

## Section I

Q NO 2

Q) What is dengue?

Dengue is a viral infection spread by the bite of Aedes mosquitoes, especially Aedes aegypti.

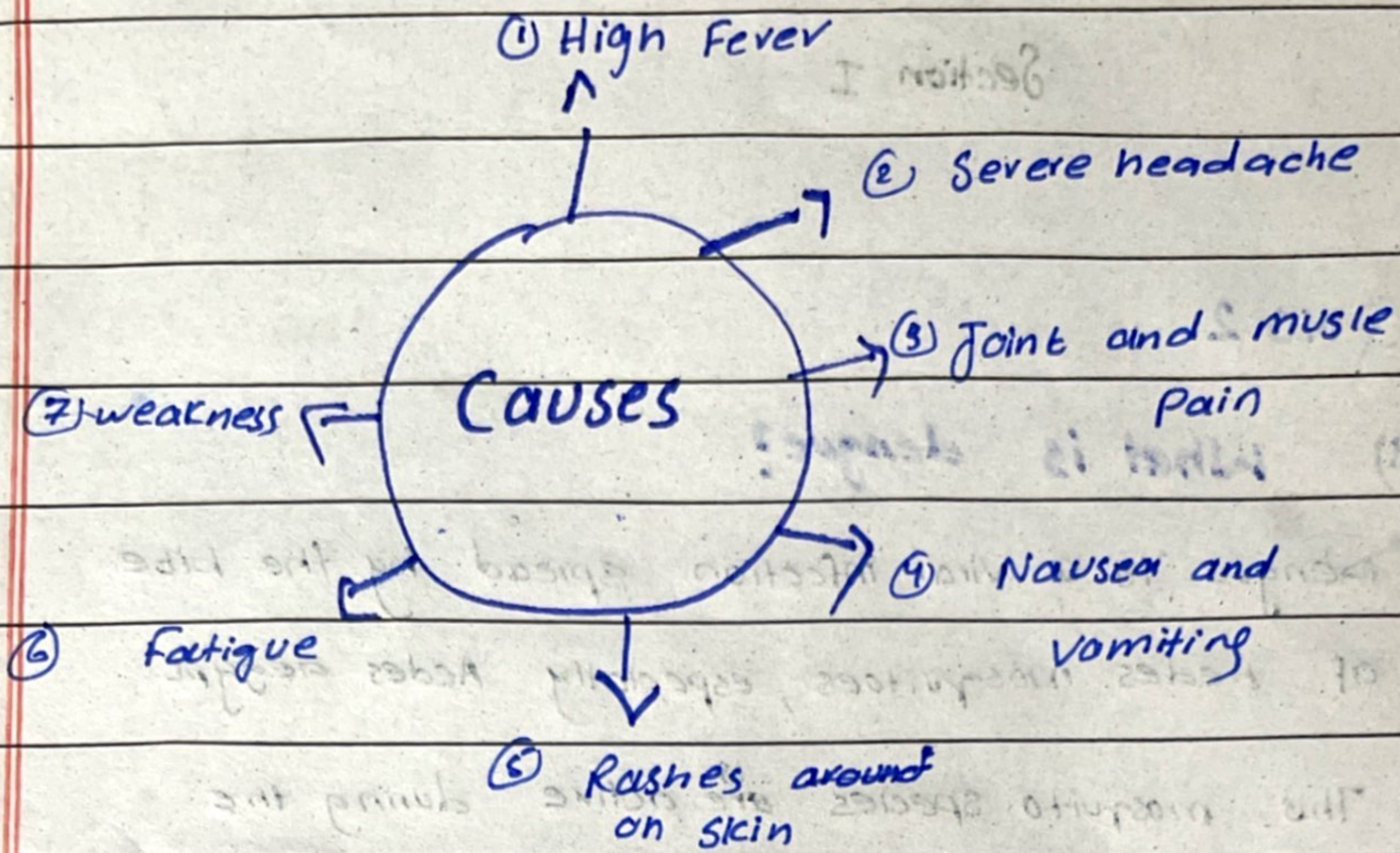
This mosquito species <sup>is</sup> active during the day and typically breeds in standing water around human environments, like in buckets, plant pots, or open drains.

### Causative agents

The dengue virus is responsible for this disease. There are four types of dengue virus,

- 1) DENV-1
- 2) DENV-2
- 3) DENV-3
- 4) DENV-4

If a person is infected ~~by~~ with one type, they develop ~~the~~ immunity against the specific type but can still catch the other types.



