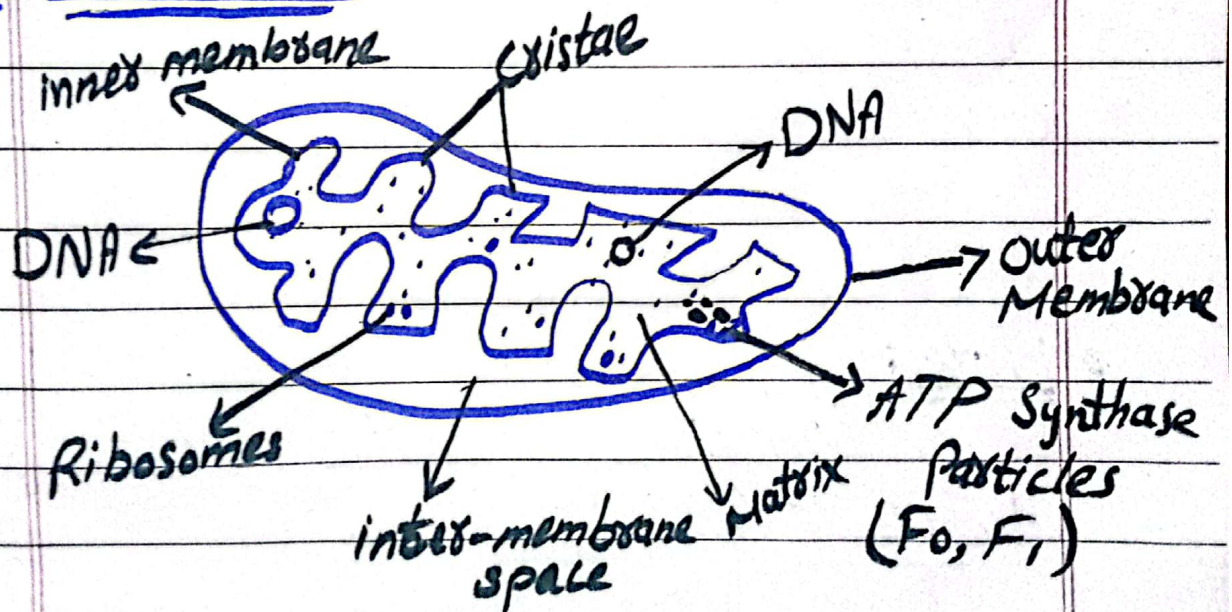
- Compartmentalization is crucial for controlling many processes occurring within cell. Separating machinery of transcription (in the nucleus) from translation (in the cytoplasm) ensures that RNA is properly processed before being used to make proteins.

⇒ **Thus,** cells compartmentalize themselves in the form of organelles for greater efficiency, regulation and organization within cells.

Mitochondria in Human cells-

Mitochondria is double membrane bound organelle within a human cell. It is also called the **Power house of the cell** because it generates an energy currency molecules called **ATP** which is crucial for all life processes of a human.

* Structure:-



Mitochondria is composed of bounded by two membranes that is outer membrane and inner membrane.

⇒ Inner membrane forms infolding called cristae. Liquid material inside the

inner membrane is called Matrix.

⇒ The space between outer and inner membrane is called inter-membrane

space. Functions:-

⇒ ATP synthase particles (F_0 and F_1) are located at inner membrane which are used for synthesizing ATP (Adenosine Tri phosphate), during cellular respiration, which is cell energy currency.

⇒ Mitochondria are self-replicating bodies because they have their own DNA and ribosomes which allows them to replicate independently and to synthesize proteins.

● Note:-

Inheritance of Mitochondria within Human cell:-

Mitochondria is inherited from mother in human cell.

* Presence of Mitochondria in Human cells:-

Mitochondria are present in all human cells except mature red blood cell and mature sperm cells.

