

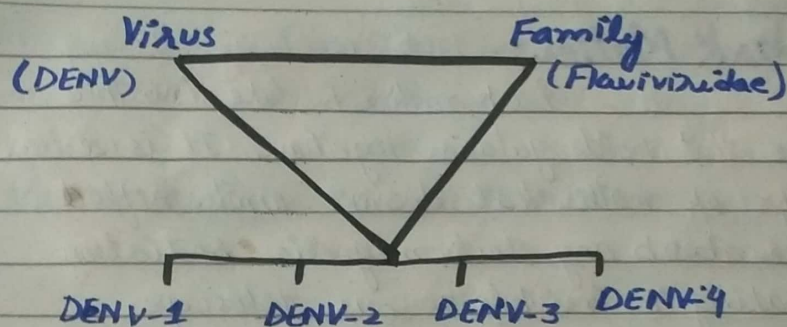
QUESTION No. 2:

2.

Dengue:

Dengue is a mosquito-borne viral illness that affects millions of people world wide particularly in tropical and sub-tropical regions.

Casulative agent:



Dengue is caused by Dengue Virus (DENV) which belongs to Flaviviridae family. There are four types of Dengue Virus that is = DENV-1, DENV-2, DENV-3, DENV-4, DENV-5 that can cause disease.

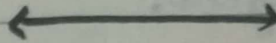
Symptoms:

The symptoms of dengue fever begin 3-14 days after being bitten by the infected mosquito and can range from mild to severe. Some of the common symptoms are:

1. Fever
2. Nausea
3. Vomiting
4. Fatigue
5. Pain
6. Rash
7. Headache

In extreme conditions it can lead to the severe symptoms like:

- i. Dengue Hemorrhagic fever (DHF) which includes bleeding, low blood platelet count and plasma leakage.
- ii. Dengue shock syndrome (DSS) which includes severe bleeding, shock and ~~plasma~~ organ impairment.



b.

Dark Matter:

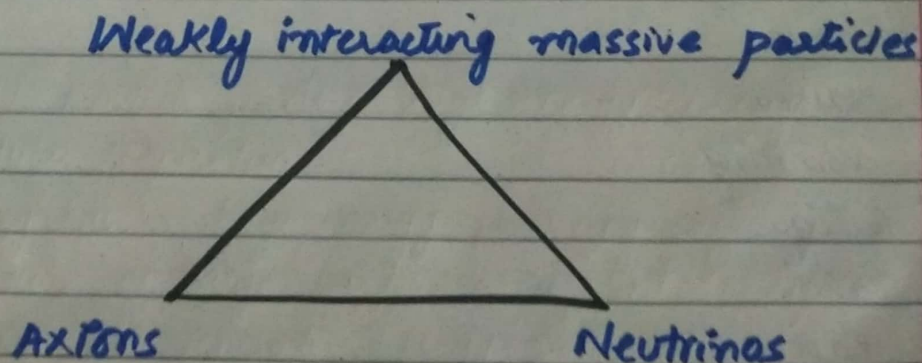
Dark matter is like invisible glue that holds galaxies together. It is a type of matter that doesn't emit, reflect or absorb any electromagnetic radiation making it invisible to our telescope.

How to infer dark matter's nature?

Despite its elusive nature the presence of dark matter can be inferred through its gravitational affect on visible matters and the way galaxy and galaxy clusters move. It's estimated that dark matter makes up 27% of the universe mass-energy density.

Candidates of dark matter:

Some popular candidates of dark matter include:



→ Dark Energy:

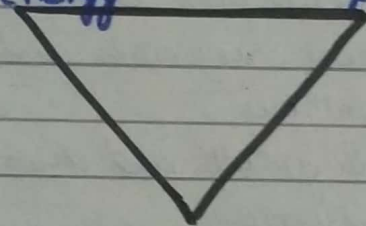
Dark energy is a mysterious force that pushes galaxies apart, driving the universe accelerating expansion. It causes galaxies to move away from each other at an ever increasing rate. It is thought to make about **68%** of universe's mass-energy density.

