

General Science and Ability:

Q No.3) Discuss different parts of eye. How far-sightedness and short-sightedness can be corrected?

Keep length equal for all answers
Write complete logic and steps in math portion

Human Eye

A human eye is roughly 2.3 cm in diameter and is almost a spherical ball filled with some fluid. Human eyes are "camera-type eyes" which means they work like camera lenses focusing light onto film. The cornea and lens of the eye are analogous to the camera lens, while the retina of the eye is like the film.

Parts of Human Eye:

Following are the parts of human eye

1- Sclera:

It is the outer covering, a protective tough white layer called the sclera (white part of the eye).

2- Cornea:

The front transparent part of the sclera is called the cornea. Light enters the eye through the cornea.

3- Iris:

A dark muscular tissue and ring-like structure behind the cornea is known as the iris. The colour of the iris actually indicates the colour of the eye. The iris also helps regulate or adjust exposure by adjusting the iris.

4- Pupil:

A small opening in the iris is known as pupil. Its size is controlled with the help of iris. It controls the amount of light that enters the eye.

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5- Lens:

Behind the pupil, there is a transparent structure called a lens. By the action of ciliary muscles, it changes its shape to focus light on retina. It becomes thinner to focus on distant objects and becomes thicker to focus on the nearby objects.

6- Retina:

It is a light-sensitive layer that consists of numerous nerve cells. It converts image formed by the lens into electrical impulses. These electrical impulses are then transmitted to the brain through optic nerve.

7- Optic nerves:

Optic nerves are of two types. These include cones and rods.

Cones:

Cones are the nerve cells that are more sensitive to bright light. They help in detailed central and colour vision.

Rods:

Rods are the optic nerve cells that are more sensitive to dim lights. They help in peripheral vision.

8- Aqueous Humor:

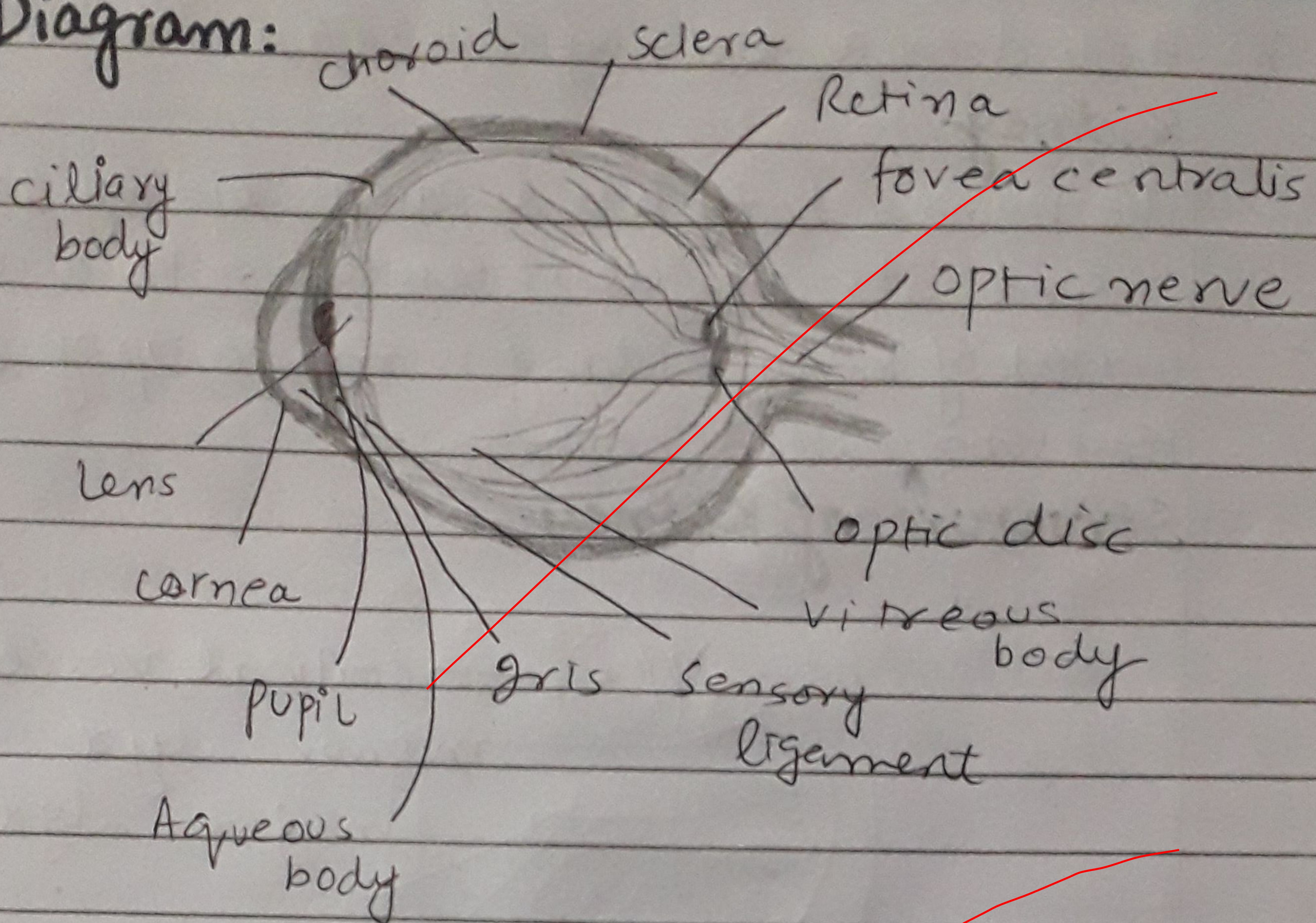
The fluid beneath the cornea has a composition similar to that of blood plasma. The aqueous humor helps to shape the cornea and provides nourishment to the eye.

9- Vitreous Humor:

A certain distance is required to focus light. It is a transparent watery gel that supports eye & allows for this distance.

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Diagram:



Structure of Human Eye

Short-Sightedness (Myopia)

In short-sightedness, the person is not able to see distant objects.

How to resolve short-sightedness

Glasses

Concave prescription lenses (called minus lenses)

Contact lens

Lasik Surgery

Intra ocular lens

Refractive lens exchange

Long-Sightedness

In long-sightedness, the person is not able to see the nearby objects.