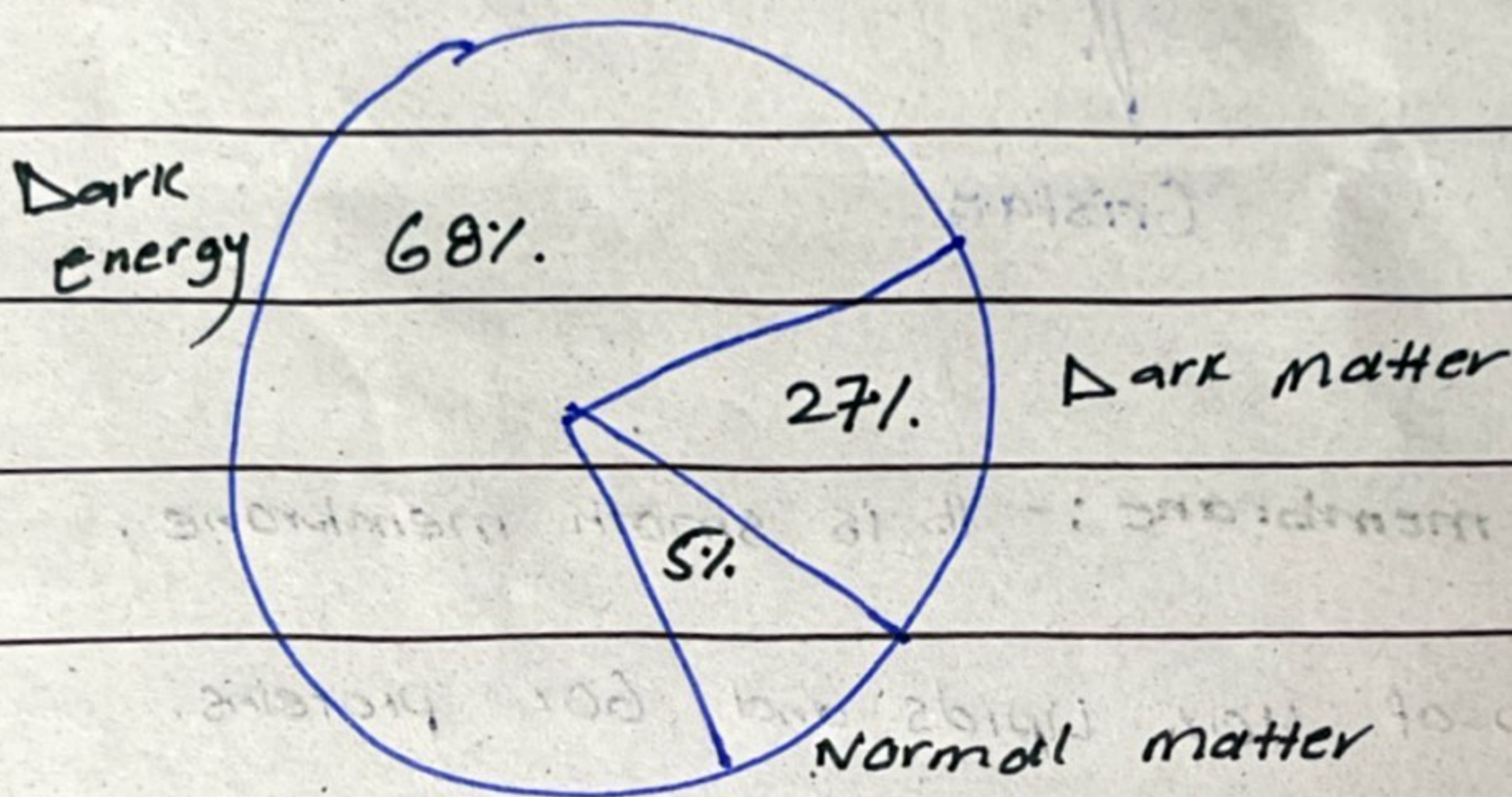
b)

## Dark matter

Dark matter is a type of matter that doesn't emit or interact with light, which is why we can't see it directly. However, we know it exists because of its gravitational effects on galaxies and other cosmic structure. In fact, dark matter makes 27% of the universe.

# Dark Energy

Dark energy on the other hand, is a mysterious force driving the accelerated expansion of the universe. Dark energy account for about 68% of the universe and has repulsive effect, pushing galaxies apart over time.

