Part-II

(Section-I)

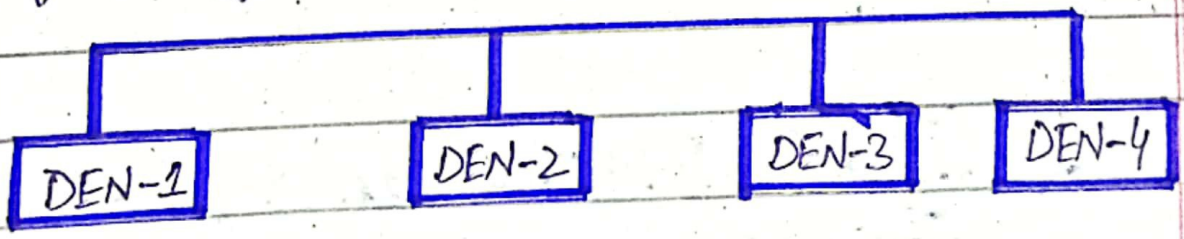
Question NO.2:-

a) Dengue:-

Dengue is a masquito-borne viral disease which is transmitted by Aedes aegypti. It was first recognized in **1950s** in **Phillipines** and **Thailand**.

Causative agents:-

Dengue fever is caused by bite of female mosquite or physical contact with the infected person. The serotypes of dengue includes:-



Symptoms:-

Following are the symptoms of dengue fever:-

- high fever (40°C / 140°F)
- severe headache
- pain behind eyes
- swollen glands
- muscle and joint pain
- nausea
- vomiting

Severe symptoms:-

i) Plasma leaking
ii) fluid accumulation
iii) respiratory distress
iv) severe bleeding
v) organ impairment

Fact:-

Between 1st January, 2024 and 27th September, 2024, a total of 25,932 confirmed dengue cases and 62 death were reported in Pakistan.
(World Health Organization)

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b) Dark Matter and Dark Energy

Dark Matter:-

Dark matter comprises particles that

do not reflect, absorb or emit light. Thus, they cannot be detected by observing electromagnetic radiations.

Properties :-

- a material that cannot be seen directly
- mysterious and invisible substance
- force of dark matter is always attractive

Composition :-

- Massive Astrophysical compact halo objects (MACHOs)
- Weakly Interacting massive particles (WIMPs)

Examples :-

Neuron stars, black holes etc.

Dark Energy :-

"The energy that helps in expansion of universe"

In fact, in **1998**, astronomers studying supernova were shocked to hear that the universe been

expanding faster around 7.5 billion years ago, after the Big Bang. It indicates some unknown forces are fighting gravity's pull, causing galaxies to speed apart from one another.

Properties:-

Repulsive force
opposite of dark matter
repels the objects, due to which things move far away from each other.

Example:-

Phantom dark energy

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c) Mitochondria

Mitochondria are double-membrane bound organelles found in eukaryotic cells. They are referred to as the **"powerhouses"** of cell due to their primary role in energy production.

Structure of mitochondria:-

1) Outer membrane:-

Outer membrane is smooth and permeable to small molecules and ions.

2) Inner membrane:-

Inner membrane is highly folded into structures known as **cristae**, which increase surface area.

3) Matrix:-

Matrix is the innermost compartment containing enzymes for citric acid cycle, mitochondrial DNA and ribosomes.

