

Keep length equal for all answers

Enough headings

Neat diagrams

Section I

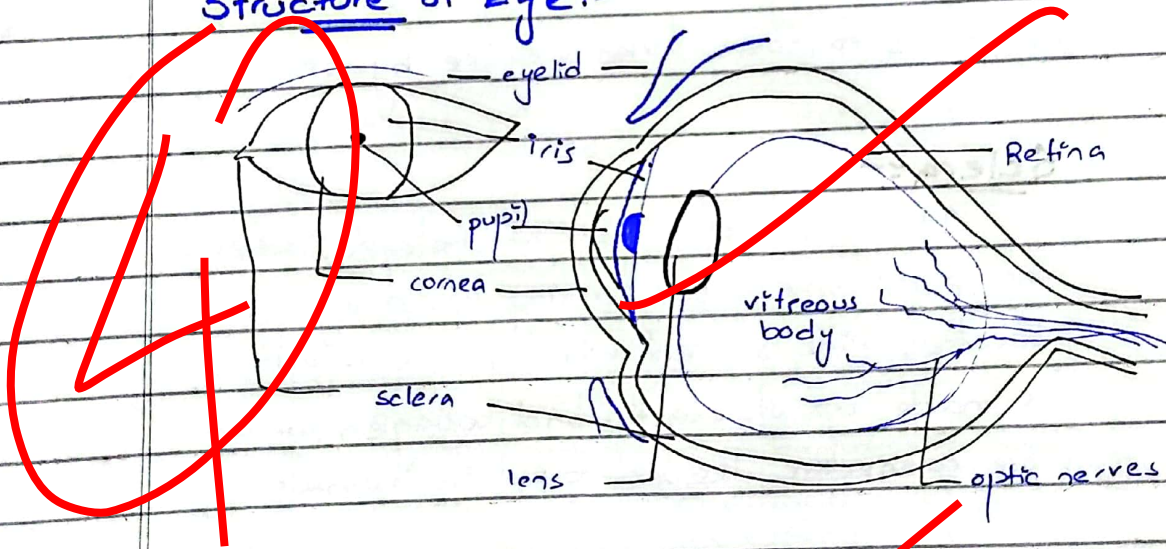
QNo:3

- a. Discuss different parts of eye. How far-sightedness and short-sightedness can be corrected?

Eye :-

Eye is a complex sensory organ that helps to visualize the objects and the world around us. It is an asymmetrical globe and about one inch in diameter.

Structure of Eye :-



Eyelid

Eyelid is the outer covering of the eye. It protects the eye from dust and other allergens. It also helps to keep the eye moist and prevents drying. It further provides mucus and tears for eye lubrication and prevents infection.

Iris:

Iris is a dark muscular structure behind the cornea. Its colour indicates the colour of the eye. It also controls the size of pupil.

Pupil:-

A small opening in the iris is called pupil. It controls the amount of light that enters the eye. It enlarges when the light is low and gets smaller when it is bright.

Cornea:-

It is the clear covering of the pupil and the iris. Light enters the eye through cornea. It provides sixty-six percent optic power. It helps us to focus what we see by bending light.

Sclera:-

It is the white part of the eye. It is the protective outer covering of the eye. It becomes pink or red when one is tired. It is made up of elastin and collagen, which are connective tissues found in mammals.

Retina :-

It is a light-sensitive layer containing nerve cells. It converts images formed by the lens into electrical impulses.

Lens:-

Lens are present behind pupil. It changes its shape to focus light into retina. It becomes thinner to focus on distant objects and becomes thicker to focus on nearby objects.

Optic nerves:-

Electrical impulses received from retina are transmitted to brain via optic nerves. There are two types of optic nerves:

Cones

These nerve cells are sensitive to bright light. They help in detailed central vision, and in perceiving coloured vision.

Rods

These are most sensitive to dim lights and help in peripheral vision and detecting motion.

Vitreous Body:-

It is a gel-like transparent body in the posterior of the eye. It supports the shape of the eye ball.

Correction of Short-sightedness:-

Short-sightedness or myopia is a condition where distant objects cannot be seen clearly. Glasses or contact lenses containing concave lenses is used to correct myopia. Laser eye surgery can also permanently fix myopia.