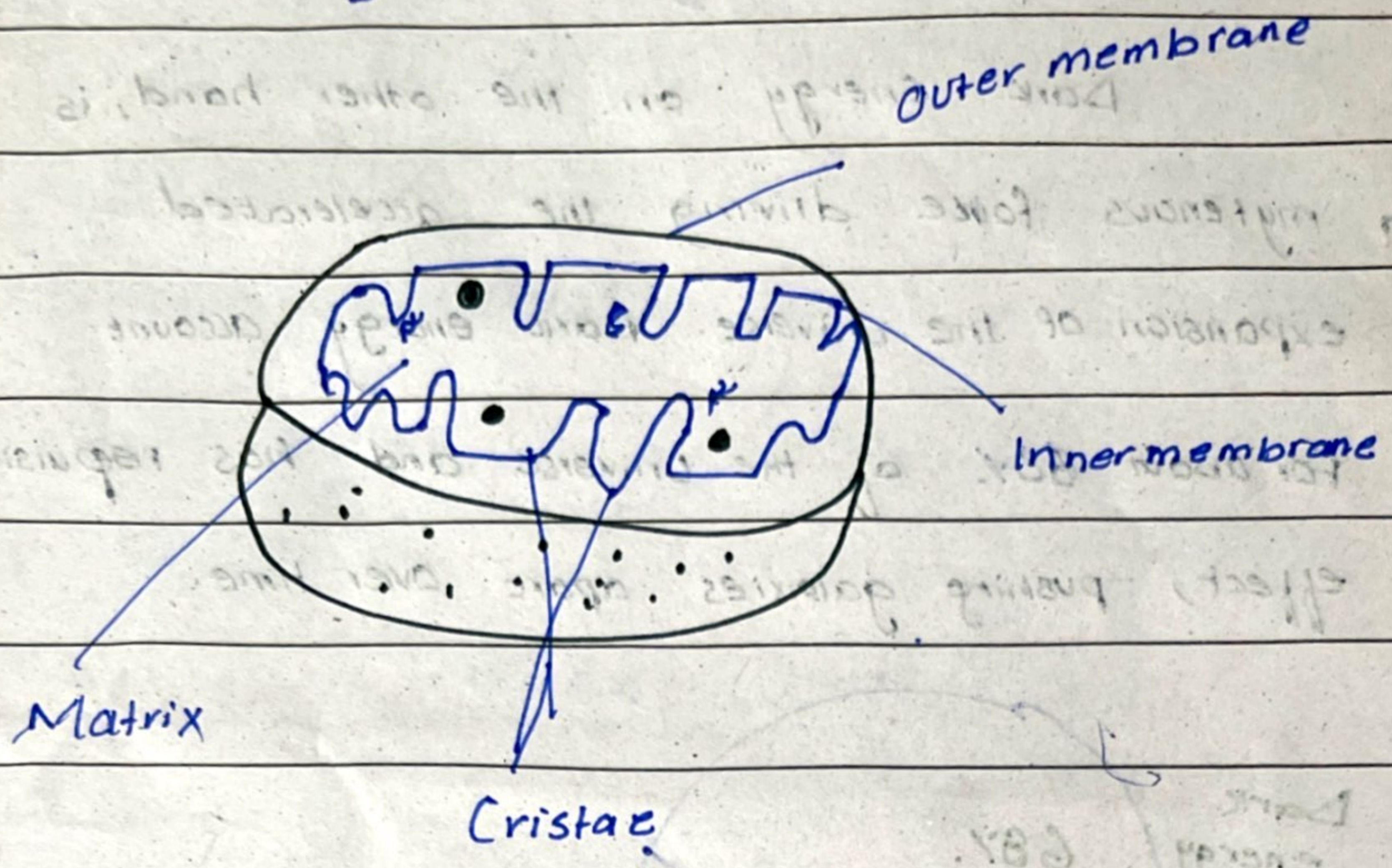


c) Discuss the structure and function of Mitochondria. How is it the powerhouse?

## Mitochondria

Mitochondria is a cell organelle which is present in plants, animals, and some microorganisms. It has filamentous and granular structure.

# Structure



1) Outer membrane :- It is smooth membrane, made up of 40% lipids and 60% proteins. due to presence of pores, it is permeable.

2) Inner membrane :- It is selectively permeable. made up of 20% lipids and 80% proteins

• Cristae :- Finger like projection

3) Intermembrane space :- The space between outer and inner membrane.

4) Matrix :- It contains enzymes, mitochondrial DNA, and ribosomes. kreb cycle occurs here.

**Functions of Mitochondria**

- ① Power house of the cell, store and release energy.
- ② Helps in the formation of heme of hemoglobin
- ③ Krebs cycle
- ④ Glycolysis
- ⑤ In the matrix of mitochondria several fatty acids are synthesized.

**Why called power house of the cell?**

Mitochondria produce ATP, which cell use for energy in practically all processes. Without mitochondria, cells wouldn't be able to sustain these energy demanding activities.