Possible explanations of dark energy:

Some possible explanations of dark energy include:

Vacuum energy

Phantom energy



Quint essence



iii - Mitochondria:

Mitochondria is called as **powerhouse** of eukaryotic cell because it generate most of the energy that cell needs to function.

Structure:

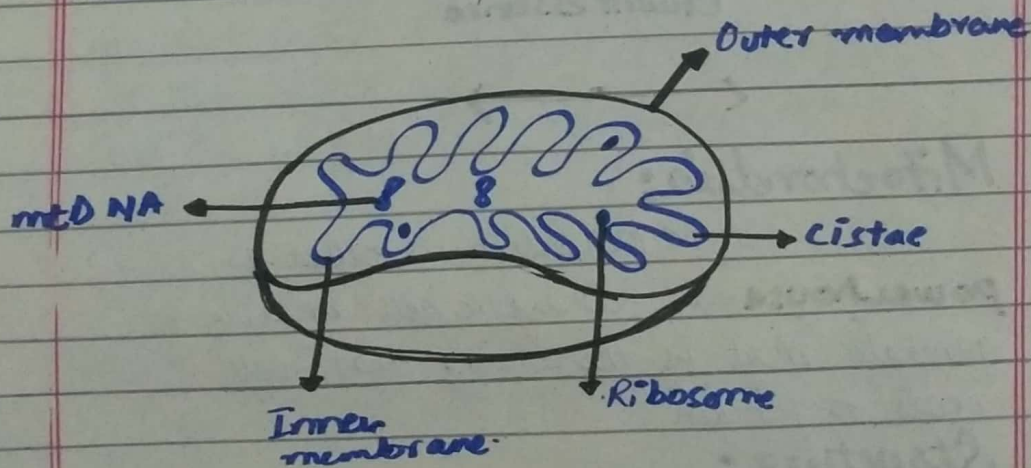
- i- Mitochondria have two membranes i.e. outer membrane and inner membrane.
- ii- Outer membrane is permeable that allows certain substances to pass through it.
- iii- The inner membrane is non-permeable and is folded into series of cistae.
- iv- The space between outer membrane and inner

membrane is intermembrane space.

- iv- The space inside the inner membrane is called mitochondrial matrix.

Function:

- i- Mitochondria is responsible for generating energy through a process called cellular respiration.
- ii- They convert glucose into **ATP (Adenosine Tri Phosphate)** which is energy currency of the cell.
- iii- They have their own DNA called as mtDNA, which is separate from DNA in nucleus.
- iv- They have their own ribosomes and play role in protein synthesis.
- v- They regulate cell growth and division and modulate immune responses.



→ Power House:

- i- Mitochondria produces high energy through cellular respiration.
- ii- They have a high energy producing capacity because of large surface area and enzymes.
- iii- They can generate energy from various sources like fatty acids, glucose etc.

- iv. They have a high efficiency energy producing mechanism with efficiency of about 60-70% as compare to other energy producing processes.

iv. Covalent bonds:

Covalent bonds are the type of bonds that are formed when two different atoms shared the electrons among them to attain stable electronic configuration. There are two types of covalent bonds.

- i- Polar covalent bond
- ii- Non-polar covalent bond

Polar covalent bond:

Electrons are shared between two atoms having different electronegativities.
e-g H_2O

Non-polar covalent bonds:

Electrons are shared among the atoms having same electronegativities.
e-g CH_4 .

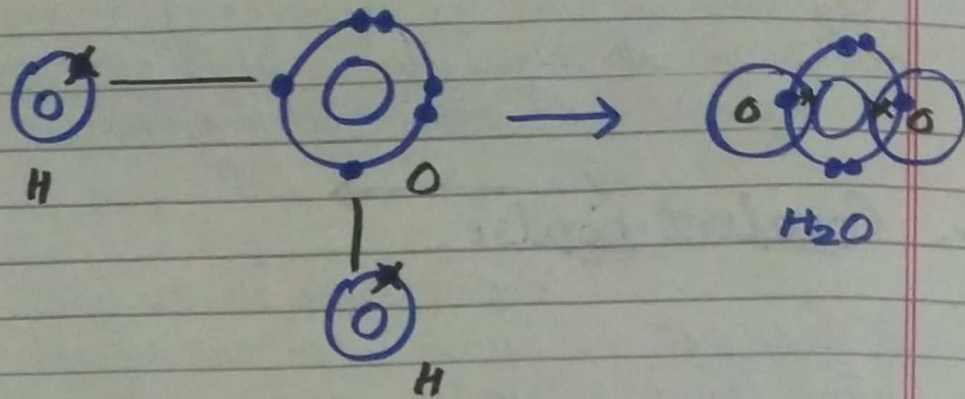
→ Types of covalent bonds based on structure:

Based on structure there are three types of covalent bonds.

