

Section-II

Question #06 :

Part(a):

Present age of the son = 30 years

Father's age = x

Five years ago, age of the father is = $x-5$

Age of son = $30-5 \Rightarrow 25$ years

Father's age is thrice the age of the son =

$$= 3(x-5) = (25 \text{ years}) \times 3$$

$$x-5 = 25 \times 3$$

$$x-5 = 75$$

$$x = 75+5$$

$$x = 80 \text{ years}$$

Hence, the current age of the father is 80 years.

Part (b):

Formula of mean =

$$\text{mean} = \frac{\text{sum of all observations}}{\text{total nbr of observations}}$$

$$50 = \frac{10+30+y+50}{4}$$

$$50 \times 4 = 10 + 30 + y + 50$$

$$200 = 90 + y$$

$$200 - 90 = y$$

$$y = 110$$

So, the value of y is 110.

Part (c) :

(i) 2, 6, 18, 54, _____
 ↖ ↗ ↗
 x3 x3 x3

In the above series, each number is 3 times more than the previous number.
- multiplying each number with digit 3 will give the next number.

According to the simple multiplication series,

2, 6, 18, 54, _____
($2 \times 3 = 6$) ($6 \times 3 = 18$) ($18 \times 3 = 54$) $54 \times 3 = 162$

the next number in the series is 162.

(ii) 3125, 256, _____, 4, 1

In the following series, the numbers are arranged following the rule;

3125, 256, _____, 4, 1
 ↓ ↓ ? ↓ ↓
 5^5 4^4 3^3 2^2 1^1

$3^3 = 3 \times 3 \times 3 = 27$

As per the sequence of the series, the missing number is 27.

Part (d) :

Given data :

Product of two numbers = 320

Ratio of two numbers = 1:5

Let the numbers are x and $5x$.

According to the question;

$$(x \times 5x) = 320$$

$$5x^2 = 320$$

$$x^2 = \frac{320}{5}$$

$$\sqrt{x^2} = \sqrt{64}$$

$$x = 8$$

the first number is $x = 8$

second number is $5x = 5 \times 8 \Rightarrow 40$

Now,

the difference b/w the squares of these two numbers is;

$$40^2 - 8^2 = 1600 - 64$$
$$= 1536$$

the required difference b/w the squares of these two numbers is **1536**.

Question # 07

Part (a) :

Selling price of Scooters = 96000

Profit made on the first scooty = 20%

Loss made on the second scooty = 20%

i) On selling the first scooter at 20% profit;

$$\begin{aligned}\text{cost price} &= \left[\frac{100}{100+20} \right] \times \text{Selling price} \\ &= \left[\frac{100}{100+20} \right] \times 96000 \\ \text{cost price} &= 80,000\end{aligned}$$

ii) on selling the second scooter, at 20% loss.

$$\begin{aligned}\text{cost price} &= \frac{100}{100-20} \times \text{selling price} \\ &= \frac{100}{100-20} \times 96000 \\ \text{cost price} &= 120,000\end{aligned}$$

$$\begin{aligned}\text{Total cost price of both scooters} &= \\ &= 80,000 + 120,000 \\ &= 200,000\end{aligned}$$

$$\begin{aligned}\text{Total selling price of both scooters} &= \\ &= 96,000 + 96,000 \\ &= 192,000\end{aligned}$$

$$\begin{aligned}\text{So, loss} &= 200,000 - 192,000 \\ &= 8,000\end{aligned}$$

The total loss made on the whole
is Rs. 8,000.

Part (b) :

men	Hours	days
↑ 195	↓ 10	20 ↓
x	↓ 13	15 ↓

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

$$\frac{x}{195} = \frac{200}{195}$$

$$x = \frac{200 \times 195}{195}$$

$$x = 200$$

Thus, the required number of men to finish the job in 15 days is 200.