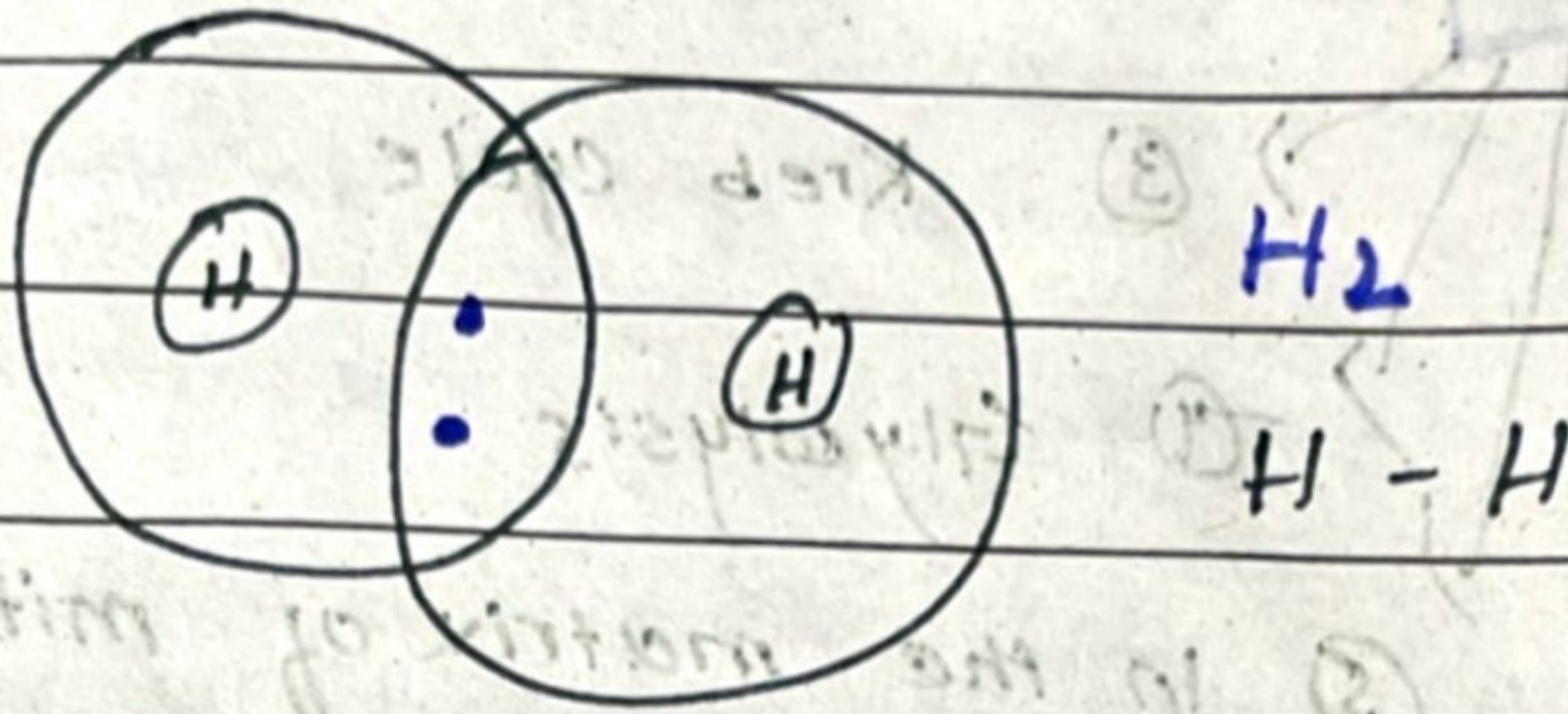
**d) Covalent Bond:-**

Covalent bond is a type of bond which is formed due to mutual sharing of electrons.

- Types
- ① Single covalent bond
  - ② Double covalent bond
  - ③ Triple covalent bond

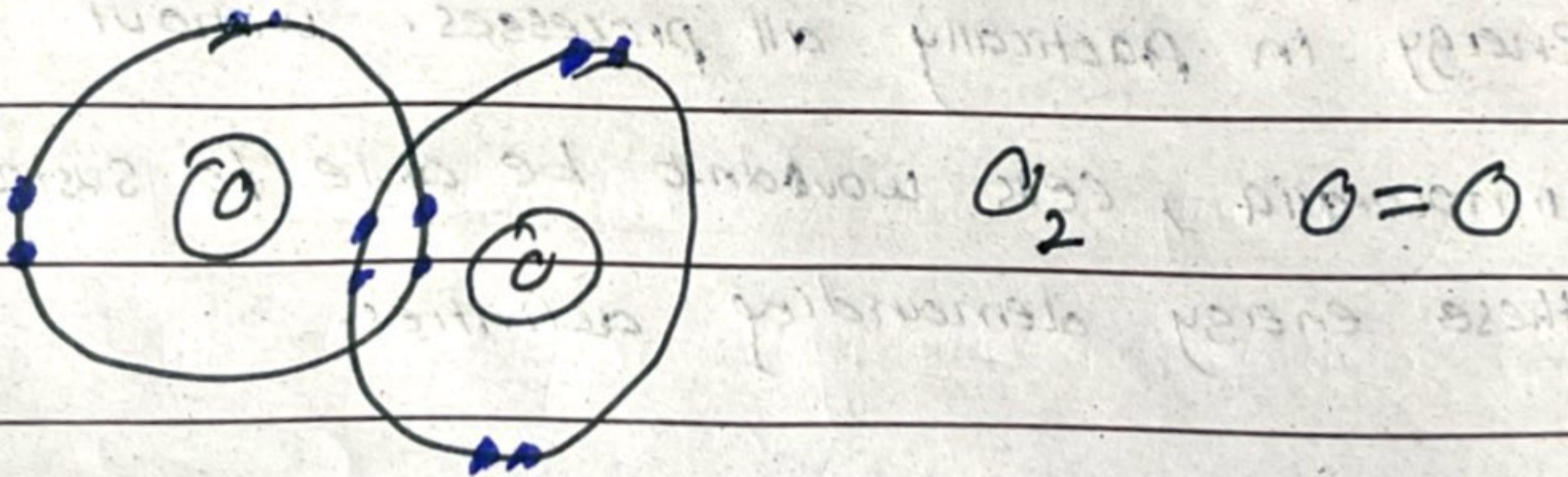
### 1) Single covalent bond:-

When two atoms share single pair of electrons.