How to resolve long sightedness

Glasses

Convex prescription lenses (called plus lenses)

Contact lens

Lasik surgery

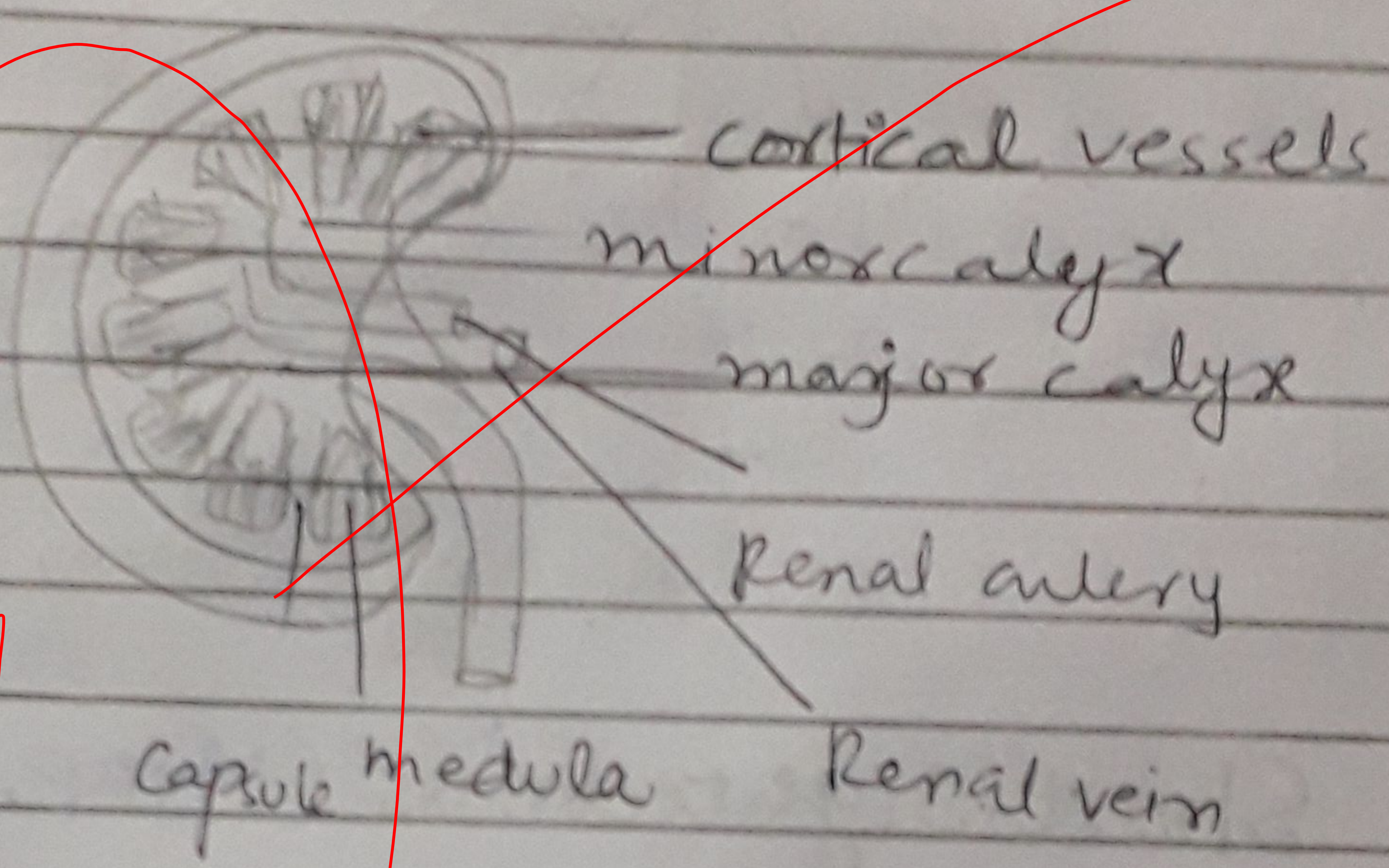
Refractive lens exchange

Q3b) How does a kidney work? Explain with diagram.

Kidney

The human body has a pair of kidney. It is bean shaped. Its weight is less than 1% of the total weight of body. Kidney is made up of 2-million tiny tubes called nephrons.

Structure of Kidney



Cortex

lighter outer region

Medulla

inner pale region

Pyramids

Cone shaped structures in Medulla

Pelvis

funnel like space into which pyramid project, called pelvis

Ureter

A duct emerges from the pelvis

Urinary bladder

ureter from each kidney enters into a sac like structure called urinary bladder.

Urethra

outer opening

Working of Kidney

Nephron is the structural and functional unit of kidney. Each kidney is made of about million of nephron. Nephron includes;

- ① Glomerulus
- ② Bowman's capsule
- ③ Renal Tubule
- ④ Loop of Henle
 - Ascending loop of Henle
 - Descending loop of Henle

Working of Nephron

① Filtration:

Blood containing waste products enters into Glomerulus. Due to high blood pressure and porous walls of the glomerulus, blood is filtered here. Blood cells and proteins remain in the glomerulus while glucose, urea, uric acid and some important salts are filtered here. These filtrate enters into the proximal part of nephron.

② Reabsorption

All the useful constituents of the filtrate like glucose, salts & H_2O reabsorbed in the proximal loop of Henle and distal part of nephron by the peritubular capillaries which are surrounding these parts.

③ Secretion

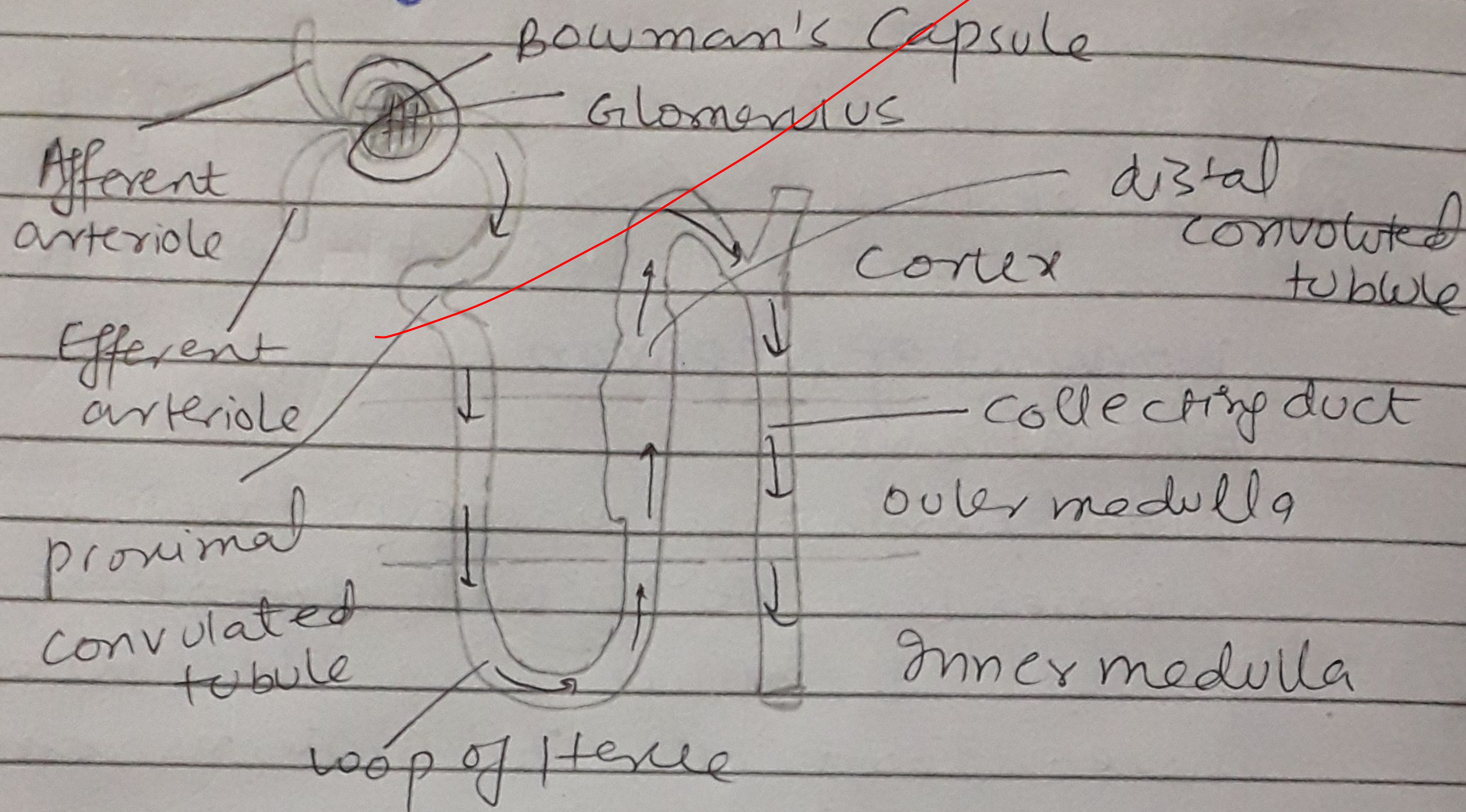
The inner layer of the nephron also secretes nitrogenous waste products into the lumen of nephron.

