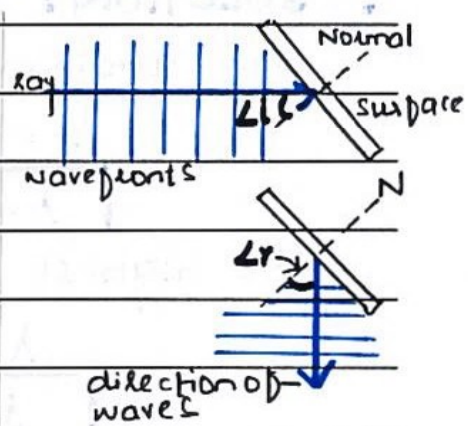
Q. No. 2 (i) **REFLECTION**: When the waves passing in one medium fall on the surface of another medium, they bounce back into the first medium. This phenomena is called **reflection**.

RULES: . The angle of incidence is equal to the angle of reflection.
. The incident ray, the normal and reflected ray at the point of incidence all lie in the same plane.

REFLECTION IN RIPPLE TANK:
When a barrier is placed in a ripple tank, the plane water waves are reflected. If the barrier is placed at an angle to the wavefront, the reflected waves obey the law of reflection i.e the angle of incident ray is equal to the angle of reflected water wave ($\angle i = \angle r$)



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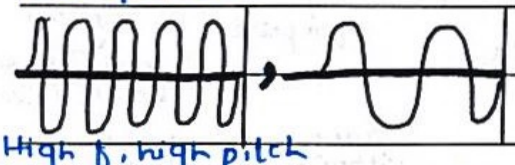
Q. No. 2 (ii)

PITCH OF SOUND	QUALITY OF SOUND
Definition	
The characteristic of sound by which we can distinguish between shrill and grave sounds is called pitch.	The characteristic of sound by which we can distinguish between two sounds of the same loudness and pitch is called quality
Dependance:	
It depends on the frequency. The higher the frequency, the greater the pitch.	It depends on the waveforms of sounds. Different sounds have different waveforms and quality.
	
E.g Women have high frequency (high pitch)	E.g Sounds of flute and clarinet

Q. No. 2 (iii)

- **GIVEN:** lowest audible frequency $f_1 = 20\,Hz$
  Highest audible frequency $f_2 = 20,000\,Hz$
  Speed of sound $v = 332\ ms^{-1}$
- **TO FIND:** wavelengths of sounds $\lambda_1, \lambda_2 = ?$
- **FORMULA:** speed = frequency × wavelength $(v = f\lambda)$
- **SOLUTION:**

For audible frequency f_1 : $v = f_1\lambda_1$

$\lambda = v/f_1 \Rightarrow 332/20$

$\lambda_1 = 16.6\ m$

For highest audible frequency f_2: $v = f_2\lambda_2$

$\lambda_2 = v/f_2 \Rightarrow 332/20000$

$\lambda_2 = 0.017\ m$

- **RESULT:** The wavelength of lowest audible frequency sound and highest audible frequency is 16.6m and 0.017m resp.

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Q. No. 2 (iv) **SHORT SIGHTEDNESS (MYOPIA):**

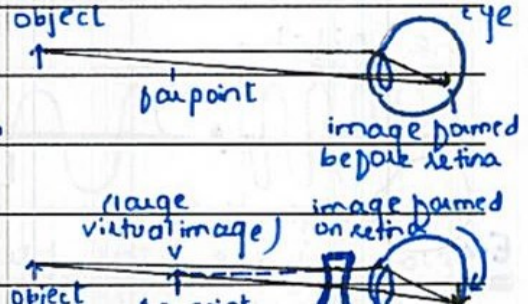
DEFINITION: The disability of eye to form distinct, sharp image of a distint object is called short sightedness

POSITION OF OBJECT: The object is at distint (far away) point.

EFFECT ON EYEBALL: This is due to the eyeball being too long.

FORMATION OF IMAGE: The image of object is formed infront of retina, causing a blurred image on retina.