Part (c) :

$$A = \{a, e, i, o, u\}$$

$$U = \{a, b, c, \dots, z\}$$

$$A' = U - A$$

$$= \{a, b, c, d, \dots, z\} - \{a, e, i, o, u\}$$

$$A' = \{b, c, d, f, g, h, j, k, l, m, n, p, q, r, s, t, v, w, x, y, z\}$$

Part (d) :

Volume of a square pyramid = 372 cm^3
height of the pyramid = 3 km

Formula:

Volume of a pyramid = $\frac{1}{3} \times \text{area of base} \times$
height of pyramid

$$372 = \frac{1}{3} \times \text{area of base} \times 3 \text{ km}$$

$$372 = \frac{3}{3} \times \text{area of base}$$

$$\text{Area of base} = 372 \text{ cm}^2$$

To find, length of each of base side =
 $x^2 = 372 \text{ cm}^2$

$$x = \sqrt{372}$$

$$x = 19 \text{ cm}$$

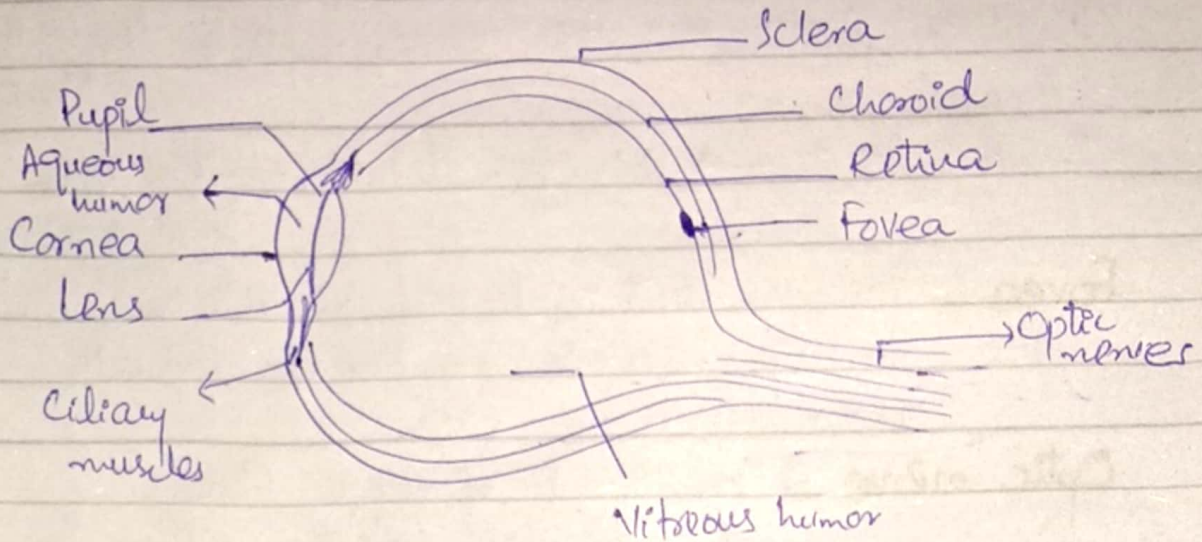
$$\text{Perimeter of its base} = 19 + 19 + 19 + 19 \\ = 76 \text{ cm}$$

Perimeter of its base is 76 cm .

Section - I

Question #03:

(a) Parts of Eye:



a) Layers of eye:

Eye is composed of 3 layers

- Outer layer - called Sclera, Cornea
- middle layer - called choroid
- Inner layer - called retina

Sclera - being the outer-most layer of eye, gives the eye its white colour

Choroid - middle layer - that contains blood vessels for the blood supply to the eye

Retina - Photosensitive layer, that contains photoreceptors. It helps in the image formation of the object.

Photoreceptors — {
Rods - sensitive to dark light
Cones - sensitive to bright light

Iris - colored part of the eye which helps to regulate the amount of light entering the eye.