All these waste products from the distal part

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enter into the collecting duct which enters opens into pelvis. From pelvis enters into the ureter then store into the urinary bladder from there excreted outside through urethra.

Diagram of Nephron



Q/N 30) How Black holes are formed?

Black Hole:

Definition

A black hole in space where gravity pulls so much that even light cannot get out. The gravity is so strong because matter has been squeezed into a tiny space.

How Black holes are formed

- Stellar black holes are made when the center of a very big star falls in upon itself or collapses. When this happens it causes a supernova. A Supernova is an exploding star that blasts part of the star into space. Scientists think supermassive black holes were made at the same time as the galaxy.

they are in.

Size of Black holes

They can be big or small. They can be as small as just one atom or as large as big ones.

Mass of Black holes

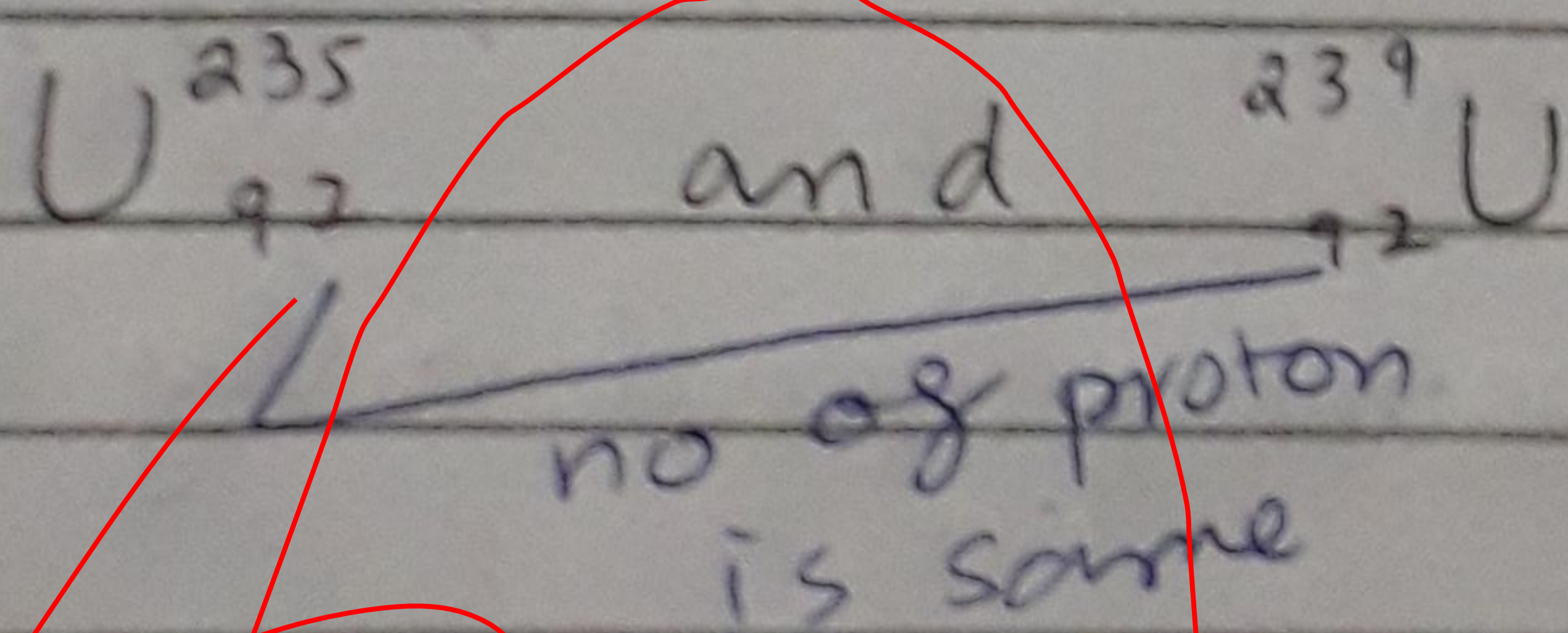
Its mass can be up to 20 times more than the mass of sun called as the stellar. They can be so massive that are more than one million suns together known as supermassive.

Q No 3) What are Isotopes, Isobars and Isotones? Give example of isotopes of Hydrogen.

Isotopes:

Atoms of same element having same atomic number but different atomic masses.

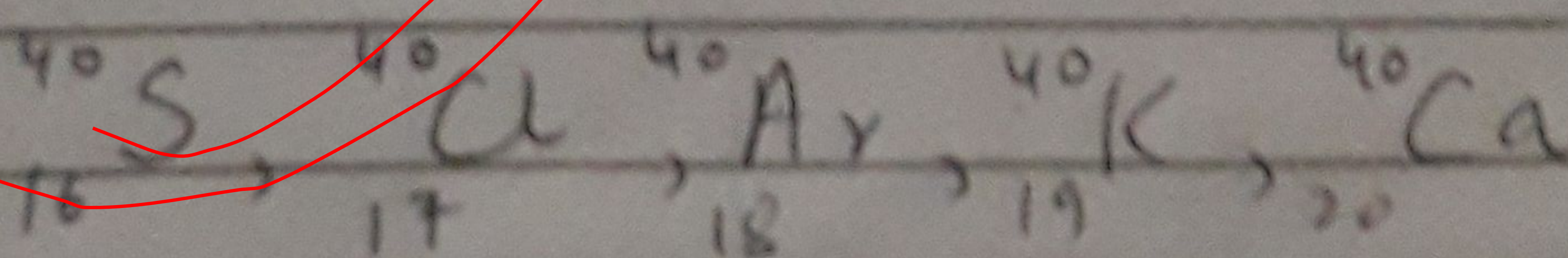
e.g



Isobars:

Isobars are elements that have same number of nucleons (sum of proton and neutrons).