Correction of farsightedness :-

Hyperopia or farsightedness is a condition where nearby objects cannot be seen clearly. It can be corrected by glasses and contact lenses containing convex lens. Whereas it can be permanently fixed through lasik surgery.

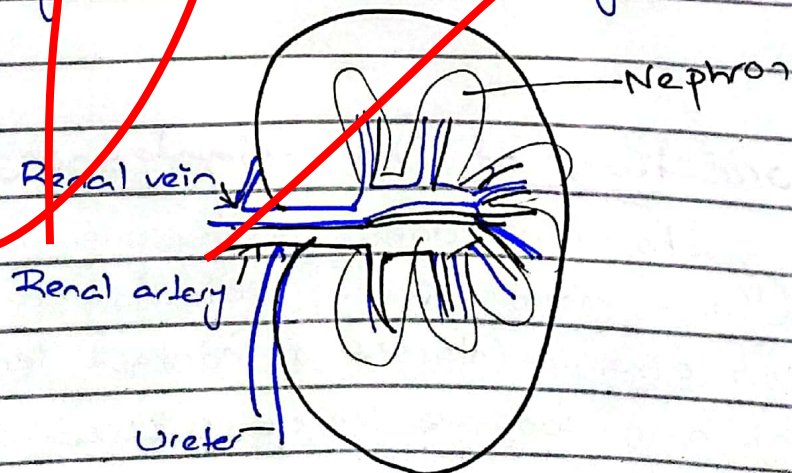
b. How does a kidney work? Explain with diagram.

Kidney:

Kidneys are dark-red and bean-shaped organ placed against the back wall of the abdominal cavity. They are protected by last two ribs.

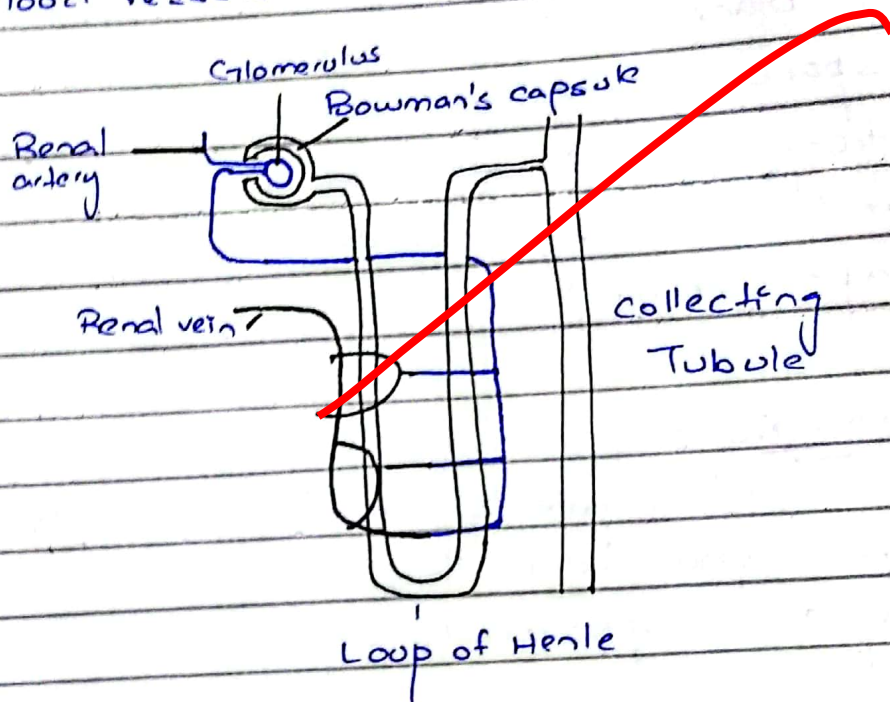
Function of kidney:

Kidneys remove waste and extra-fluid in the body. They also help to keep balance of many substances in the body.



Nephron (functioning unit of kidney):-

Kidney is made up of millions of filtering units called nephron. It contains twisted tubules and network of associated blood vessels.



As blood flows through each nephron, it contains tiny blood vessels called -the glomerulus -that allow smaller water molecules, waste and other salts to pass into the tubule. As the blood fluid moves across -the tubule, blood vessels reabsorb water, minerals and nutrients required by the body. So it removes excess substances and water from body. This waste becomes urine and is excreted outside -the body.

c. How black holes are formed?