- i- Single covalent bond
- ii- Double covalent bond
- iii- Triple covalent bond.

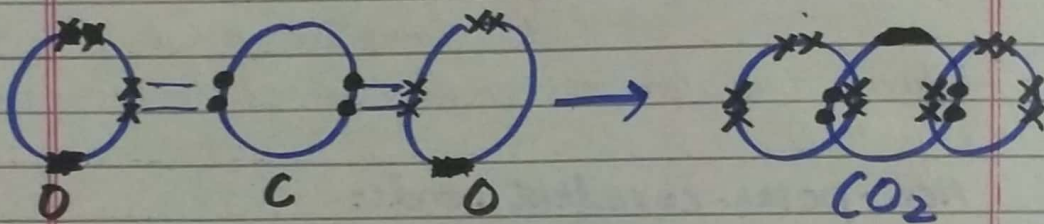
Single covalent bond:

When only one electron pair is shared between two atoms then single covalent bond is formed.
e-g H_2O



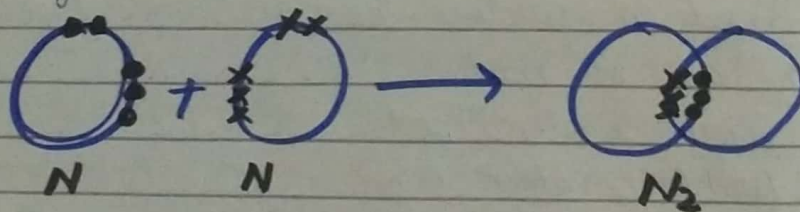
→ Double covalent bond:

When two electron pairs are shared between two atoms then double covalent bond is formed. e-g CO_2 .



→ Triple covalent bond:

When three electron pairs are shared between two atoms it formed triple covalent bond e-g N_2 .



QUESTION No. 3:

i.

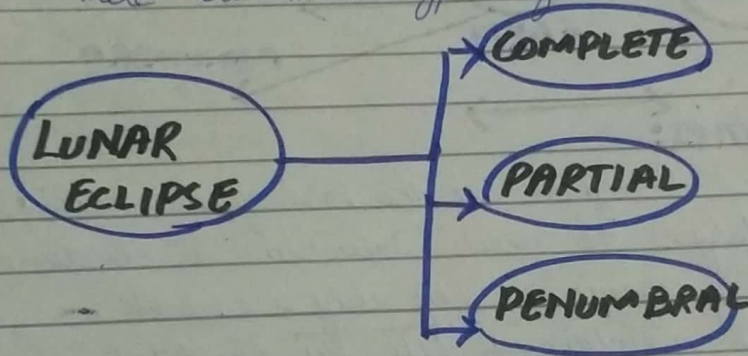
→ Lunar Eclipse:

A lunar eclipse occurs when the earth passes between the sun and

the moon, blocking the sunlight from reaching the moon. The earth makes a long conical shadow in space called **umbra**. Surrounding the conical shadow is another partial shadow called **penumbra**. It can be seen at night