CORRECTION: It can be corrected by using a diverging (concave) lense. The lense diverge the light rays. To the observer, the rays appear to come from far point and so forms a sharp virtual image



Q. No. 2 (v) • **GIVEN:** Magnitude of charge $q = +2C$

Potential at one point $V_a = 100V$

Potential at other point $V_b = 50V$

• **TO FIND:** Energy supplied by charge $E = ?$

• **FORMULA:** Energy supplied $= q(V_{a-b})$ or $E = qV$

• **SOLUTION:**

Energy supplied by charge $E = q(V_a - V_b)$

$= q(100 - 50)$

$= 2(50)$

$$E = 100J$$

• **RESULT:** The energy supplied by the charge while moving from a point of 100V to 50V is 100J.

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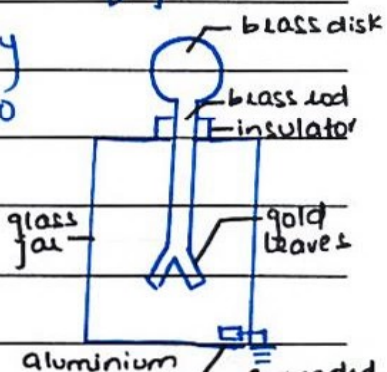
Q. No. 2 (vi) **GOLD LEAF ELECTROSCOPE:** It is a sensitive instrument used for the detection of charges.

CONSTRUCTION: It consists of brass rod connected to a brass disk at the upper end and 2 gold foil leaves at the bottom. It passes through an insulator that keeps the rod in place. The whole system is placed inside glass jar. The charges can easily move from the disk to the thin gold leaves. A thin aluminium foil is connected at the inside of jar at its lower portion. The foil is usually grounded by connecting it with a conducting copper wire to Earth. This is done to keep the gold leaves safe from external electrical disturbances.



Q. No. 2 (vii)

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Q. No. 2 (viii)

Q. No. 2 (ix) **NOT OPERATION:**

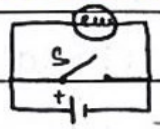
DEFINITION: It is a logic operation in which when the value of input is 0, the output is 1 and when the input is 1, the output is 0.

BOOLEAN EQUATION: It's symbol is bar (-) and equation is $X = \bar{A}$ (read as X equals A NOT)

TRUTH TABLE AND EXPLANATION: A bulb is connected to a battery by a switch in parallel. When the switch is open, the bulb is ON and when switch is close, bulb is OFF due to resistance of bulb.

TABLES:

SWITCH	BULB
OPEN	ON
CLOSE	OFF



(A) INPUT	OUTPUT (A)
0	1
1	0

It is called as inverter as it changes the state of Boolean variable. It performs 'inversion complementation and so change a High level input to low level and vice versa.

Symbol:

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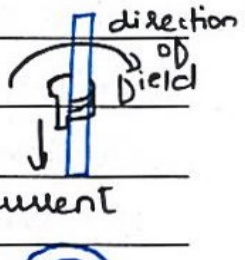
Q. No. 2 (x) The direction of magnetic field can be found using **"RIGHTHAND GRIP RULE"** which states that "If we hold a current carrying wire in our right hand such that the thumb points in the direction of current, then curling the fingers of hand will give the direction of magnetic field of wire.

a) UPWARD DIRECTION: If the current is in upward direction, then by pointing thumb upwards, our fingers will curl in anticlockwise direction. Thus the direction of magnetic lines of force will be in anticlockwise direction.

b) DOWNWARD DIRECTION: By pointing the thumb in downward direction, the fingers will curl in clockwise direction, therefore the direction of field will be clockwise



Q. No. 2 (xi) **FAX MACHINE :** It is an electronic device which sends information from one place to another in the form of electrical signal.

FUNCTION AND WORKING : The facsimile's or fax machine is widely used all around the world to send information including text and graphics. The fax machine scans a page and converts its text and graphics into electrical signal which is then transmitted to the other fax machine. The other machine receives the signal and converts the signal back into text. A printer is used to copy the message sent onto a paper.

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Q. No. 2 (xii) **NUCLEAR FUSION :** It is the process by which 2 lighter nuclei join or fuse to form a heavier nuclei.