In bright light \Rightarrow Iris closes pupil = less light enters

In dim light \rightarrow Iris opens/dilates pupil \rightarrow more light enters eye

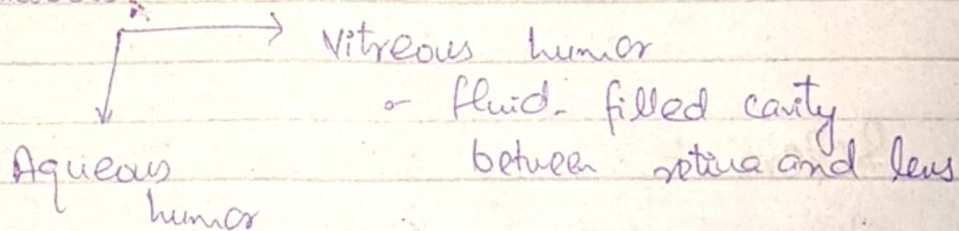
Fovea - is a part dipped in retina
- contains massive number of cone cells
- Helps in sharp vision

Optic nerve - comprised of nerve fibres carrying visual messages from the retina to the brain

Lens - the part where light enters the eye.

Chambers of the eye:

Entire eye is divided into two chambers:

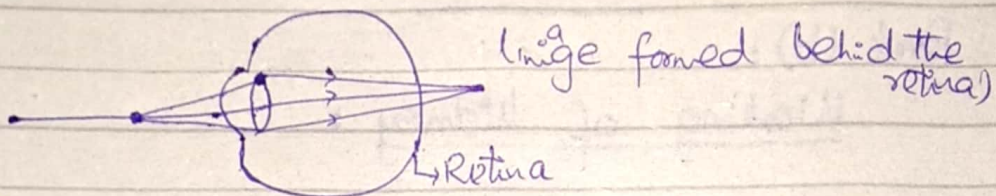


- cavity b/w lens and Cornea

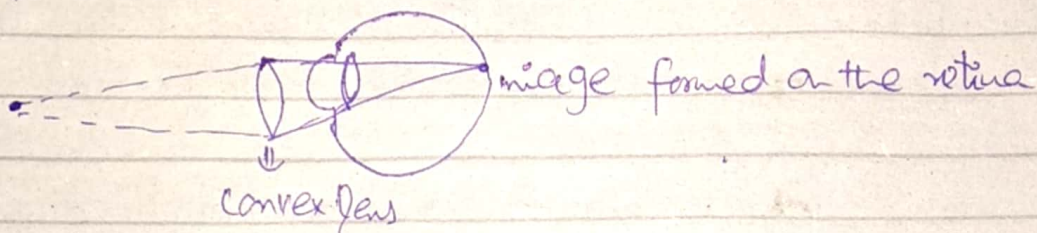
Far sightedness and short-sightedness:

↓
Person unable to see near-objects clearly as image is formed **behind the retina**

- To correct farsightedness, **convex lens** is used as a converging lens. This converging lens will refract light before it enters the eye and decrease the image distance. Resultantly, image is formed on the retinal surface.



if corrected:

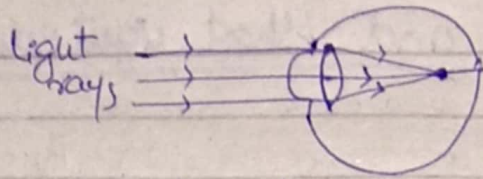


Short-sightedness:

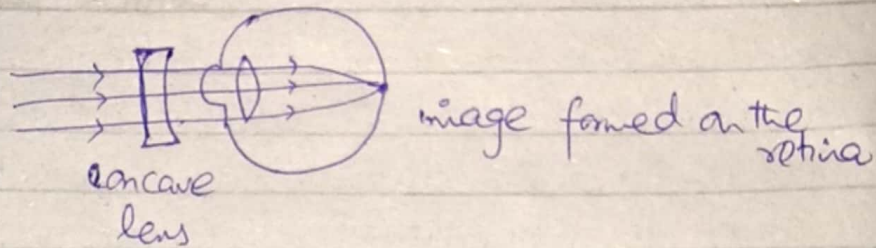
it is the inability of the eye to focus on distant objects, but can see the near-objects clearly.

- image is formed in front of the retina, rather on the retina.

- To correct short-sightedness, **concave lens** is used. Concave lens is a diverging lens, so it diverges light before it reaches the eye, and produces image on the retina.