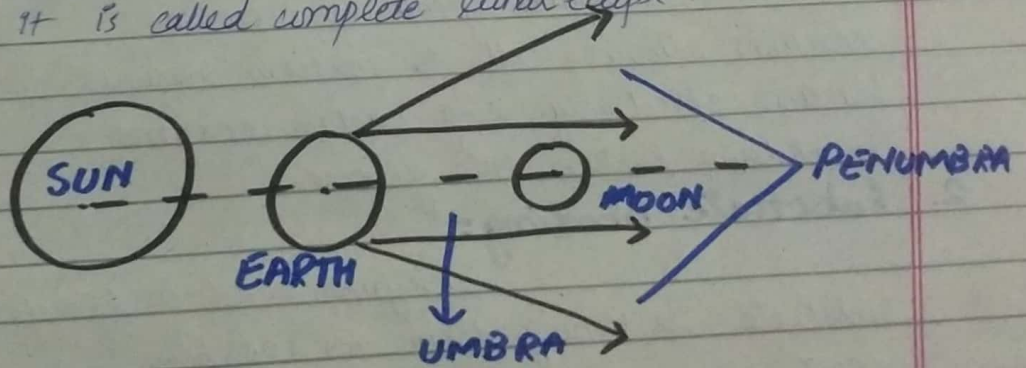
Types of lunar eclipse:

There are three types of lunar eclipse.



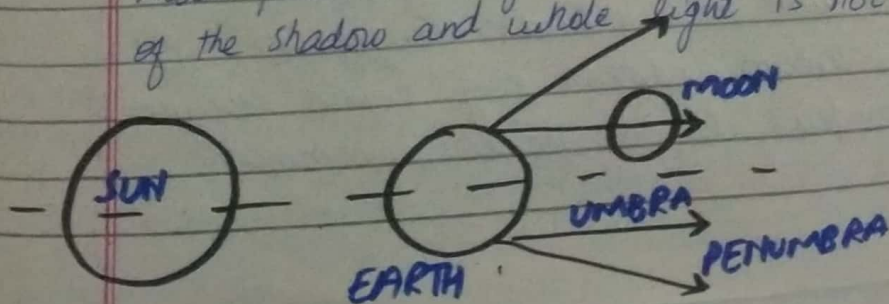
Complete lunar eclipse:

When the earth comes in line with the sun and the moon then it is called complete lunar eclipse.



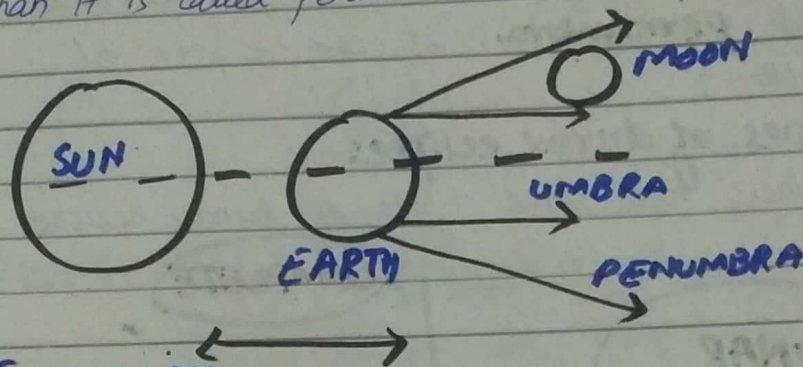
Partial lunar eclipse:

When the path of the moon passes through the penumbral region of the shadow and whole light is not obscured.



→ PENUMBRAL LUNAR ECLIPSE:

When the whole of the moon passes through penumbral region then it is called penumbral lunar eclipse.



b. Enzymes:

Enzymes are the biological molecules that catalyze the specific biochemical reactions in living organisms. They play a crucial role in maintaining life by facilitating various cellular processes.

Functions of enzymes:

1. Catalysis:

Enzymes speed up chemical reactions allowing cells to perform various functions effectively. e.g. Lactase enzyme breakdown lactose into glucose.

2. Substrate binding:

Enzymes bind to specific substrate positioning them for specific reaction e.g. Hexokinase enzyme binds to glucose.

3. Optimizes reaction conditions:

Enzymes work their best with in particular temperature, pH and optimum conditions e.g. pepsin enzymes digest proteins in the acidic environment.

4. Reusability:

Enzymes can be reused multiple times making them efficient catalyst. e.g. alcohol dehydrogenase enzyme which converts alcohol to acetaldehyde.