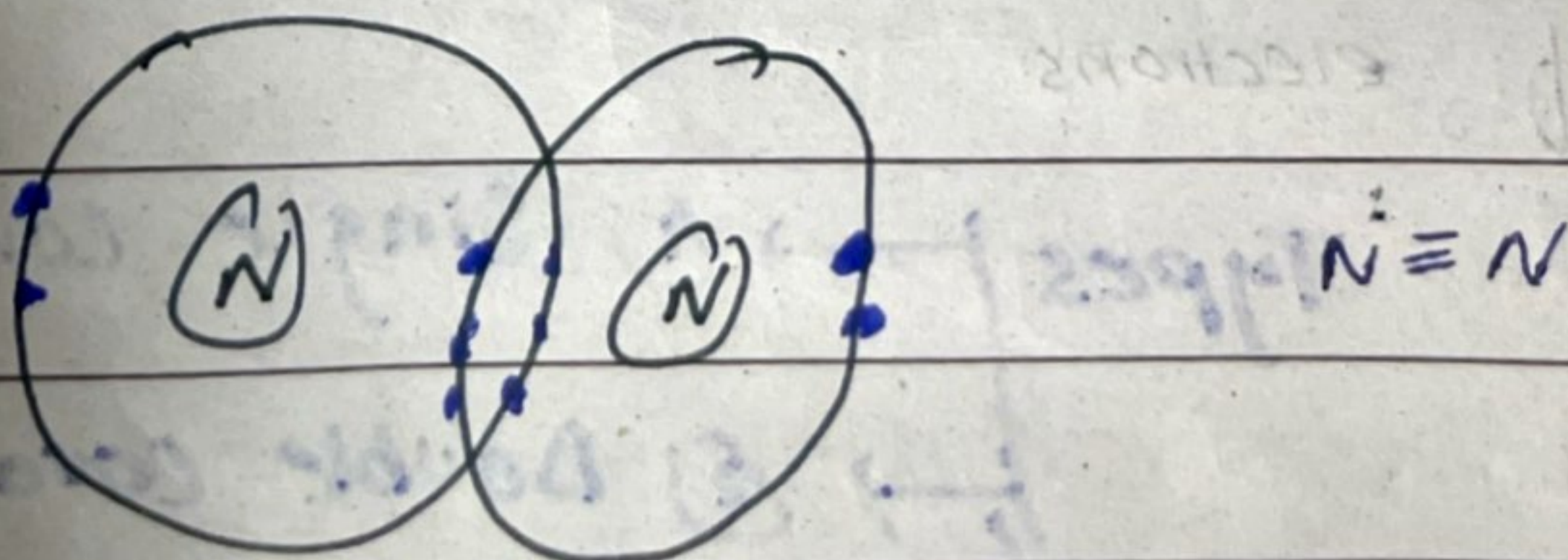
### 2) Double covalent bond

Double covalent bond is formed when two atoms share two pair of electrons.



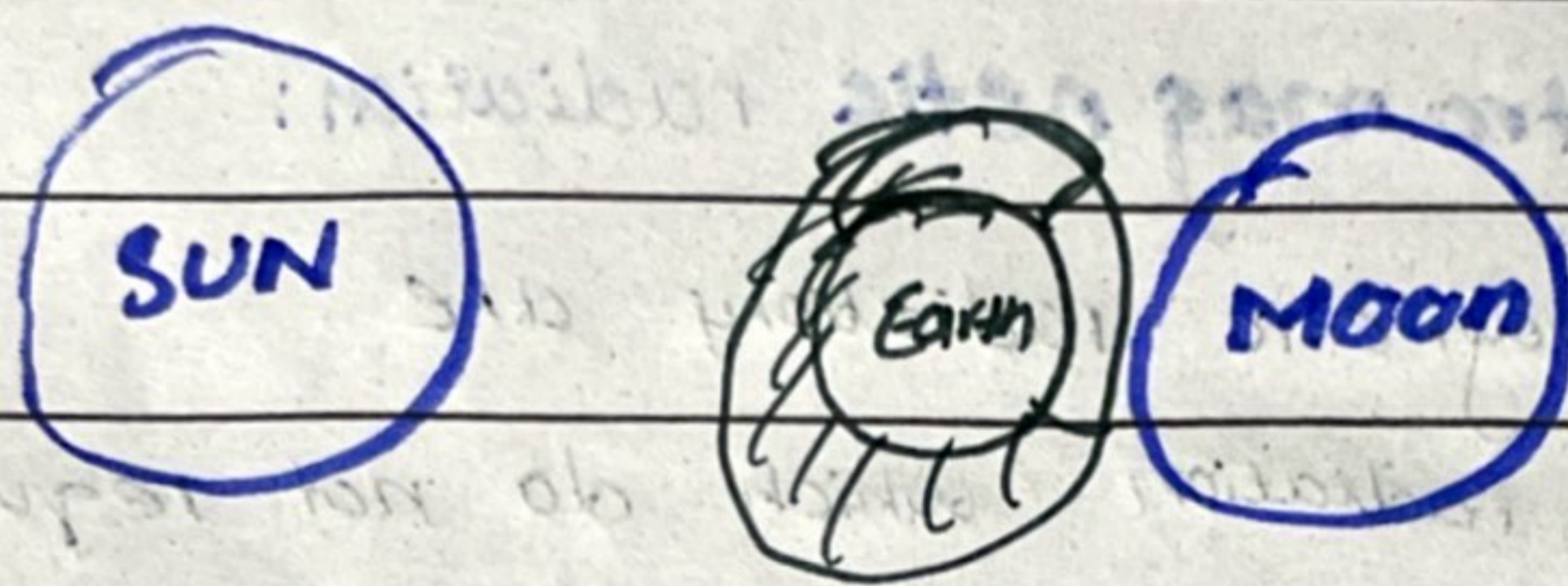
### 3) Triple covalent bond

Triple covalent bond is formed when three pair of electrons are shared.