• short sightedness - image formed in front of retina
if corrected using concave lens,



Part (b):

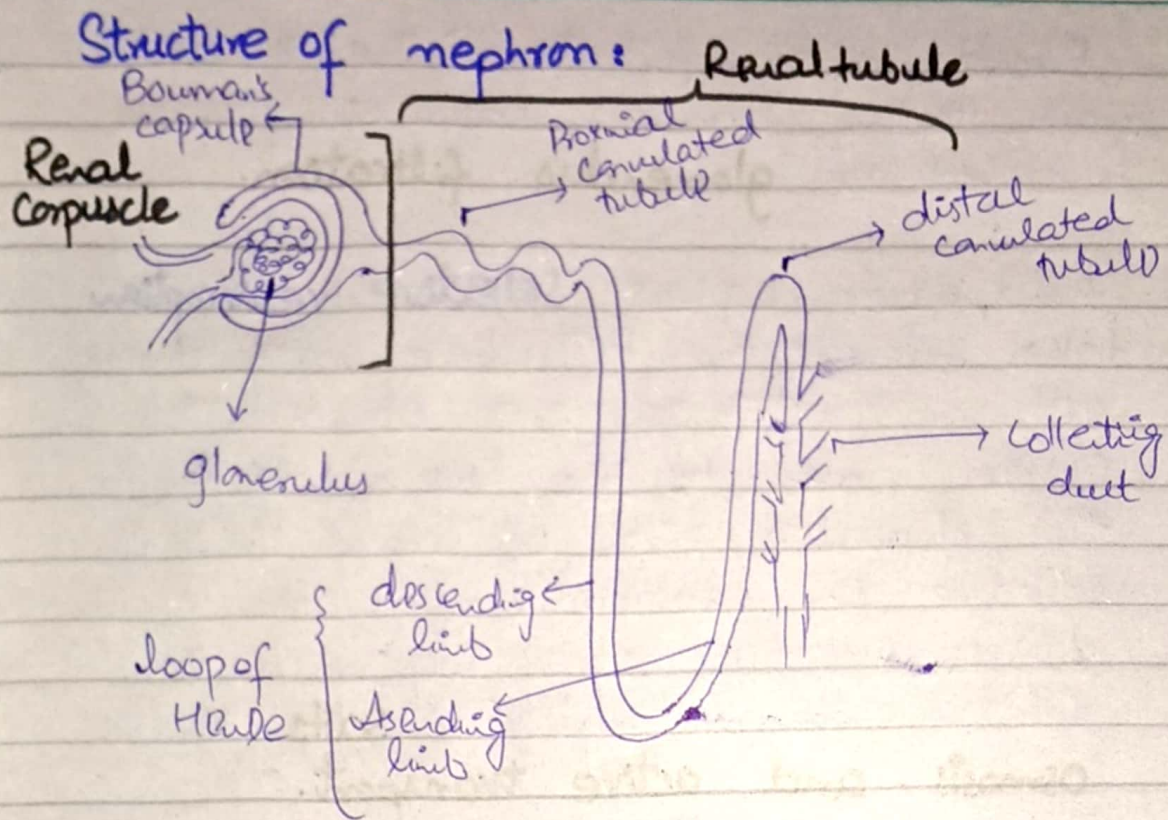
Working of kidney :

Kidneys are a bean-shaped organ located below the rib cage. The kidneys help to

- remove the waste products from the body
- to maintain the balanced concentration of electrolytes
- Regulates the blood pressure

Each of the kidney is made up of about a million of filtering units called as **nephrons**.

Nephrons also called as the structural and functional unit of kidney.



Nephron is mainly composed of two parts

- ↳ Renal corpuscle
 - ↳ Glomerulus
 - ↳ Bowman's capsule
- ↳ Renal tubule
 - ↳ Proximal convoluted tubule (PCT)
 - ↳ loop of Henle
 - ↳ distal convoluted tubule (DCT)
 - ↳ collecting duct

a) Renal Corpuscle

↳ consists of a network of capillaries called as **glomerulus** - that filters the blood

- Each glomerulus is ~~is~~ enclosed in a cup shaped structure called **Bowman's capsule**.