5. Multienzyme complexes:

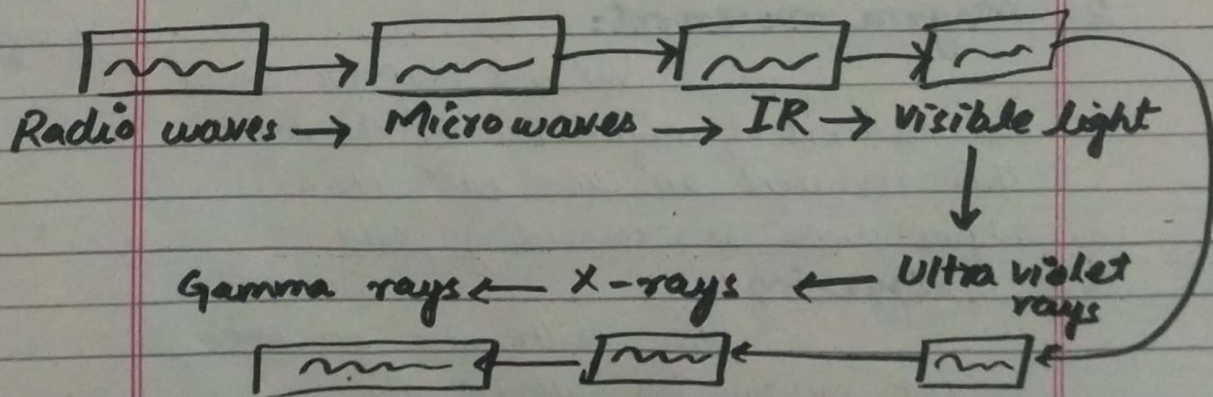
Enzyme can form complexes to perform sequential reactions e.g. pyruvate dehydrogenate complexes.

C) Electromagnetic Radiations:

Electromagnetic radiations (EMR) are the energy waves that propagate through electromagnetic field and transmit energy through space. They are created by the vibration of the charged particles such as electrons.

EMR spectrum:

EMR spectrum is the range of all possible frequencies of EMR with each type of radiation blending into another type.



1. Radio waves: These have longest wavelength, lowest frequency e.g. FM radio

2. **Microwaves:** Used for heating and cooking as well as wireless.
3. **IR:** Used for heat and thermal imaging.
4. **Visible light:** Which we can see with eyes.
5. **UV rays:** Higher energy than visible light, cause chemical reactions.
6. **X-rays:** High energy rays used in medical imaging.
7. **Gamma rays:** Highest energy with short wavelength.

d-



Earthquakes and volcanic eruptions:

Yes, both earthquakes and volcanic eruptions are interconnected below as follows:

1. Plate Tectonics:

Both earthquake and volcanic eruptions are the result of plate tectonics, which is the movement of earth's outer layer. As plate moves, they can create stress leading to earthquakes or can cause volcanoes.

2. Magma movement:

Volcanic eruptions involve the movement of magma beneath the surface. This movement can cause earthquake as magma pushes the surrounding plates.

3. Triggering:

Large earthquakes can trigger volcanic eruptions by altering the stress on earth's crust, making it more likely for magma to rise on earth.

4. Gas Release:

Volcanic eruptions can release gases like CO_2 and SO_2 which can increase earthquake activity around earth's surface.

5. Ground Deformation:

Volcanic eruption can cause ground deformation which can lead to earthquake as surrounding rock adjust itself according to the earth's shape.

Section - II

QUESTION No. 6:

i-

Given series = 9, 8, 10, k, 12

$$A.M = 15$$

To find:

$$k = ?$$

Sol: $A.M = \frac{\text{Sum of all the values}}{\text{Total values}}$

$$15 = \frac{9+8+10+k+12}{5}$$

$$15 = \frac{39+k}{5}$$

$$39+k = 15 \times 5$$

$$39+k = 75$$

$$k = 75 - 39$$

$$\boxed{k = 36}$$

so value of $k = 36$

$$\begin{array}{r} 75 \\ \times 5 \\ \hline 475 \\ \hline 375 \\ \hline 375 \end{array}$$

ii- Let the mixture contain initial quantity of sugar and water be $4x$ and $3x$.