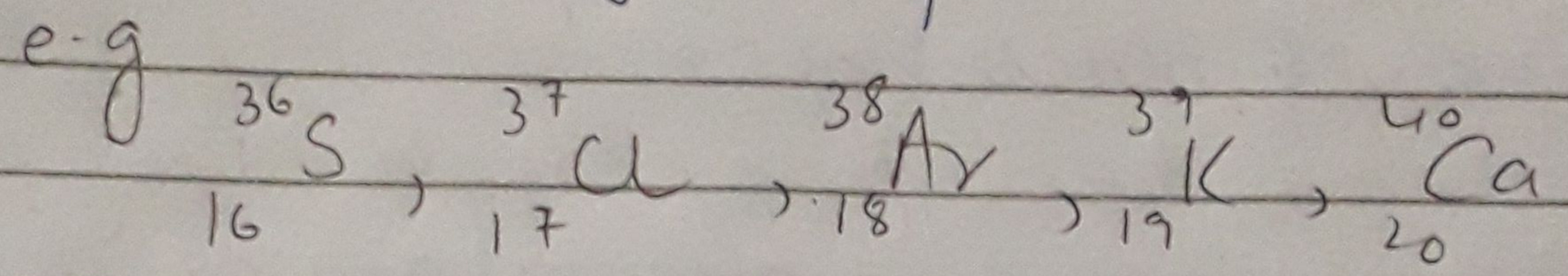
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Isotones:

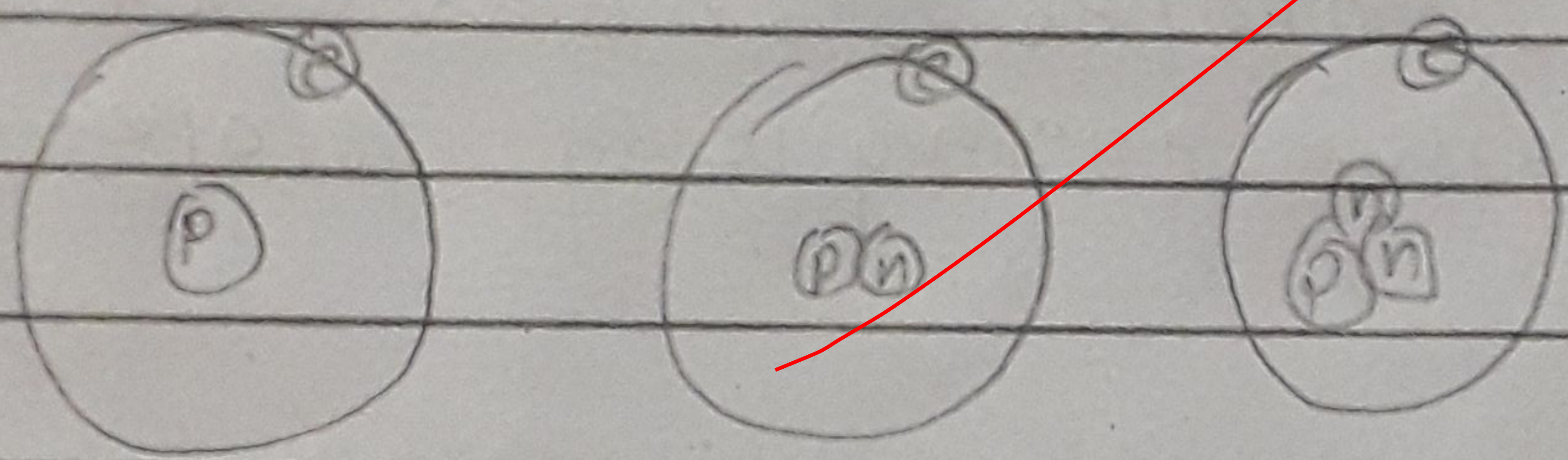
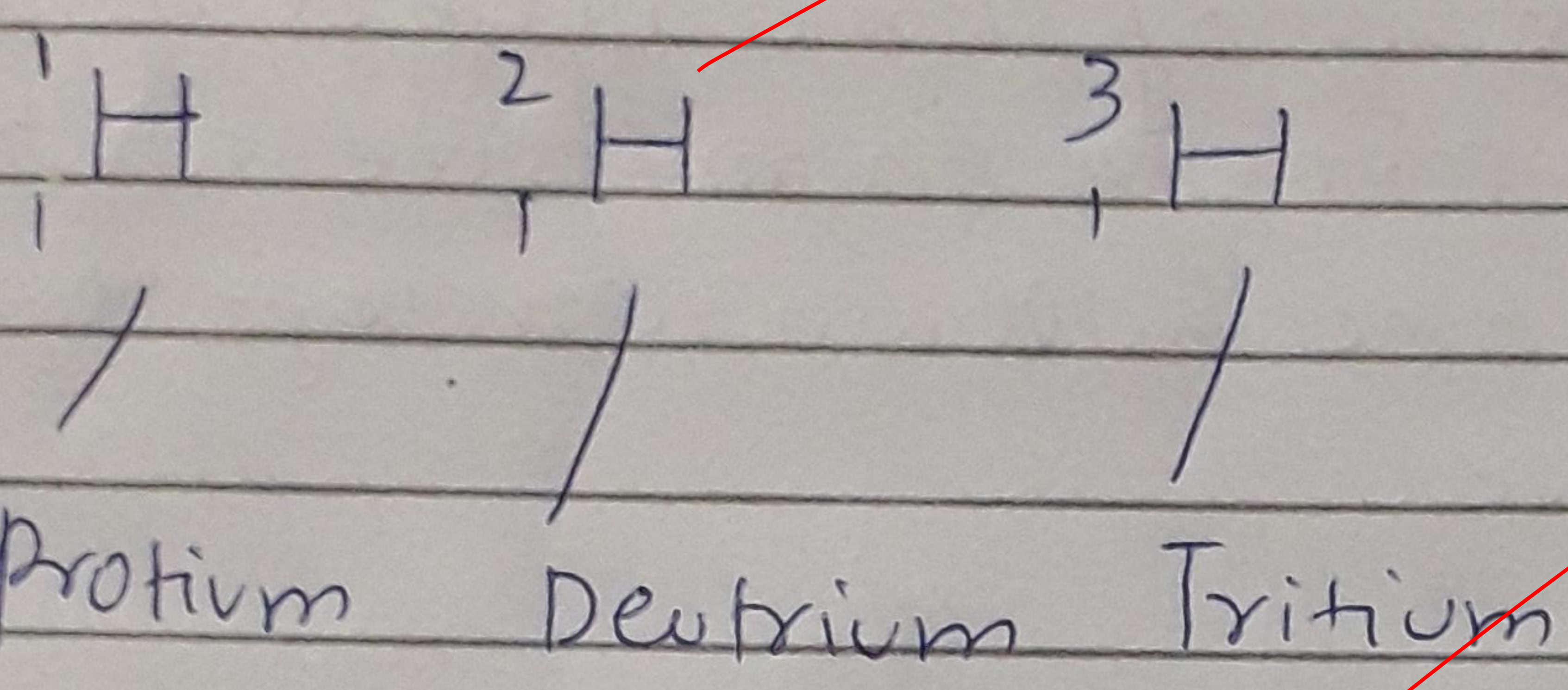
Isotones are atoms that have same neutron

number but different proton numbers



Isotopes of Hydrogen

Hydrogen has three naturally occurring isotopes.