## Q No 3, What is Lunar Eclipse

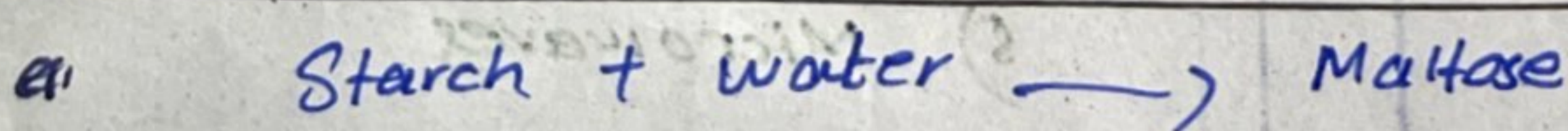
Lunar Eclipse occurs when earth moves between the sun and the moon, casting a shadow across the lunar surface.



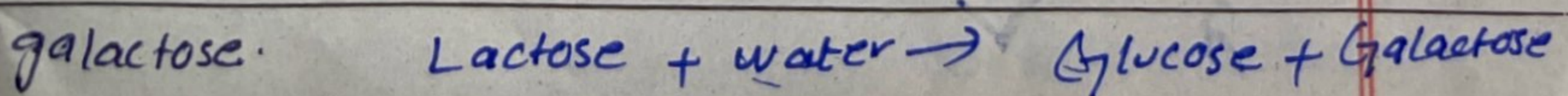
- Types
- ① Total Lunar Eclipse (Umbra)
  - ② Partial Lunar Eclipse (Penumbra)

## b) Functions of Enzymes:-

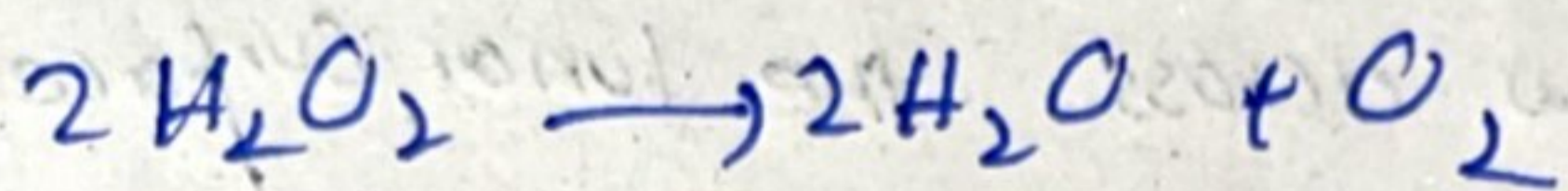
1) **Amylase** :- found in saliva and the pancreas, amylase helps break down starch into simple sugars,



2) **Lactase** :- present in the small intestine, it break downs lactose into sugar and



3) **Catalase**:- It is found in nearly all living organism exposed to oxygen. Helps in the breakdown of  $H_2O_2$

