

Question 1

- a) Working principle of optical fiber. Enlist main importance of fiber optics.

Optical fibers are thin strands of glass or plastics. They are thin like hair and they carry packets of energy in the form of light. They work on the principle of "Total internal Refraction".

Working of Optical Fibers.

To understand its working some diagrams needs to be discussed.

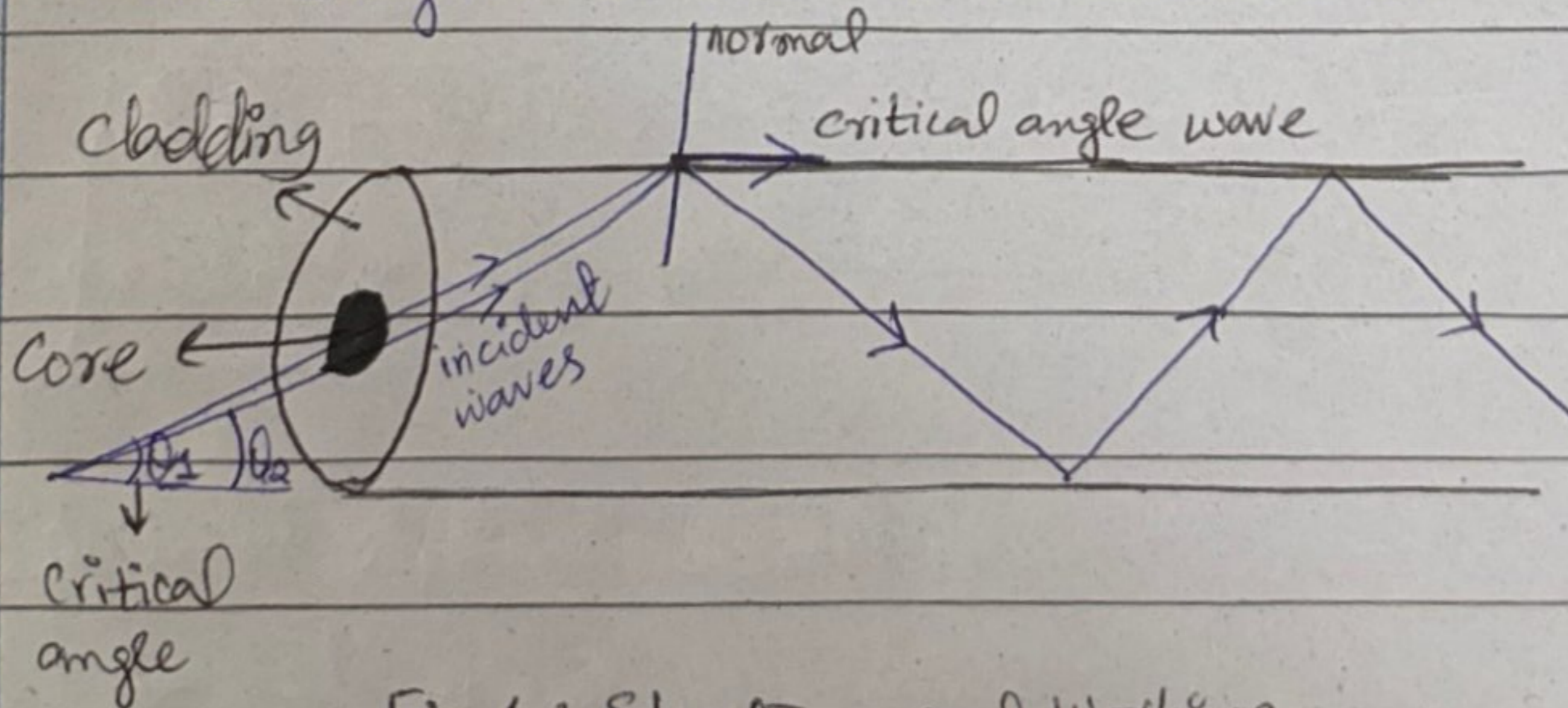


Fig. 1: Structure and Working of Optical fiber

Core: Centre of optical fiber. High density which cause more bending of light.

Cladding: The outer layer of core. It has relatively less density.

Critical Angle: The angle that bends the light at 90° . Any further increase in angle will then cause total internal reflection.