Blood after filtration in the glomerulus moves to the Bowman's capsule. This process is called as **glomerulus filtration**.

Second, process called **selective reabsorption** takes place in the PCT, where water, glucose, salts and other ions are absorbed. The filtrate moves to the loop of Henle. The descending limb of loop of Henle is selective for reabsorption of water through **diffusion**. Ascending limb of loop of Henle is selective for reabsorption of **salts** through **osmosis and active transport**. The filtrate moves to the distal convoluted tubule where 99% reabsorption of water gets completed.

3rd step is **Tubular secretion**, where various amino acids, electrolytes, creatinine, urea and urea is secreted to maintain the pH of the urine. After this, urine formation takes place and collecting ducts of various nephrons merge into the renal pelvis of the nephron where it empties urine into the ureter.

Part (c):

Black hole:

A black hole is an area in space where gravity is so strong that light cannot get out.

In fact, it is an object so compact that the velocity needed to escape an object from its surface is greater than the speed of light.

Black hole formation:

Astronomers believe that one of the only three things can happen to a star once it has burned out, depending on its mass:

- a) A star less massive than the sun collapses until it forms a **white dwarf**, with a radius of only a few thousand kilometers.
- b) If the star is between one and four times the mass of the sun, it can produce a neutron star, such a star recognized as **pulsar**.
- c) Many astronomers believe that the galaxies like the Milky Way were formed from a large cloud of gas which collapsed and broke

up into individual stars.

- d) It is also possible that the very centre there was too much matter to form an ordinary star, or that the stars which did form were so close to each other that they combined to form a black hole.

Part (d):

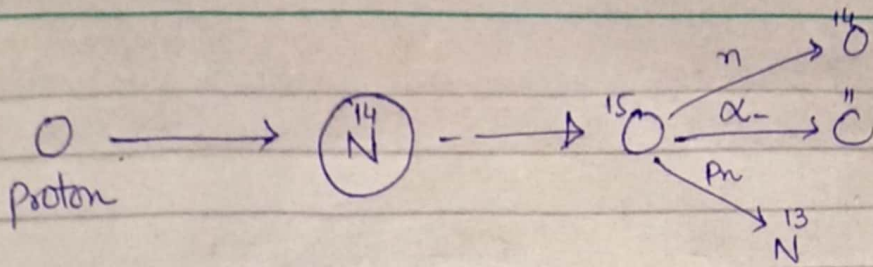
i) Isotopes :

Isotopes are the atoms having the same atomic number but different mass number.

It signifies that the number of protons in isotopes are different. Hence, the atomic weight of the isotopes of an element are different.

Isotopes of the same element have the same chemical properties because they have the same number and arrangement of electrons.

The physical properties of the isotopes are not the same.



N^{14} and N^{13} are the isotopes of nitrogen.

i) Isobars :

Isobars are atoms of different elements which have same atomic masses but different atomic numbers.

• Isobars have different number of protons, different number of electrons and different number of neutrons.

• Chemical properties of isobars are widely different, but their physical properties are identical.

For example,

I^{131}	Xe^{131}
Protons 53	Protons 54
Neutrons 78	Neutrons 77
Atomic mass 131	Atomic mass - 131

iii) Isotones :

Isotones are the nuclei which have the same number of neutrons. Both the atomic number and mass number are different, but the value of neutron is the same.

For example;
Chlorine-37 and Potassium-39 are isotones.

Chlorine - 37	Potassium - 39
nbr of protons = 17	Nbr of protons = 19
" " neutrons = $37 - 17$ = 20	Nbr of neutrons = $39 - 19$ = 20

Cl and K are isotones.

Isotopes of hydrogen:

there are three isotopes of hydrogen;

${}^1_1\text{H}$	${}^2_1\text{H}$	${}^3_1\text{H}$
Protium	Deuterium	Tritium
1 electron	1 electron	1 electron
1 Proton	1 Proton	1 Proton
0 Neutron	1 neutron	2 neutron