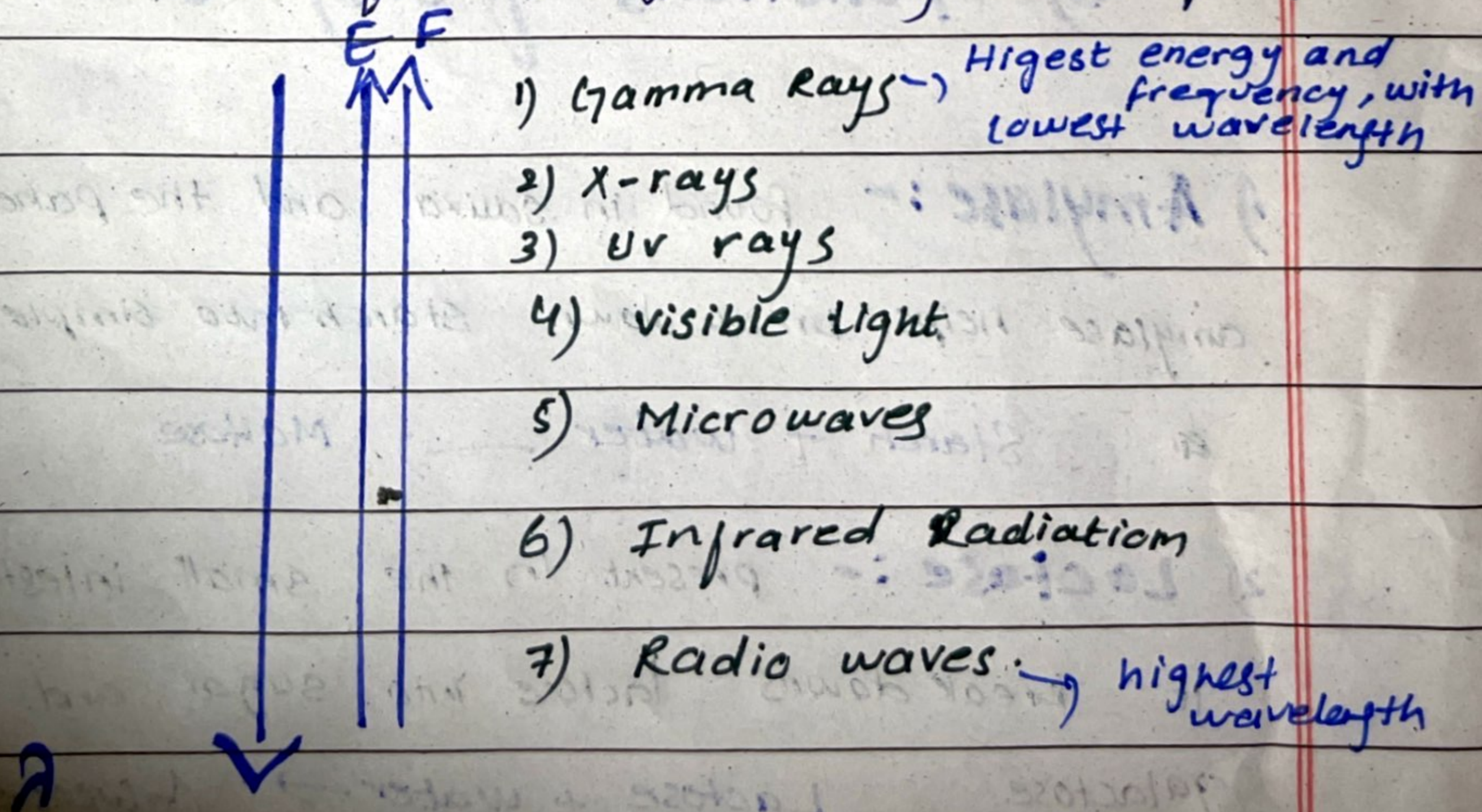


4) **Electromagnetic radiation**:-

Electromagnetic radiations are type of radiation which do not require medium to travel

### EMR Spectrum

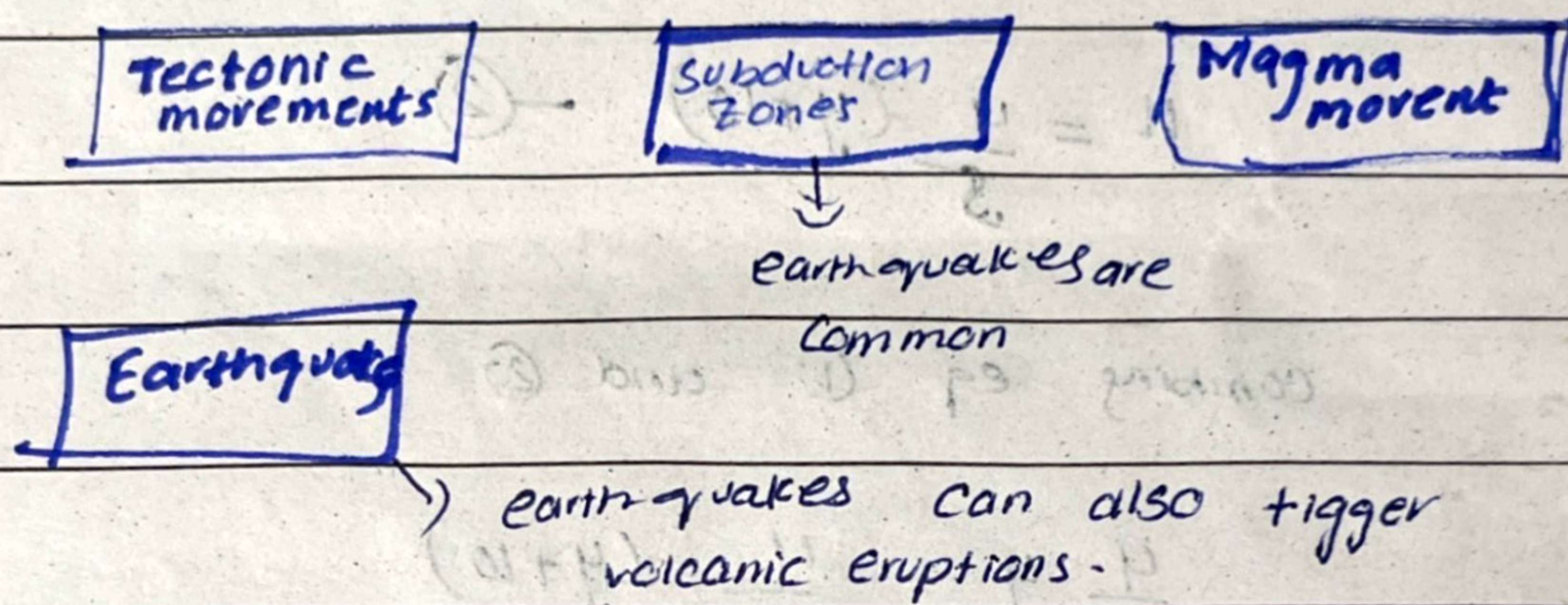
The electromagnetic spectrum is the range of all the types of electromagnetic radiations, classified on the basis of wavelength, energy and frequency.





d) Earth quakes and volcanic Eruption  
interconnected?

Yes Earth quakes and volcanic eruptions are  
closely linked through the dynamics of tectonic  
plates and magma movement within the earth crust.