Total Internal Refraction: Refraction means bending of light. Total internal refraction means that the light waves do not leave the optical fiber and are refracted inside. Thus, carrying data.

How light travels along optical fiber?

It travels through bending of light. This bending is due to total internal refraction. Plus it

travels at the speed of light i.e. $3 \times 10^8 \text{ m/s}$
 The greater the area of core more information can travel.

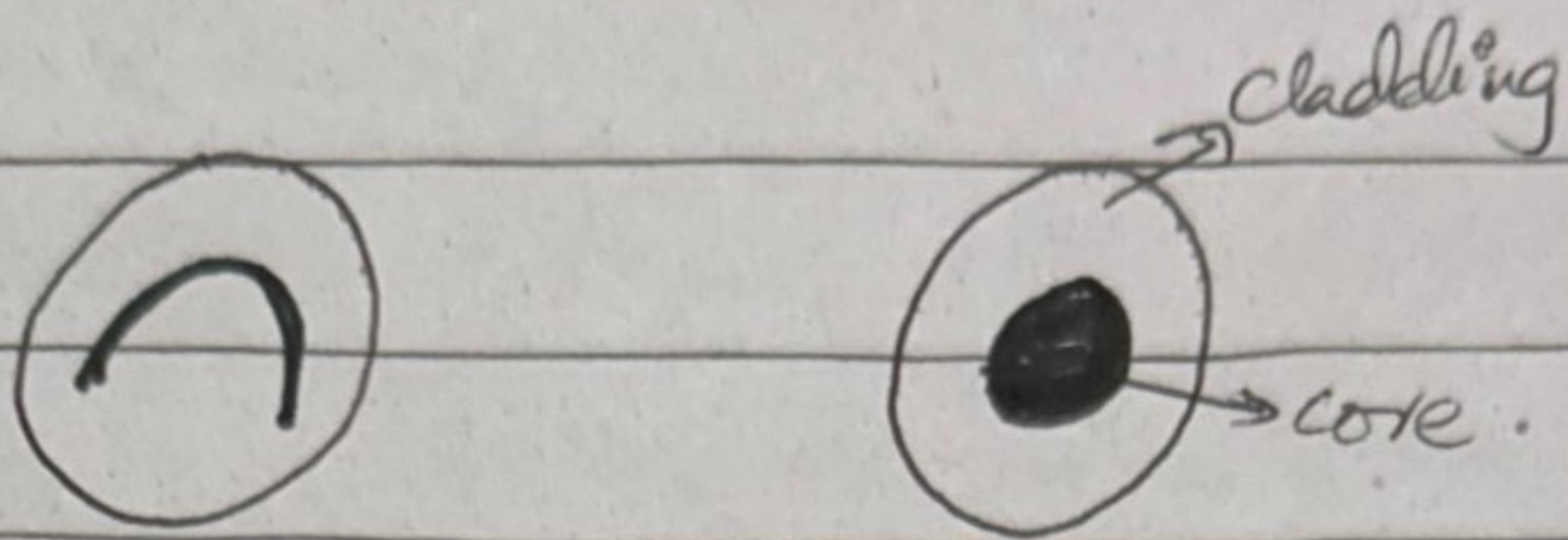


Fig 2a: Bending
of light

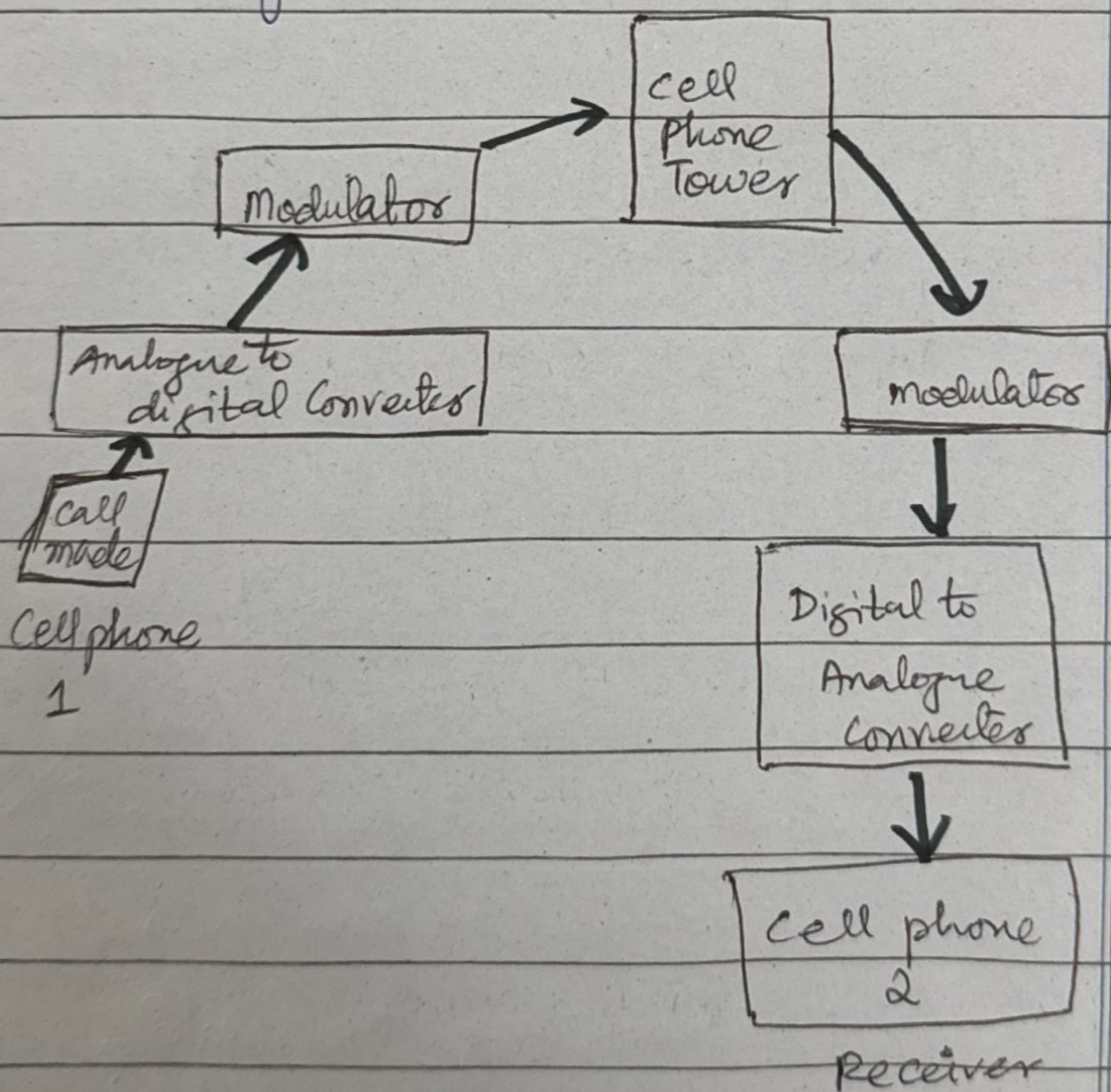
Fig 2b: Cross-sectional
view of optical
fiber.

Importance of Optical Fiber

1. Transferring of data from one place to another
2. Fastest mode of data transfer
3. Safe and secure method
4. Safe and not impacted by harsh weather conditions
5. Expensive but reliable method.
6. Can work even in sea, thus helps in connecting the world.

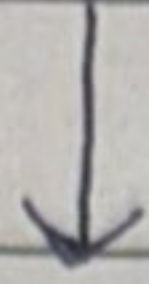
b. Cell phone communication through block diagrams.

Cell phones are devices that connect the people throughout the world. One can not only hear each other's voice or text messages but can also see each other through video calls. Their working is explained through following block diagram.



Explanation of Block Diagram.

Cell phone one makes a call to receiver on cell phone 2.



To convert the Analogue data into bit and bytes it is passed through Analogue to Digital Converter as it is easy to transfer data using Zero's and One's



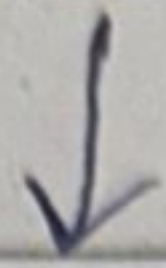
This data transfer is through Electromagnetic wave i.e Radio wave. It travels with speed of light has frequency 1×10^4 and wave length of 10^3 m.