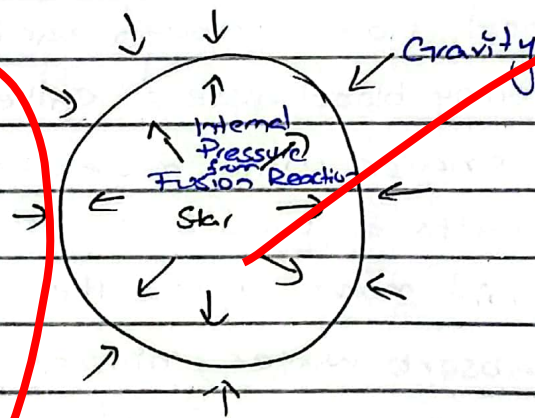
Formation of Blackholes:-

Black hole:

Black hole is a massive object in the space. It is extremely dense and have a strong gravitational field. Its gravitational force is so strong that even light cannot escape from it.

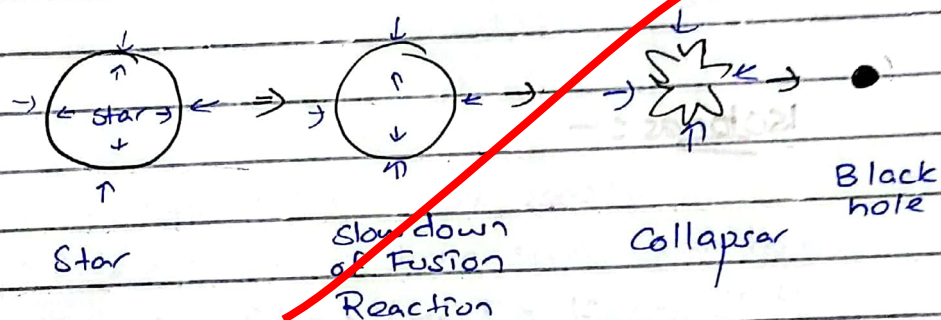
Formations:-

Black hole is formed when a star collapses upon itself. This event is called collapsar (collapse of the star).



There are two forces opposing each other on a star - these are gravitational force and internal pressure. Their balance keep the star in its form. It so happens that fusion reaction slows down which decreases its internal pressure relative to its gravitational force

The gravitational force is higher so the star collapses upon itself. All the matter collapses and accommodates in a small space of infinite mass and density. Its gravity becomes so strong that even light cannot escape so it is called black hole.



d. What are isotopes, isobars and isotones?
Give examples of isotopes of Hydrogen.

Isotopes:-

Isotopes are atoms of the same material having same atomic number but different mass number. i.e. same proton number but different neutron number. They have same chemical properties since electron number is same, but different physical properties such as melting and boiling point.

Isobars :-

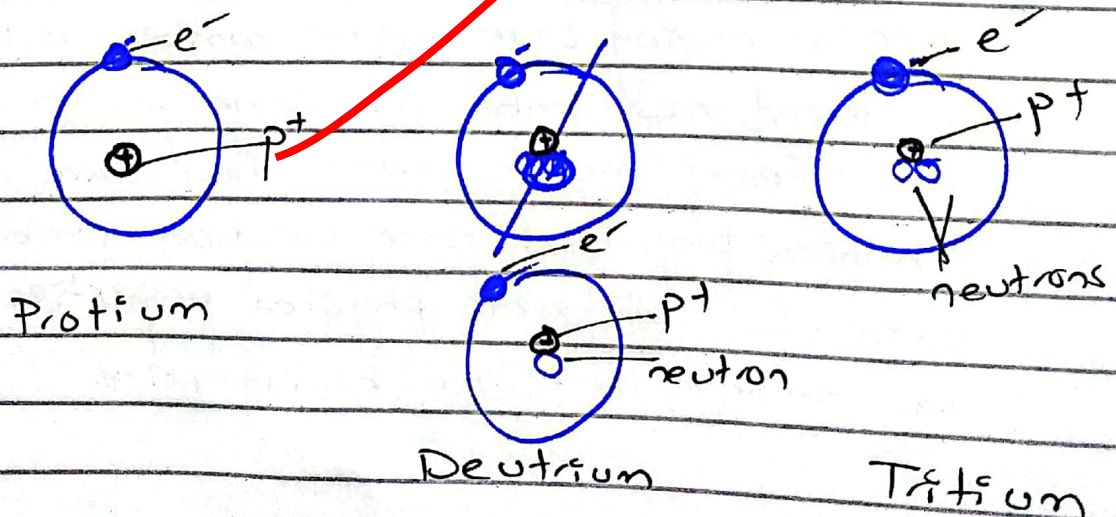
Isobars are atoms of different elements having same number of protons and neutrons. They have same atomic mass but different atomic numbers. For example, Iron (Fe) and Nickel (Ni) have atomic number is 26 and 28 respectively. Their mass number is 58.