Q Nos) Distinguish b/w RAM & ROM?

	RAM	ROM
①	Abbreviation Random access memory	Read only memory
②	volatility RAM is volatile in nature as its automatically erased when computer shut-downs	ROM is non volatile since it is never erased when there is any shutdown or restart of computer
③	Accessibility RAM can be directly accessed by processor	ROM cannot be directly accessed by processor. Since it is transferred into RAM where it is executed by processor.

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(4)

Storage

RAM is used to store the temporary information for limited time

ROM is used to store the permanent information

(5)

Hardware structure

RAM is in form of chip

ROM is generally optical drivers made of the magnetic tapes

(6)

Cost

Costlier than ROM

Cheaper than RAM

(7)

Size

Chip size is larger than ROM.

Chip size is smaller than RAM

(8)

writing speed

writing data to a RAM chip is faster process.

writing data to ROM chip is a slow process

(9)

Storage limit

A RAM chip can store multiple gigabytes (GB) of data up to 16 GB or more per chip.

A ROM chip typically stores only several megabytes (MB) of data up to 4 MB or more per chip.

Nibble:

In computing and digital technology, a nibble is four consecutive binary digits or half of an 8-bit byte. When referring to a byte, it is either the first four bits or the last four bits, which is why a nibble is sometimes referred to as half-byte.

USB:

It stands for universal serial bus. It is a mechanism used to connect computer with peripheral devices. USB transmits data between two devices in smaller, bite-sized quantities known as packets.

Q(No 5b) How AI has revolutionised the world? Justify
AI stands for **"Artificial Intelligence"**. It has truly revolutionised the world.

- 1) It has digitalized the society
- 2) It has enabled humans to collect, process and analyse large amounts of data at a faster rate.
- 3) It has led to creation of new technologies
- 4) It has improved business process
- 5) AI-powered technologies such as natural language processing, image and audio recognition and computer vision have revolutionised the way we interact with and consume media.
- 6) AI-powered personal assistants such as Siri and Google Assistant have been used by people.
- 7) Chat GPT is excellent and helps students in studies.

Q No 50) How does an optical fiber work? write some of its advantages.

Fiber Optics:

Fiber optic lines are strands of optically pure glass as thin as human hair that carries digital information over long distances.

Working of Fiber Optics

Principle

Total Internal Reflection

Working

Light travel down a fiberoptic cable



bounce repeatedly off the walls



Each tiny photon bounces down the pipe



Light hits the glass at a really shallow angle (less than 42 degrees)



It reflects back in again



This is called Total Internal Reflection



It keeps the light inside the pipe



Another thing which keeps the light inside is the structure of cable.



The main part of cable in middle is called

Core

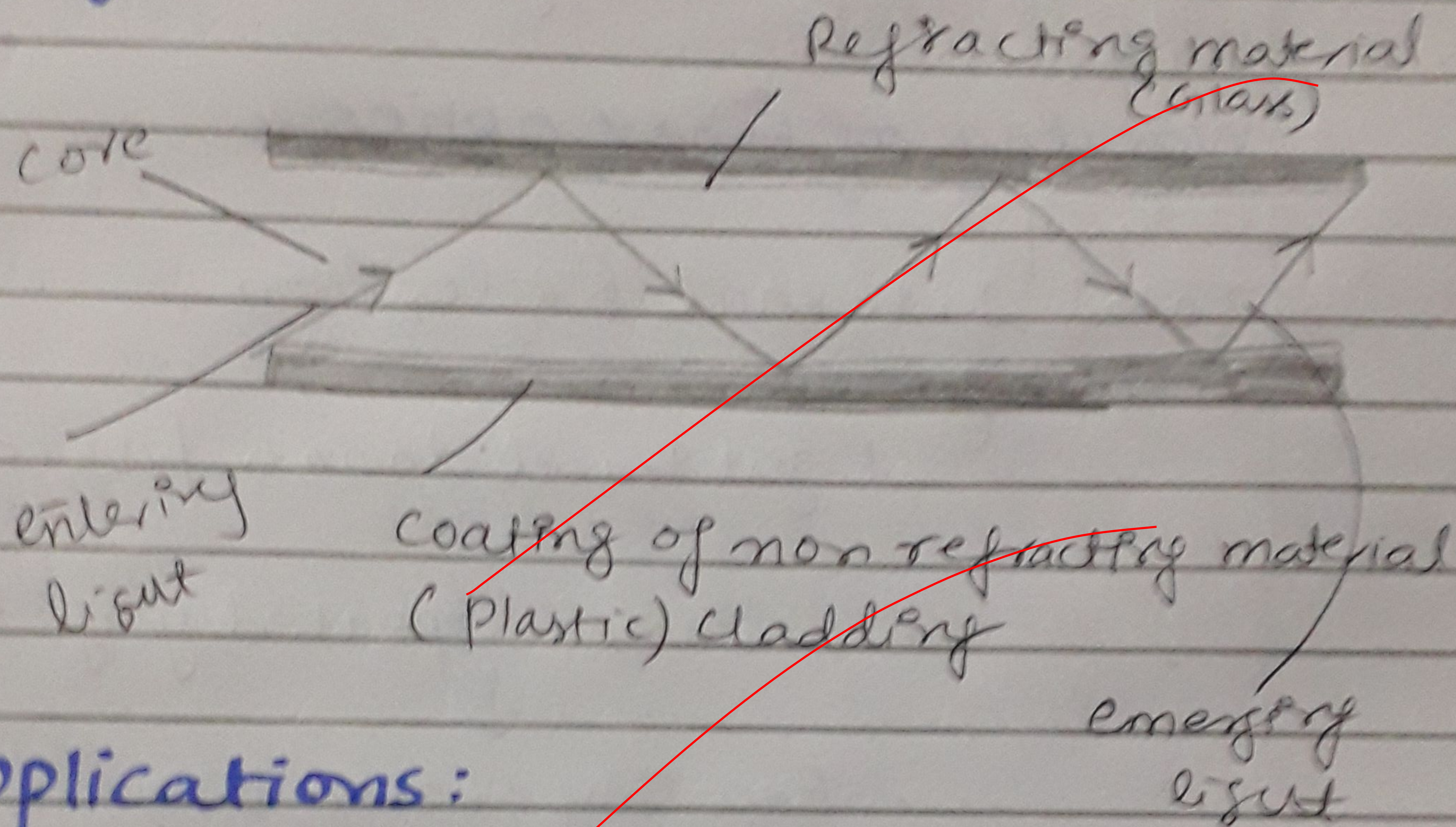


and that's the bit the light travels through.