It is passed through a modulator. Depending upon the modulator the data is either modulated on basis

of \rightarrow ~~max~~ Amplitude
 \rightarrow phase
 \rightarrow frequency

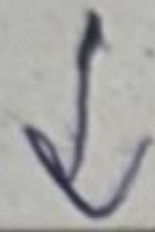
This helps prevent data loss.



It then is transferred ~~to~~ to cell phone tower.



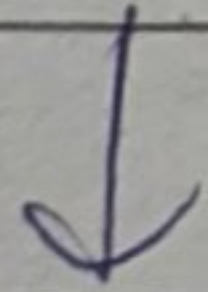
From tower it is directed to the locality where the receiver is



To its cell phone tower it is directed to a modulator who now demodulates the data



Then to the receiver cell phone where it is converted to Analogue signal.



In the end the receiver receives the call.

Thus, this is how cell phones work.

1-1-2020

c) Briefly explain satellites. Define working of GPS.

There are two kinds of satellites i.e. Natural and Artificial satellite. Natural satellites mean moon. and artificial ones are many but one of them is Geo-stationary satellite. They are called satellites because they orbit the earth.

Geostationary satellite

These satellites orbit the earth. They are over a fixed part of earth. They also move in the same motion as the earth moves on its axis. They move anti clockwise. A total of 3-4 geostationary satellites are rotating around earth.

Natural Satellite

Unlike other man made satellites they are not launched by humans and they do not need fuel to operate. It follows the concept of centripetal force which is:

$$F = \frac{mv^2}{R}$$

m = mass of object

v = velocity

R = radius of circle in which they are orbiting

Geo Positioning Satellites

There are around 24 GPS for earth. They are launched and their purpose is to locate objects on earth. They work in following manner:

24 GPS satellites
in earth's
orbit



Detects an object



Send signal to
GPS tower



Sends signal to
another near

GPS



GPS tower receives
signal



Compare speed, position
and time to detect
object motion and
direction

Date: / /

Thus, this is how GPS can detect objects on earth using geo-positioning satellites. It helps people find routes and are called GPS systems.

D) Differentiate Between RAM and ROM.

↓

Both RAM and ROM are primary source of storage. Their purpose is to store data. Their differentiation is as follows.

RAM	ROM
Random Access Memory	Read Only memory
volatile memory	Permanent memory
More storage facility	Less storage facility

Fast data access	Slow in data processing
Can be altered i.e data can be added or deleted	Fixed can not be altered
Expensive	Inexpensive
Example PRAM	Example EPROM

Question 2

c.
$$\text{Average} = \frac{\text{Weight of all members}}{\text{Total number of people}}$$

$$\text{Average} = \frac{A+B+C}{3}$$

$$\frac{A+B+C}{3} = 45$$

$$A+B+C = 135 \rightarrow (1)$$

$$\frac{A+B}{2} = 40$$

$$A+B = 80 \text{ (1)}$$

$$A = 80 - B \text{ (2)}$$

$$\frac{B+C}{2} = 43$$

$$B+C = 86$$

$$C = 86 - B \text{ (3)}$$

Substituting equation (2) and (3) in equation (1).

$$80 - B + B + 86 - B = 135$$

$$80 + 86 - B = 135$$

$$168 - 135 = B$$

$$B = 33$$

Hence weight of B = 33 kg.

d) Let the unknown number = x .

$$x + 17 = 60 \left(\frac{1}{x} \right)$$

$$x + 17 = \frac{60}{x}$$

$$x^2 + 17x - 60 = 0$$

Solving the Quadratic equation through factorisation method

$$x^2 + 17x - 60 = 0$$

$$x^2 - 3x + 20x - 60 = 0$$

$$x(x - 3) + 20(x - 3) = 0$$

$$x = -20 \quad x = 3$$

Rough work -

$$1 \times 60 = 60$$

$$3 \times 20 = 60$$

$$-3 + 20 = 17$$

As x is positive therefore $x = 3$ Ans

b)

$$5:7:8$$

$$\begin{aligned} \text{Sum of ratios} &= 5+7+8 \\ &= 20 \end{aligned}$$

% of each ratio

$$\frac{5}{20} \times 100$$

$$\frac{7}{20} \times 100$$

$$\frac{8}{20} \times 100$$

$$25\%$$

$$35\%$$

$$40\%$$

$$25 \times 14$$

$$8 \times 35$$

$$40 \times 7$$

hys

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