Isobones :-

Isobones are different types of atoms that have same number of neutrons. For examples, Cl-37 and K-39 are two different atoms having same number of neutrons i.e. 20.

Isotopes of Hydrogen :-

Hydrogen has three isotopes. They are H-1, H-2 and H-3



QNO:5

- a) Distinguish between RAM and ROM. Also define Nibble and USB.

RAM:-

RAM is made up of small memory chips that forms memory module of a computer. It has temporary storage that remains until the computer is running. As the computer shuts down, data is lost.

ROM:-

ROM is the permanent memory of a computer. It is essential to start up the computer. It cannot be changed and remains even if the computer is shut down.

RAM	ROM
<ul style="list-style-type: none">• Random Access Memory• can edit/add/remove• Volatile Memory• Temporary memory	<ul style="list-style-type: none">• Read Only Memory• cannot edit/add/remove• Non-volatile memory• Secondary (Permanent) memory

Nibble:-

Nibble is a memory unit made up of binary data. It is a four consecutive binary digit data. Each of the four digits is 0 or 1 in any combination makes up a nibble. e.g. 0011, 0010, 0111 or 1111.

USB :-

USB (Universal Bus Serial Bus) is a connection between two electronic devices. It allows data exchange between two devices thus helping in communication. It is also used to power batteries in smartphones or laptops through USB ports.

b. How has AI revolutionized the world? Justify.

Artificial intelligence (AI) has revolutionized the world by its contribution to various sectors from education to health. AI algorithms are designed to make decisions using real-time data. Following are some of the things revolutionized by AI.

Self-driving cars :-

AI has helped in transportation in various ways including providing real-time data of traffic congestion, road blockage and other traffic obstructions. Self-driving cars are a revolutionary thing in AI where they drive themselves. Tesla has made such cars that drive themselves making sense of real-time surroundings. Thus, they make navigational decisions.

Chatbots and Chat-GPT :-

Chatbots and chat-gpt are have revolutionized the world's way one interacts with machines by transforming complex tasks into engaging dialogues. Virtual assistants like My AI on Snapchat helps in daily activities where the chatbot speaks in not only english, but multiple languages.

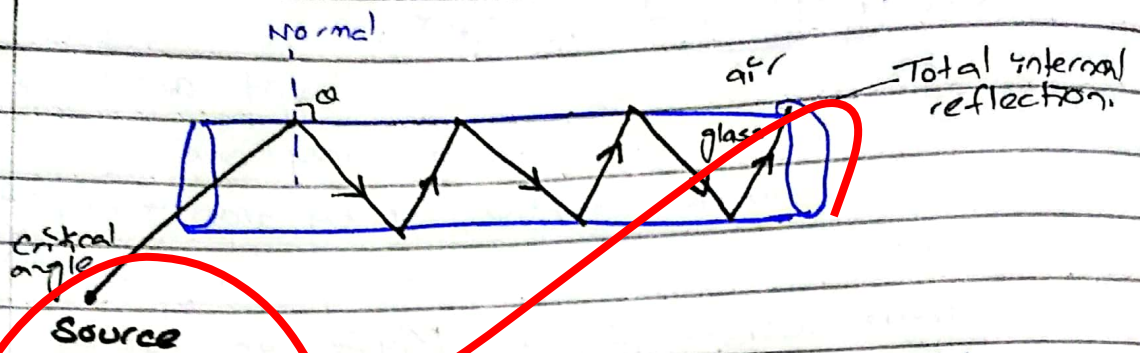
AI in legal systems :-

AI in legal system can help to reduce the complexity of large legal documents and quick decision-making. Legal decisions take years to reach decisions. AI can do it in seconds where all context is ingrained in it. A district court in Pakistan did it where the chat gpt came up with a decision in seconds along with long-form document.