Wrapped around the outside of core is another layer of glass called **cladding** to keep the light signals inside core.

Diagram:



Applications:

- ① Use in military's retrieval and deployment
- ② Missile systems
- ③ Radar system
- ④ Television cable
- ⑤ Internet

Q No 5d) What is critical speed of a satellite?

Critical Speed of Satellite

The critical velocity of satellite is independent of the mass of satellite. So the critical velocity of satellite doesn't change with the change of mass of satellite. The critical speed of satellite is constant for the planet. For Earth, the critical speed is 7.9 km/hour.

Example:

Let mass of satellite is m
distance of satellite around earth
at a distance of h

Mass of Earth is M

Radius of Earth is R

centripetal force of satellite is balanced
by the gravitational force.

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$\frac{mv^2}{r} = \frac{GMm}{r^2}$$

$$mv^2 = \frac{GMm}{r}$$

$$v^2 = \frac{GM}{r}$$

$$v = \sqrt{\frac{GM}{r}}$$

So

$$v = \sqrt{\frac{GM}{R+h}}$$

→ distance b/w satellite
and centre of Earth

So, critical velocity of satellite is

(i)

Directly proportional to square root of mass of satellite

(ii)

Inversely proportional to the square root of the distance.

Hence, critical velocity is independent of mass of satellite and does not change with mass of satellite
So critical speed of satellite is constant for planet. It is 7.9 km/h .

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Q No 5) Differentiate Geo-stationary and polar Satellites.

Geo-stationary Satellite

polar satellite

① Geo-stationary Satellites orbit the earth at equator.

polar satellites are orbiting the poles.

② They orbit at high altitude approximately at a distance of 35,800 km.

They orbit at low altitudes closer to Earth's surface at a distance of 500-800 km.

③ They are orbiting in an orientation of west to East.

They are orbiting in an orientation of North to South.

④ Time for one orbit is one day per orbit.

It crosses equator twice per orbit.

⑤ Journey of orbit is above the equator.

Its journey is over North and South poles.

⑥ It monitors same region of Earth all day as it is synchronised with rotation of Earth.

Provides more detailed information about weather and takes whole Earth photos.

⑦ Example is the Communication Satellite.

Earth observation and monitoring satellites.

Q No 8) Discuss the factors which can affect IQ

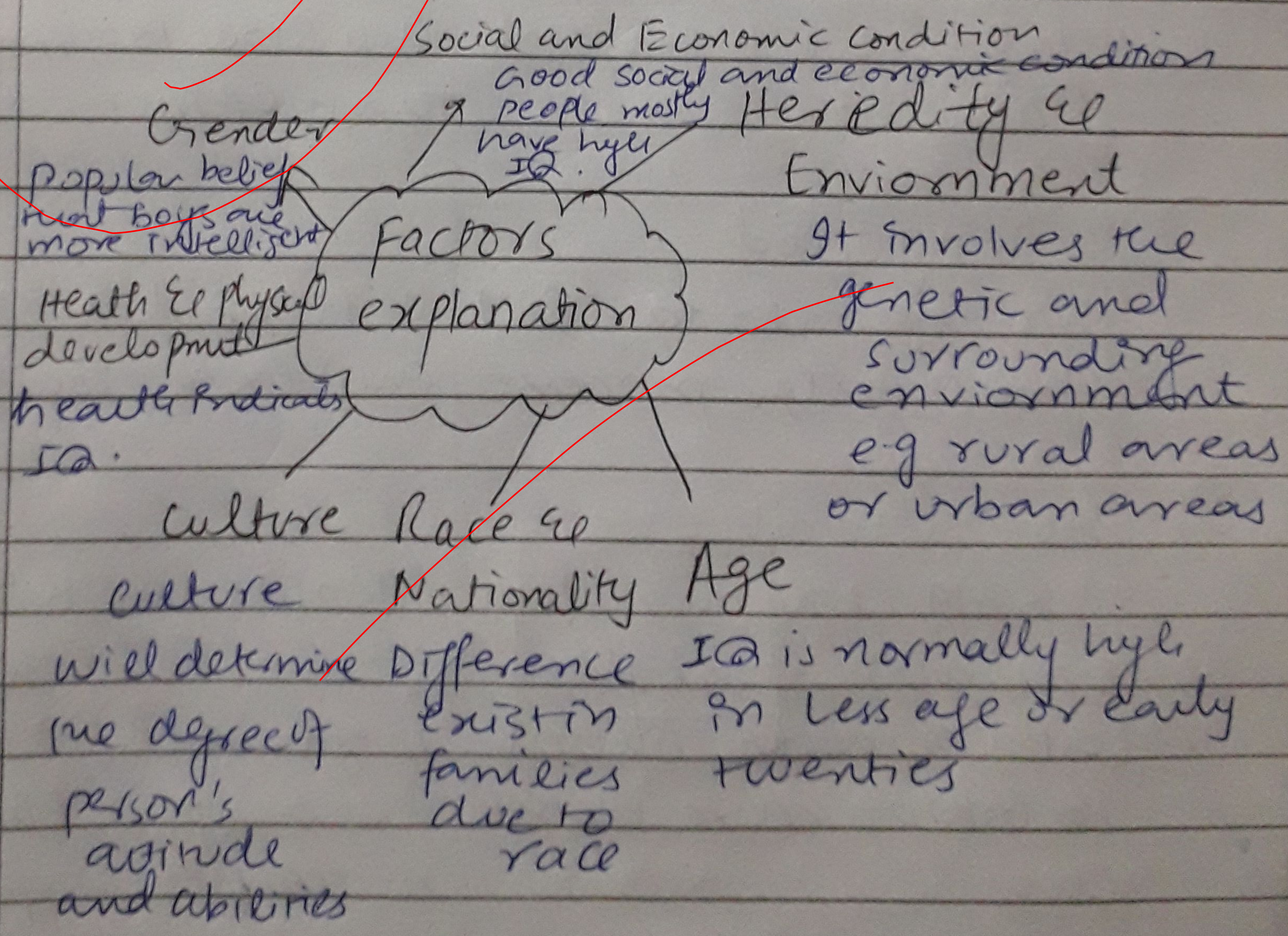
IQ

An intelligence quotient or IQ is a score derived from one of several different tests designed to assess intelligence.