According to the given condition

$$4x : 3x + 10 = 4 : 5$$

$$\frac{4x}{3x+10} = \frac{4}{5}$$

By cross multiplication

$$4x(5) = 4(3x+10)$$

$$20x = 12x + 40$$

$$20x - 12x = 40$$

$$8x = 40$$

$$x = \frac{40}{8}$$

$$\boxed{x = 5}$$

So, initial quantity of sugar solution = $4x$
 $= 4(5)$
 $= 20$

c. \longleftrightarrow
Volume of football = ?

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

$$r = 12 \text{ cm}$$

$$V = \frac{4}{3} \left(\frac{22}{7} \right) (12)^3$$

$$= \left(\frac{4}{3} \right) (3 \cdot 14) (1728)$$

$$= 7234.56 \text{ cm}^3$$

$$\begin{array}{r} 12 \\ \times 12 \\ \hline 24 \\ 12 \times \\ \hline 144 \end{array} \quad \begin{array}{r} 144 \\ \times 12 \\ \hline 288 \\ 144 \times \\ \hline 1728 \end{array}$$

d. \longleftrightarrow

-10, -8, 6, 40, 102, ?

QUESTION No. 7:

a.

Given.

$$20\% \text{ of } x = y$$

To find

$y\%$ of 20 in terms of x .

First

$$y = 20\% \text{ of } x$$

$$y = \frac{20}{100} (x)$$

$$y = 0.2x$$

Now $y\%$ of 20 in terms of x

$$y\% \text{ of } 20$$

$$= \frac{y}{100} (20)$$

$$= \frac{y}{5}$$

$$= 0.2y$$

$$x = 0.2(0.2y)$$

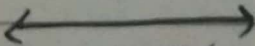
$$= \text{As } y = 0.2x$$

so

$$= 0.02y$$

$$= 0.02(0.2x)$$

$$\boxed{y = 0.04x}$$

b.  Let the average monthly salary of P and Q be x , Q and R be y and R and P be z .
So According to given condition.

$$\frac{P+Q}{2} = 5050$$

$$\frac{x+y}{2} = 5050 \quad (i)$$

$$\frac{Q+R}{2} = 6250$$

$$\frac{y+z}{2} = 6250 \text{ (i)}$$

$$\frac{R+P}{2} = 5200$$

$$\frac{z+x}{2} = 5200 \text{ (ii)}$$

Adding eq (i), (ii) and (iii)

$$\frac{x+y}{2} + \frac{y+z}{2} + \frac{z+x}{2} = 5050 + 6250 + 5200$$

$$\frac{x+y+y+z+z+x}{2} = \frac{16500 \times 2}{2}$$

$$2x + 2y + 2z = 16500 \times 2$$

$$2(x+y+z) = 16500 \times 2$$

$$x+y+z = 16500 \text{ (iv)}$$

Now from eq (i)

$$\frac{x+y}{2} = 5050$$

$$x+y = 10100$$

$$10100 + z = 16500$$

$$\frac{y+z}{2} = 6250$$

$$y+z = 12500$$

Putting in (iv)

$$x + 12500 = 16500$$

$$x = 16500 - 12500$$

$$x = 4000$$

So salary of P is 4000



$$\begin{array}{r} 5050 \\ 6250 \\ + 5200 \\ \hline 16500 \end{array}$$

$$\begin{array}{r} 5050 \\ \times 2 \\ \hline 10100 \\ 6250 \\ \hline 12500 \end{array}$$

c- Total tosses = 500 times.

i) Two heads = 105 times
Probability = $\frac{105}{500}$
 $= 0.21$

ii) One head = 275 times
 $= \frac{275}{500}$
 $= 0.55$

iii) No head = 120 times
 $= \frac{120}{500}$
 $= 0.24$

d- let James's current age be x and dad's age be y .

According to given condition

$$y = 4x \quad (i)$$

At 14 years.

$$y + 14 = 2(x + 14)$$

$$y + 14 = 2x + 28$$

$$4x + 14 = 2x + 28$$

$$4x - 2x = 28 - 14$$

$$2x = 14$$

$$x = 7$$

James's current age be 7 +

Now putting in eq (i)

$$y = 4x$$

$$= 4(7)$$

$$\boxed{y = 28}$$

so father's age is 28.