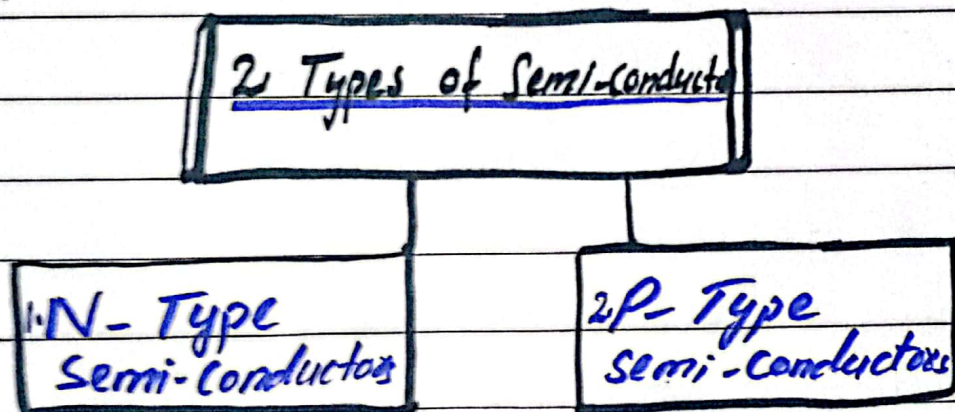
QUESTION #3

~~a b p~~

* Doping:-

The process in which impurities are added into semiconductors to boost up their conducting properties is called doping.

* Types of Semi-conductors:-



1. * N-Type Semi-Conductors:-

The semi-conductors which are formed due to result of the doping of pentavalent electron donor impurities like arsenic and antimony in silicon and germanium semiconductors are called N-Type semiconductors.

* Example - Silicon Crystal Doping with Arsenic:-

Silicon is an insulator at low temperature because it has ^{four} valence electrons which form covalent bonds with neighbouring atoms. All of the ~~four~~ valence electrons form covalent bonds.

When Silicon crystal is doped with a pentavalent element Arsenic, then four out of five valence electrons of ~~silicon~~ ~~arsenic~~ form covalent bond with four valence electrons of silicon. The fifth valence electron is free to move and acts as a charge carrier making silicon crystal a better conductor.

2. P-Type Semiconductors:-

The semiconductors which are formed due to the result of doping of **trivalent electron deficient impurities** like boron and indium in the silicon and germanium semiconductors are called P-Type semi-conductors.

Doping of Silicone with Indium:-

All the three valance electrons of Indium form covalent bonding with 3 out of 4 valance electrons of Silicone. A space called a **hole** is left in silicon crystal due to shortage of electrons. This hole acts as a positive charge and can move from one place to another on the application of potential difference, making silicon a better conductor.

QUESTION # 3

~~Q.3~~

Merits and Demerits of Volcanic Eruptions.

Volcanic eruption have both merits and demerits.

* Merits of Volcanic Eruptions:-

1. Geothermal energy can be generated in areas where magma lies close to surface. This energy can be harnessed as renewable energy.
2. Ash ejected by volcano acts as a good

- fertilizes for soil.
- 3) Volcanoes attract many tourists who enjoy the dramatic scenery that they produce.
 - 4) Volcanic rock can be used for building materials and making products like porcelain.
 - 5) Numerous types of landforms are created due to cooling and solidification of magma below the earth's surface and lava above the surface. They also bring valuable minerals like gold and silver to surface.

* Demerits:-

1. Volcanoes are dangerous, They can kill people and animals and damage property.
- 2) Economic activity can suffer as it is hard for business to operate after an eruption.
- 3) Habitats and landscapes are damaged due to lava flows.

4) Volcanic ash can cause respiratory issues.

5) Eruptions can lead to air pollution and the resulting gasses can impact global climate.

QUESTION # 3

~~Ad B~~

* Dengue:-

Dengue fever is also known as break Bone fever. Dengue fever is a painful viral infection that is spread from mosquito to people.