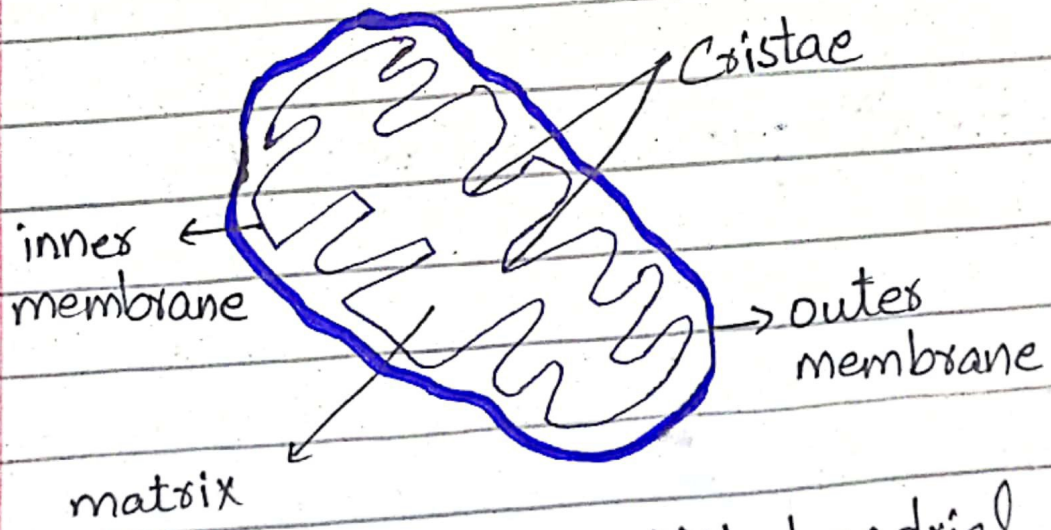


Fig:- Mitochondrial structure

Functions of mitochondria:-

1) ATP Production:-

Mitochondria generate ATP through oxidative phosphorylation, utilizing the electron transport chain and chemiosmosis.

2) Metabolism:-

It participates in metabolic pathways, which converts nutrients into energy.

e.g, krebs cycle.

3) Regulation of metabolism:-

It helps to regulate cellular metabolism, apoptosis and responses to cellular stress.

4) Calcium storage:-

It acts as reservoirs for calcium ions, which are crucial for various cellular processes, including signaling.

5) Heat production:-

Mitochondria generates heat through a process called non-shievering thermo-genesis involving uncoupling proteins.

d) Covalent Bonds:-

"The bonds which are formed by mutual sharing of electrons are called covalent bonds."
These types of bonds are formed by non-metal atoms.

Types of covalent bonds:-

i) Single covalent bond:-

The bond which is formed by sharing of one electron pair is called single covalent bond.

Example:-

H_2 , H—H

In H_2 molecule, two hydrogen atoms share one pair of electrons.

Representation:-

It is represented by single line (—).

ii) Double covalent bond:-

The bond which is formed by sharing of two electron pairs is

called double covalent bond.

Example:-

O_2 , $O=O$

In an oxygen molecule, two oxygen atoms share two pairs of electrons.

Representation:-

It is represented by 2 lines.

(=).

Triple covalent bond:-

The bond formed by sharing of three electron pairs is called triple covalent bond.

Example:-

N_2 , $N\equiv O$

In a nitrogen molecule, two nitrogen atoms share three pairs of electrons.

Representation:-

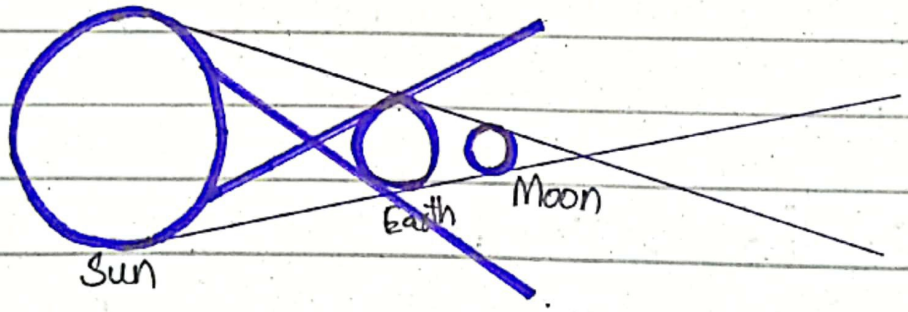
It is represented by 3 lines.

(≡).