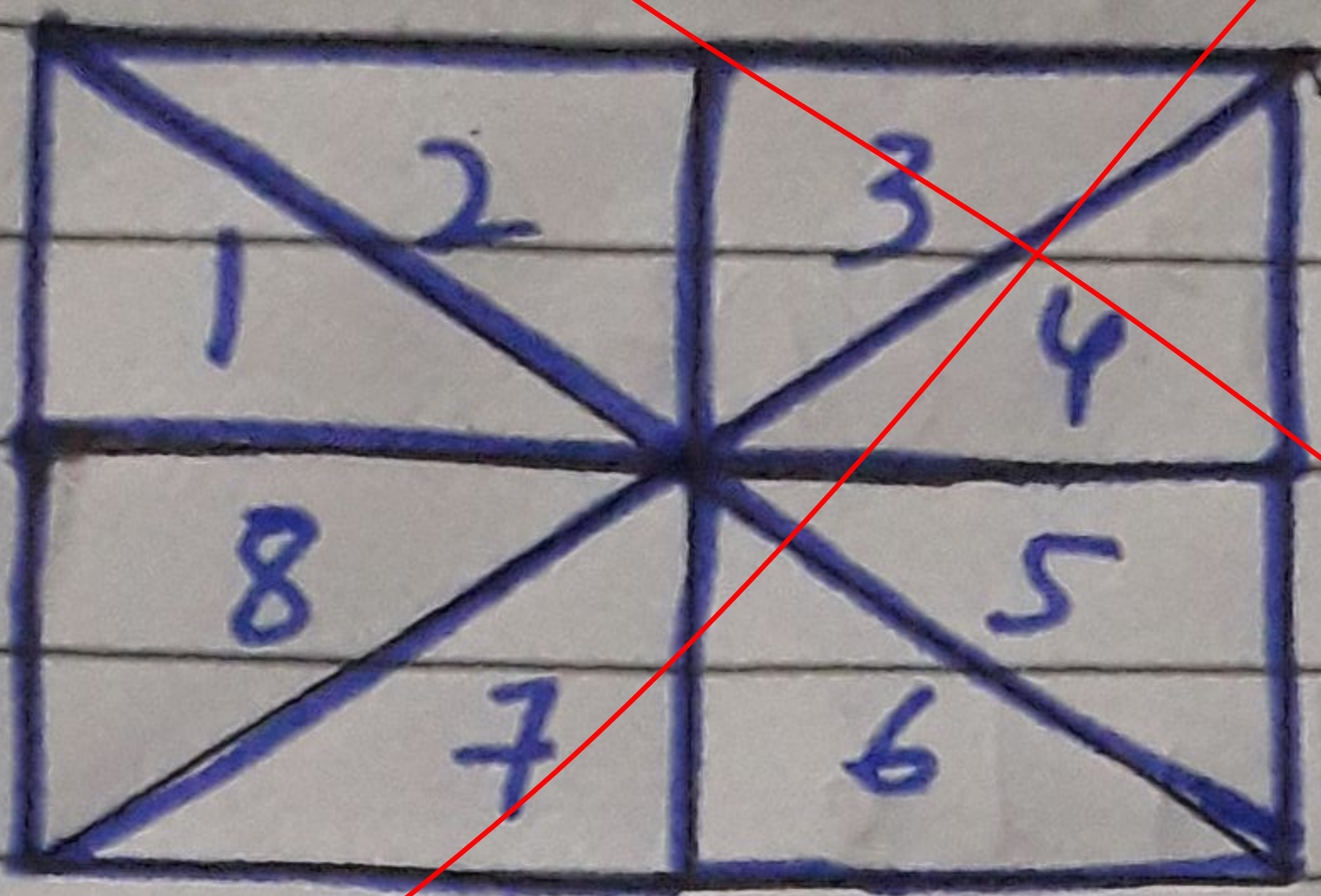
Factors

Multiple factors can affect IQ

- ① Heredity and Environment
- ② Age
- ③ Race and Nationality
- ④ Culture
- ⑤ Health and physical development
- ⑥ Gender
- ⑦ Social and Economic condition



Q No 8c) Find the number of triangles in following figure



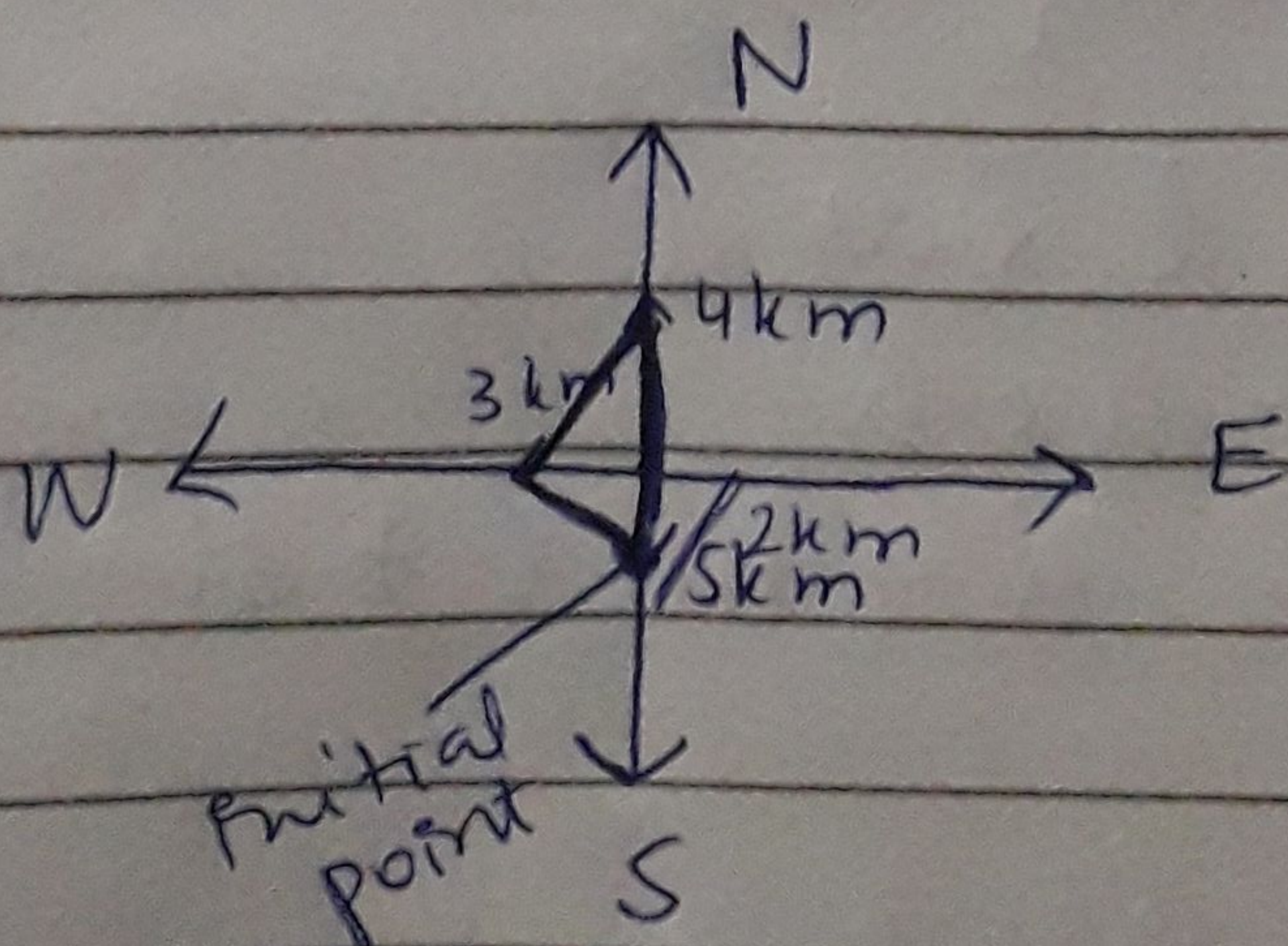
There are total 8 number of triangles.