MASS - ENERGY RELATION : The mass of final nuclei is always smaller than the original nuclei. According to mass-energy relation, this mass is converted to energy

EXAMPLE: When a Deutrium ($_1^2H$) combines with tritium ($_1^3H$), a Helium nucleus or α-particles is formed.

$$_1^2H + _1^3H \longrightarrow _2^4He + _0^1n + \text{energy}$$

ENERGY : It releases large amount of energy (25.7 MeV) which equals to 5.14 MeV energy per nucleon. The energy coming from the sun and stars is a result of fusion reaction of hydrogen nuclei into Helium. Temperature on sun is 20 million Joules which is favourable in this reaction.

Q. No. 2 (xiii)

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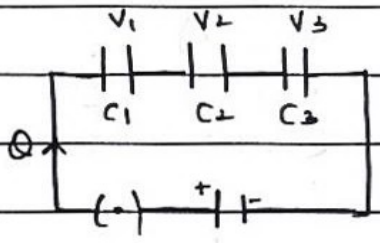
Q. No. 2 (xiv) **GIVEN:** $C_1 = 3\,\mu F$, $C_2 = 4\,HF$

$$C_{eq} = \frac{60}{47}\,\mu F \Rightarrow \frac{1}{C_{eq}} = \frac{47}{60}$$

TO FIND: $C_3 = ?$

FORMULA: $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$

SOLUTION:



$$\frac{47}{60} = \frac{1}{3\,\mu F} + \frac{1}{4\,\mu F} + \frac{1}{C_3}$$

$$\frac{1}{C_3} = \frac{47}{60} - \left(\frac{4+3}{12\,\mu F}\right)$$

$$= \frac{47}{60} - \frac{7}{12\,\mu F} \Rightarrow \frac{47-35}{60} \Rightarrow \frac{12}{60}$$

$$1/C_3 = 12/60 \Rightarrow C_3 = 60/12 \Rightarrow \boxed{C_3 = 5\,\mu F}$$

RESULT:

Q. No. 2 (xv) **INTENSITY LEVEL:** The difference between the loudness of unknown sound (L) and the loudness of faintest audible sound (L_0) is called the intensity level of unknown sound.

DERIVATION: Loudness $L \propto \log I$

$$L = K \log I \quad \text{– (i)}$$

For loudness of faintest audible sound (L_0) of intensity (I_0); $L_0 = K \log I_0$ –(ii) Subtracting eq (ii) from (i)

$$L - L_0 = K \log I / I_0$$

When $I = 10 I_0$, the intensity level is taken as a unit (Bel) and value of K becomes 1.

$$\text{Intensity level} = \log \frac{I}{I_0} \text{ (Bel)}$$

Bel is large unit. Its smaller unit is (deciBel dB) $\therefore$ 1Bel = 10 dB

$$\text{Intensity level} = 10 \log \frac{I}{I_0} \text{ (dB)}$$

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- a -

Q. No. 3 (Page 1/4)

RESISTANCE :

According to Ohm's law,

"The current I passing through any conductor is directly proportional to the potential difference V applied across the 2 ends of conductor such that the temperature and physical condition of conductor doesnot change."

So,

$$I \propto V \quad \text{or} \quad V \propto I$$

$$\boxed{V = IR}$$

where R is the constant of proportionality called the **resistance** of conductor.

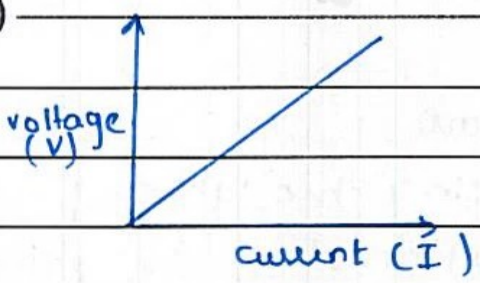
DEFINITION OF RESISTANCE :

"The property of a substance due to which it offers opposition to the flow of electrons (charges) is called resistance."

The opposition is due to the collisions of the electrons in current with the atoms of conductor.