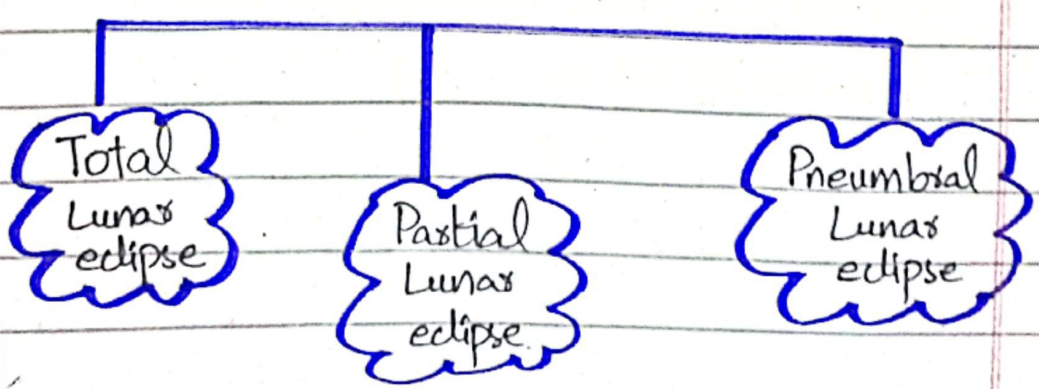
Question No. 3:-

a) Lunar eclipse:-

A lunar eclipse occurs when the **Earth** passes between the Sun and the Moon, causing the Earth's shadow to block sunlight from reaching the Moon. This can only happen during the **full moon**. It can be observed from anywhere on the night side of Earth and is safer to view with naked eye.



Types of Lunar eclipse:-



b) Function of enzymes:-

Enzymes are biological catalysts that speed up chemical reactions in living organisms without being consumed in the process. The work by lowering the activation energy needed for reactions to occur.

1) Catalysis:-

Enzyme accelerate biochemical reactions.

> Amylase breaks down starch into sugars in the saliva.

2) Regulation:-

Enzymes can be regulated to control metabolic pathways.

> Phosphofructokinase regulates glycolysis by controlling conversion of fructose-6-phosphate to fructose-1,6-bis-phosphate.

3) Specificity:-

Enzymes are highly specific for their substrates.

> Lactase specifically catalyzes the breakdown of lactose into glucose and galactose.

4) Energy Production:-

Enzymes play a key role in metabolic processes that produce energy.

> ATP synthase catalyzes the formation of ATP from ADP and inorganic phosphate during cellular respiration.

5) DNA replication and repair:-

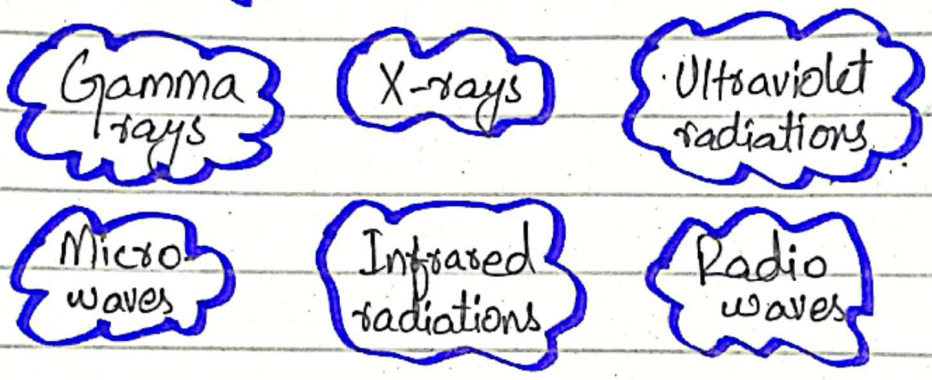
Enzymes are essential in genetic processes.

> DNA polymerase synthesizes new DNA strands during replication.

c) Electromagnetic radiations:-

Electromagnetic radiations refers to waves of energy that travel through space at speed of light. These waves have both electric and magnetic fields and can vary in wavelength and frequency.