## Section 2

QNO6

a) Determine the value of  $k$  if the arithmetic

mean of 9, 8, 10,  $k$ , 12 is 15

Sol:-

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

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

$$75 = 39 + k$$

$$k = 36$$

b)

Sol-

The initial ratio of sugar to colored water is  $\frac{x}{y} = \frac{4}{3}$

$$x = \frac{4}{3}(y) \quad \text{--- (1)}$$

when 10 liter colored water is added

$$x = \frac{4}{3}(y+10) \quad \text{--- (2)}$$

Combining eq (1) and (2)

$$\frac{4}{3}y = \frac{4}{3}(y+10)$$

multiply both sides by 3

$$3 \times \frac{4}{3}y = 3 \times \frac{4}{3}(y+10)$$

$$4y = 4(y+10)$$

$$4y = 4y + 40$$

$$4y - 4y = 40$$

$$0 = 40$$

$$y = \frac{40}{4} = 10$$

$$y = 10 \quad \text{--- (3)}$$

putting value of

y in eq (1)

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

$$V = 20 \text{ liters}$$

c) What will be the volume of football with radius 12 cm?

Sol:-

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

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

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

$$= \boxed{7234.56} \text{ Ans}$$

d) Given a series of  $-10, -8, 6, 40, 102, \dots$

First the difference between consecutive terms

$$\text{From } -10 - (-8) = 2$$

$$6 - (-8) = 14$$

$$40 - 6 = 36$$

$$102 - 40 = 62$$

Find the differences of these differences

$$24 + 14 = 14 - 2 = 12$$

$$14 + 34 = 34 - 14 = 20$$

$$\text{From } 34 + 62 = 62 - 34 = 28$$

Find the difference of 2nd level differences

$$\text{From } 12 + 20 = 20 - 12 = 8$$

$$\text{From } 20 + 28 = 28 - 20 = 8$$

The 3rd level difference is common

~~Use it in 2nd level~~

The next level after 28 would be

$$28 + 8 = 36$$

The next level after 62

$$62 + 36 = 98$$

Add it in original term

$$102 + 98 = \boxed{200} \text{ Ans}$$

QNO 7

a) If 20% of  $n = y$ , what value of  $y\%$  of 20 in terms of  $n$ ?

to calculate value of  $y\%$  of 20

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

$$= y = \frac{20}{100} n$$

$$y = 0.2n$$

calculate  $y\%$  of 20

$$= \frac{y}{100} \times 20$$

$$= \frac{0.2n}{100} \times 20$$

$$= 0.04 \text{ Any}$$

b) P and Q have an average monthly salary of Rs 5050. Q and R have an average monthly income of 6250, while P and R have an average monthly income of 5200. Find the monthly salary of P

Sol:-

$$1) \text{ The average monthly salary} = \frac{P+Q}{2} = 5050$$

$$P+Q = 10100 \text{ --- (1)}$$

$$2) \text{ The average monthly salary} = \frac{Q+R}{2} = 6250$$

$$Q+R = 12500 \text{ --- (2)}$$

$$3) \text{ The average monthly salary of } P+R = 5200$$

$$P+R = 10400 \text{ --- (3)}$$

lets rearrange eq (3) and (1)

$$Q = 10100 - P \text{ --- (4)}$$

$$R = 10400 - P \text{ --- (5)}$$

Substituting  
(Combining) eq 4 and 5 in (2)

$$(10100 - P) + (10400 - P) = 12500$$

$$20500 - 2P = 12500$$

$$20500 - 12500 = 2P$$

$$P = \frac{8000}{2} = 4000$$

c) Two coins are tossed 500 times

we get:

Two heads: 105 times

one head: 275 times

No head: 120 times

Find the probability of each event to occur.

Sol:-

$$\text{Probability} = \frac{\text{Number of favourable outcomes}}{\text{Number of total outcomes}}$$

1) Two head : 150

$$\text{Probability} = \frac{150}{500} = 0.2$$

2) One head : 275

$$\text{probability} = \frac{275}{500} = 0.55$$

3) No head = 120

$$P = \frac{120}{500} = 0.24$$

d) Jamie's dad is 8 times older than Jamie. In years time, Jamie's dad will be twice the age of Jamie. What is the sum of Jamie's age now and Jamie's dad's age now?

let  $n$  represent Jamie's current age

Then Jamie's current dad's current age can be expressed as  $4n$

as he is 4 times older than Jamie

In 14 years,

$$n + 14 \text{ — Jamie's age — (1)}$$

$$4n + 14 \text{ — Dad's age — (2)}$$

$$n + 14 = 4n + 14$$

14: According to the problem Jamie's age will be twice as the age of Jamie

$$4n + 14 = 2(n + 14)$$

$$4n + 14 = 2n + 28$$

$$4n - 2n = 28 - 14$$

$$2n = 14$$

$$n = \frac{14}{2} = 7$$

$$n = \frac{14}{2} = 7$$

$$n = 7$$

P.



Putting value of  $n$  in ~~eqn (1) and (2)~~

$$\text{Dad's age} = 4n$$

$$= 4 \times 7$$

$$= 28$$

$$\text{Sum of their ages} = n + \text{dad's age}$$

$$= 7 + 28$$

$$= 35$$