- e. How does optical fiber work? Write some of its advantages.

Working of optical fibers :-

The working principle of optical fiber is Total internal Reflection. It is the complete reflection of ray of light within a medium.



Light travels down an optic cable by bouncing off the walls of cable continuously. Each photon bounces down like continued mirror-like reflections.

Advantages of Optical Fiber :-

Fast speed :-

Optical fiber supports high bandwidth and speed. So information can be transmitted faster. Also large information can be transmitted. si

Cheaper :-

They are inexpensive as compared to copper wire.

Light weight :-

Optical fiber is thinner and light weight than copper cable. They can fit in more compact spaces.

Less signal loss :-

There is less signal loss degradation. making conversation clearer in telephone and television.

Longer lifespan :-

Optical fibers have longer lifespan than other cables. Their lifecycle is of over 100 years.

d. What is critical speed of Satellite? Differentiate Geo-Stationary & Polar Satellites.

Critical Speed of Satellite :-

It is the minimum speed required to move the satellite around the earth. It is the most important factor in the launch of the satellite. The critical speed is 27,000 km/h for a satellite to move in a circular orbit around the earth.

Geo-stationary satellite :-

This satellite rotates around the earth in the same direction and speed of the rotation of the earth. Its speed is 3.5 km/s. They are always over a single location and have a direct line of sight over 40% of the Earth's surface. They are useful in communication and covers more area.

Polar Satellites :-

Polar satellite examines poles of earth. They also sense auroras. They help scientists in protecting future satellites from atmospheric risks. They orbit at low-orbits.

Geo-stationary Satellite

- high-orbit
- located near equator
- move along the rotation of Earth

Polar Satellite

- low-orbit
- located near poles.
- permanently stationed at poles

QNO:6

(a)

Past

$$\text{Father's age: } 3 \times \text{son or } 3y - 5 \quad \text{--- (1)}$$

$$\text{Son's age: } y - 5 \quad \text{--- (2)}$$

Present

$$\text{Father's age: } x \quad \text{--- (3)}$$

$$\text{Son's age: } 20 \quad y = 30 \quad \text{--- (4)}$$

$$\text{Past age of son} = y - 5$$

$$\text{where } y = 30$$

$$= 30 - 5$$

$$= 25 \text{ years is the age of son } 5 \text{ years ago.}$$

Father's age 5 years ago

$$= 3y - 5$$

$$= 3(25) - 5$$

$$x - 5 = 75 - 5 = 70 \text{ years} \quad \text{--- (5)}$$

Present age of father

x
From (5)

$$x - 5 = 70 \text{ years}$$

$$x = 70 + 5$$

$$x = 75 \text{ years}$$

So, present age of father is 75 years.

b. Mean of 10, 30, y and 50 = 50

$$y \quad \quad \quad = ?$$

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

$$= \frac{90 + y}{4} = 50 \times (4)$$

$$= 90 + y = 200$$

$$y = 200 - 90$$

$$y = 110$$

c. Missing numbers :-

i) 3, 6, 18, 54, —

$$2 \times 3 = 6$$

$$6 \times 3 = 18$$

$$18 \times 3 = 54$$

All the numbers are multiples of 3 of previous numbers

So,

$$\boxed{54 \times 3 = 162}$$

162 is the missing number

ii) 3125, 256, —, 4, 1

$$5^5 = 3125$$

$$4^4 = 256$$

$$\boxed{3^3 = 27}$$

$$2^2 = 4$$

$$1^1 = 1$$

So, the missing number is $3^3 = 27$

~~iii)~~

d. $x \times y = 330$

$$x : y = 1 : 5$$

$$(x^2 \cdot y^2) = ?$$

Since the ratio of two numbers is 1:5

It becomes

$$x \times 5x = 320$$

$$5x^2 = 320$$

$$x^2 = 64$$

$$\Rightarrow x = 8$$

$$8 : 5$$

~~8~~

$$8 \quad x = 8$$

$$y = 5(8) = 40$$

Difference b/w square of numbers is

$$(40^2 - 8^2) = 1600 - 64$$
$$= \boxed{1536}$$

QNO: 8

(a)

N

W