Dengue virus ~~aff~~ infects 50-100 million individuals annually.

* Symptomology:-

Symptoms which usually begin four to six days after infection and last for upto 10 days may include:

- Sudden high fever
- Severe headache
- Pain behind the eyes.

- Severe joint and muscle pain
- Fatigue
- Vomiting
- Nausea.
- Skin Rash.

* Causative Agents:-

Dengue is mosquito-borne disease caused by any one of the five closely related dengue viruses. Dengue is transmitted by several species of mosquito within genus *Aedes*, principally *A. aegypti*.

* Remedies:-

There is no specific medicine to treat dengue infection. Pain relievers with acetaminophen can be used and medicines with aspirin should be avoided which could worsen bleeding. Complete rest and drinking plenty of fluids and getting examined from doctor is necessary.

QUESTION #04

~~Q4B~~

Plant Kingdom:-

Plantae is plant kingdom which includes all plants on earth. These are multicellular eukaryotes.

*Chlorophyll:-

All the plants have green pigment called chlorophyll in the chloroplast within leaves. It absorb sunlight and reflects green light. It has certain pigments called chlorophyll a, b which carry out photosynthesis. Here water molecules is broken, ~~to~~ in process of photosynthesis.

⇒ Chlorophyll is necessary for production of carbohydrates in the process of photosynthesis.

* Plant Kingdoms:-

Kingdom Plantae

is subdivided into four subgroups.

1. Thallophyta
2. Bryophyta
3. Pteridophyta
4. Phanerogamae

- Gymnosperms
- Angiosperms.

⇒ Thallophyta - lower most plants.

⇒ Bryophyta - small terrestrial plants

⇒ Pteridophyta - oldest vascular plants

⇒ Phanerogame - seed-bearing plants

~~ab~~

* Role of Ribosomes:

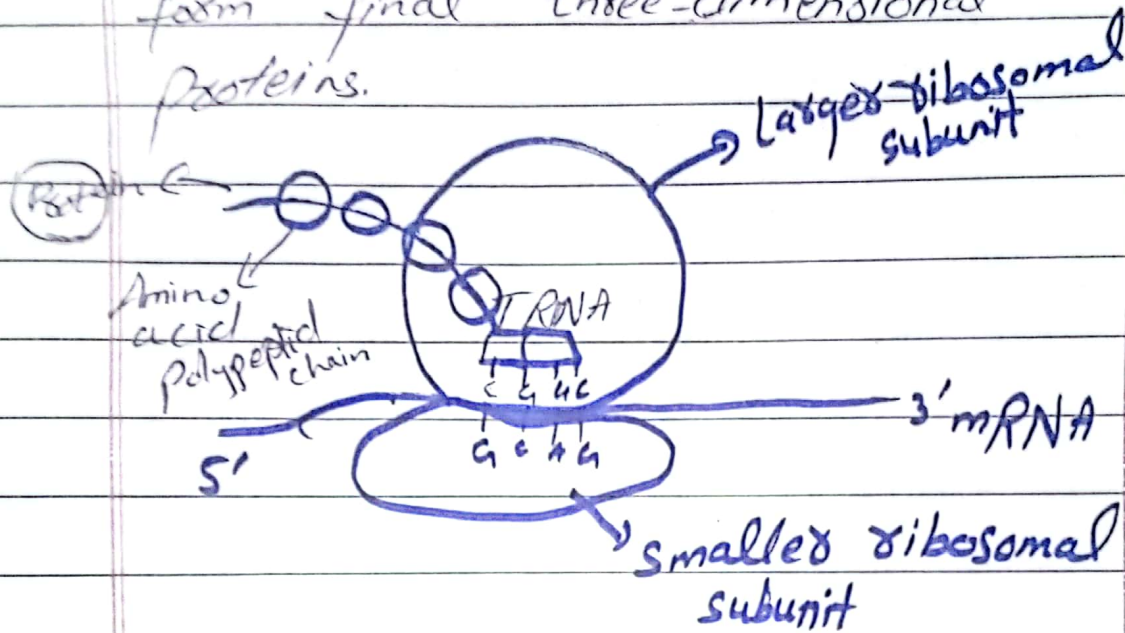
Ribosomes

are also called protein factories.