Q No 8b) A pizza is divided into 8 slices in which 3 slices contain raisin in it. Shiza picks a slice, what is the probability that she will pick a slice with raisin.

$$\text{Prob}(E) = \frac{\text{No of way of occurrence of an event}}{\text{Total possible outcomes}}$$

$$= \frac{3}{8}$$

Q No 8a) A crow travels South 5 km then 3 km west and then 4 km north. Finally travels 2 km South-east. How far is the crow from initial point?



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using pythagoras theorem

$$H^2 = B^2 + P^2$$

$$H^2 = (3)^2 + (4)^2$$

$$H^2 = 9 + 16$$

$$H^2 = 25$$

$$\sqrt{H^2} = \sqrt{25}$$

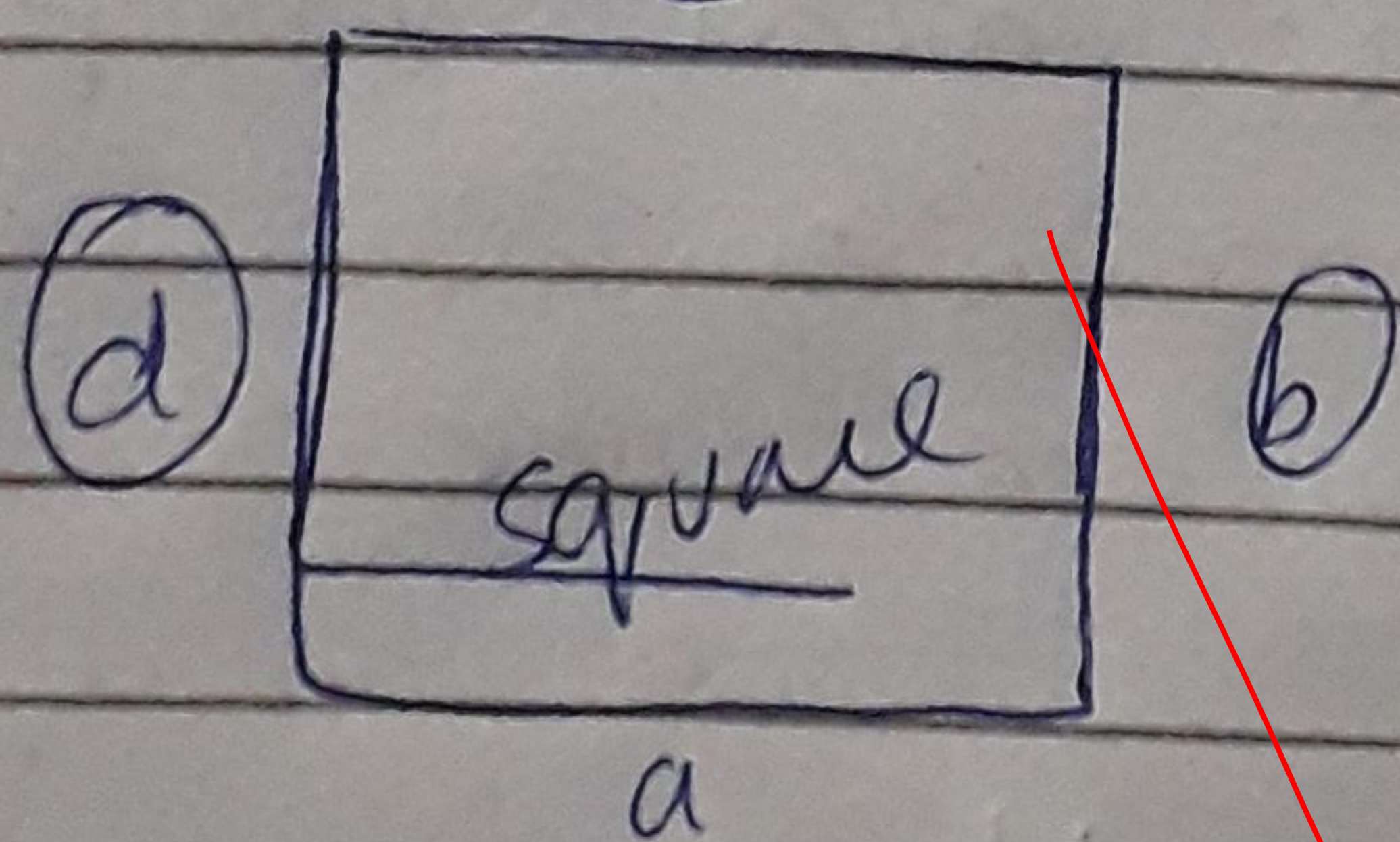
$$H = 5 \text{ km}$$

Q No 7d) A square pyramid has a volume of 372 cm^3 , height is 3 km , perimeter of base = ?

$$\text{Volume} = 372 \text{ cm}^3$$

$$\text{Height} = 3 \text{ km}$$

$$\text{perimeter} = ?$$



$$A = l \times w$$

$$A = a \times b$$

$$P = a + b + c + d$$

Q11671) If $A = \{a, e, i, o, u\}$
 $V = \{a, b, c, \dots, z\}$
 $A' = \{a, e, i, o, u\}$

Q11079) A woman...

sale price of 2 scooties = $96000 + 96000$
 $= 192000$

① Scooty $\rightarrow 96000 \rightarrow 20\%$ profit

② Scooty $\rightarrow 96000 \rightarrow 20\%$ loss

$\rightarrow \frac{\text{profit}}{\text{original}} \times 100$

$\rightarrow \frac{\text{loss}}{\text{original}} \times 100$

$96000 \rightarrow 20\%$

~~$\frac{20}{96000} = 0.00020833$~~

$96000 / 20 = \boxed{4800} \rightarrow \text{profit}$

$\frac{4800}{96000} \times 100 = 5\%$

so there is loss and gain of 5%

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Q No 98) 195 men

195 men \rightarrow 10 hours \rightarrow 20 days

x men \rightarrow 13 hours \rightarrow 15 days

Men	hours	days
195	10	20
x	13	15

Days	hours	Men
20	10	195
15	13	x

$$\frac{x}{195} = \frac{10}{13} \times \frac{20}{15} \times 3$$

$$x = \frac{40}{39}$$

$$x = \frac{40}{39} \times 195$$

$$x = 200$$