Main types:-



EMR spectrum:-

The electromagnetic spectrum is the range of all types of electromagnetic radiation, classified by wavelength or frequency.

The electromagnetic spectrum encompasses a wide range of radiation types, each with unique properties

and uses, from gamma rays and x-rays used in medicine to radiowaves used for communication.

d) Interconnection of earthquakes and volcanic eruptions :-

Yes, earthquakes and volcanic eruptions are interconnected, primarily due to their relationship with tectonic processes.

1) Tectonic plate boundaries

Both earthquakes and volcanic eruptions commonly occur along tectonic plate boundaries. These boundaries can be divergent, convergent or transform.

2) Pressure build-up

As tectonic plates move, stress builds up in the Earth's crust. When pressure exceeds the strength of rocks, it results in an earthquake. In volcanic

areas, this pressure can also cause magma to rise, potentially leading to an eruption.

3) Magma Movement:-

Earthquakes can occur as magma forces its way to the surface, fracturing rocks and causing tremors. This is often observed before volcanic eruptions, where increased seismic activity indicates that magma is moving.

4) Volcanic Earthquakes

These are specific to volcanic areas and occur due to movement of magma within the volcano, causing tremors. Such earthquakes can serve as precursors to eruptions.

(Section-II)

Question No.8:-

c) $(A \cup B)' = A' \cap B'$

$A = \{10, 11, 12, 13, 15\}$

$B = \{10, 12, 14\}$

$U = \{10, 11, 12, 13, 14, 15, 16, 18\}$

L.H.S:-

$(A \cup B)'$

$(A \cup B) = [\{10, 11, 12, 13, 15\} \cup \{10, 12, 14\}]$

$= \{10, 11, 12, 13, 14, 15\}$

$(A \cup B)' = U - (A \cup B)$

$= \{10, 11, 12, 13, 14, 15, 16, 18\} - \{10, 11, 12, 13, 14, 15\}$

$= \{16, 18\}$

R.H.S:- $A' \cap B'$

$A' = U - A$

$= \{10, 11, 12, 13, 14, 15, 16, 18\} - \{10, 11, 12, 13, 15\}$

$= \{14, 16, 18\}$

$B' = \{ U - B$

$= \{10, 11, 12, 13, 14, 15, 16, 18\} - \{10, 12, 14\}$

$= \{11, 13, 15, 16, 18\}$

$A' \cap B' = \{14, 16, 18\} \cap \{11, 13, 15, 16, 18\}$

$= \{16, 18\}$

Hence, L.H.S = R.H.S

a)

Charge $= £20 + 40n$

$n = 7$ (no. of windows)

Then,

Charge $= £20 + 40(7)$

$= £20 + 280$

$= £300$

If a house has 7 windows, Brian will charge £300.

d)

No. of triangles = ?

Total no. of triangles = 12
in given figure

Question No. 6 :-

c)

Volume of football = ?
radius = 12 cm

Formula :-

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

Solution :-

$$V = \frac{4}{3}(3.14)(12\,cm)^3$$

$$= \frac{4}{3}(3.14)(1728)$$

$$= \frac{4}{3}(5424.9)$$

$$= \frac{21699.68}{3}$$

$$= 7233.2\,cm^3$$

7233.22
3 | 21699.68
21
6
6
9
9
9
9
6
6
86/2

12
12
24
12×
144
12
0288
144×
1728
3.14
0 8 6 8 2
1 7 2 8×
5 1 8 4 ××
0 5 4 2 4.9 2
4
21699.68

d) $-10, -8, 6, 40, 102$

~~$(-10)+(-8) = (-10+8) = -2$~~

$(-10) + 2 = -8$

$(-8) + 14 = 6 \rightarrow 14-2=12$

$6 + 34 = 40 \rightarrow 34-14=20$

$40 + 62 = 102 \rightarrow 62-34=28$

$102 + 98 = 200 \rightarrow 98-62=36$

12
20
28
36

With the difference of 8 → we have the last value (98) which is added to 102 to get 200.