These are non-membranous organelles found in both prokaryotes and eukaryotes.

⇒ Ribosomes synthesize proteins by reading genetic information from mRNA and then linking together

amino acids with help of t-RNA to form polypeptide chain. These polypeptide chains then fold to form final three-dimensional proteins.



~~add~~

i) Biofuel :-

Biofuel is a renewable energy source that is derived from plant, algal, or animal biomass. Biomass is traditionally burned to produce heat.

ii) Adulteration:-

The act of making

food or drugs worse in quality by adding something to them.

iii) Hydrosphere:-

Discontinuous layers of water at or near earth's surface. It includes all ~~water~~ liquid and frozen surface waters and ground waters.

iv) Troposphere:-

Troposphere is lowest layer of earth's surface extending upto 13km. It contains most of mass (~ 75-80%) of atmosphere.

v) Isotopes:-

Isotopes are atoms of same element that have the same number of protons but different number of neutrons, which result in different atomic masses for example ${}_{12}^{12}\text{C}$ and ${}_{12}^{14}\text{C}$.

~~Q. 10~~ Methods of Solid Waste Management:-

- Composting
 - Landfilling
 - Incineration
 - Recycling
 - Waste-to-energy
 - Biogas generation
 - Open burning
 - Reuse
 - Sea Dumping
 - Vermicomposting.
-

SECTION-II

Q No. 7

~[a]~

Solution:

Diameter of a Sphere = 14 cm

$$\text{Radius (r)} = \frac{14}{2} = 7 \text{ cm}$$

$$\therefore \text{Volume} = \frac{4}{3} \pi r^3$$

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

$$= \frac{4312}{3} = \cancel{1437.33}$$

$$= \boxed{1437.33} \text{ Ans}$$

(b)

Solution:

Total Savings = 25,000 Rs

Ratio = 1 : 2 : 3 : 4 : 5

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

$$= 15$$

$$\text{Smallest share} = 25000 \times \frac{1}{15} = \boxed{1,666 \text{ Ans}}$$

[d]

Given the sides 5cm, 12cm and 13cm

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

$$13^2 = 169$$

Since $5^2 + 12^2 = 13^2$, the triangle is a right ~~angle~~ triangle.

The angle opposite the 13cm side is 90° .

$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$$

$$\tan(\text{Angle}) = 5/12 \approx 22.62^\circ$$

$$\boxed{22.62^\circ}$$

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The sum of angles in a triangle is 180°

$$\text{Third angle} = 180^\circ - 90^\circ - 22.62^\circ$$

$$= \boxed{67.38^\circ}$$

[C] $\rightarrow$ (ii)

Sol,

3, 5, 7, 11, 13, 17 Ans

(i)

Sol,

2, 6, 18, 54, 162, 486

$$2 \times 3 = 6$$

$$6 \times 3 = 18$$

$$18 \times 3 = 54$$

$$54 \times 3 = 162$$

$$162 \times 3 = 486$$

This pattern is correct Ans

SECTION II

QUESTION # 06

~~QCB~~

Distance covered by bicycle = 36 km

Speed = 18 km/hr

Time = ?

Speed = $\frac{\text{Distance Covered}}{\text{Time}}$

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

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

$$\text{Time} = 2 \text{ hours.}$$

~~QCB~~Camera price with 25% discount = $200 \$ \times \frac{25}{100}$

25% discount = 50

Price after discount = $200 - 50 = 150$ 6% Tax amount = $150 \times \frac{6}{100} = 9$

Total amount Paid = Discounted Price + Tax amount

$$= 150 + 9$$

$$\text{Total amount paid} = 159$$