- **FORMULA:** $R = V / I$
- **SI UNIT:** It's SI unit is ohm (Ω) defined as "If a voltage of 1V is applied across the ends of conductor such that it produces a charge of 1 Ampere, its resistance will be 1 ohm (1Ω)".
- **GRAPH OF OHM'S LAW:** If the voltage is increased, the current passing through the conductor will also increase. The graph is a straight line, the slope of which is constant (i.e R = constant).

Q. No. 3 (Page 2/4)



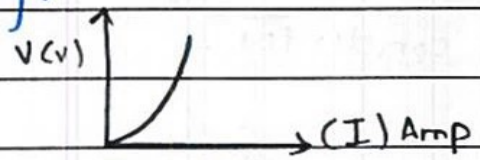
$\frac{\Delta V}{\Delta I} = \frac{V}{I} = R$ (constant).

OHMIC AND NON OHMIC:

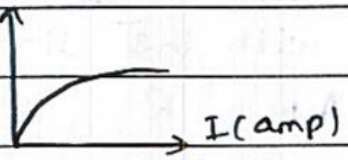
→ "The materials which have constant resistance over wide range of voltage is called ohmic conductor."

→ "The materials which have resistance that changes with voltage or current are said to be non-ohmic conductors."

Ohmic conductors have a linear voltage-current relationship in which ratio of V and I is constant. e.g (metals). Non-ohmic have non linear voltage-current relationship. E.g filament lamp (resistance increases) and thermistor (resistance decreases on heating.



Filament



Thermistor

FACTORS AFFECTING RESISTANCE:

Explanation: A long ~~wa~~ pipe offers more resistance than a short one. Similarly a pipe with larger cross sectional area provides less resistance than smaller area.

Similarly, long wires offer more resistance and thick wires offer less resistance than thin wires.

Q. No. 3 (Page 3/4) this we conclude that factors affecting resistance are,

- length of conductor
- Area of conductor
- Nature of conductor
- Temperature (physical condition)

DERIVATION : For a particular substance at fixed temp., The resistance R is directly proportional to the length of conductor,

$$R \propto L \qquad (1)$$

If length is increased, R will also increase and vice versa.

Resistance varies inversely as the cross sectional Area, $R \propto 1/A$ (2)

Thick wires have less R than thin wires.

Combining (1) and (2)

$$R \propto L/A$$

$$R = \rho \frac{L}{A}$$

where ρ is the constant of proportionality called the resistivity or specific resistance.

- If length of wire is 1m and area is $1m^2$ then $R = \rho$. So if $1m^3$ of any conductor is taken, its resistance will be equal to specific resistance.

Q. No. 3 (Page 4/4) (b)

GIVEN: Power generated $P = 500\ MW$

voltage $V = 250\ kV$

TO FIND: Current $I = ?$

FORMULA: $P = V \times I$

SOLUTION:

$$P = V\,I$$

$$I = P / V$$

$$= \frac{500\ MW}{250\ kV}$$

$$= \left(\frac{500 \times 10^6\ W}{250 \times 10^3\ V}\right)$$

$\therefore$ Mega $= 10^6$

Kilo $= 10^3$

$$\boxed{I = 2000\ \text{Ampere}}$$

RESULT: The current passing will be 2000 Amp.

متعلقہ سوال کا جواب صرف مختص کردہ جگہ پر اور بیرونی نشان کے اندر دیا جائے۔

Q. No. 4 (Page 1/4)

Q. No. 4 (Page 2/4)

متعلقہ سوال کا جواب صرف مختص کردہ جگہ پر اور بیرونی نشان کے اندر دیا جائے۔

Q. No. 4 (Page 3/4)

Q. No. 4 (Page 4/4)

(a)

Q. No. 5 (Page 1/4)

AC GENERATOR:

"An AC generator converts rotational kinetic energy (Mechanical) into electrical energy."

CONSTRUCTION:

- It consist of an armature (coil) which is rotated across the magnetic field of external magnet to produce induced current.
- The loop of coil moves within the field and is perpendicular to the field at the ends of magnet. When it moves, it cuts through the magnetic lines of force and induced e.m.f is produced.
- It consist of galvanometer to detect the production of electrical current in wires.
- It consist of rings and brushes for the steady flow (rotational movement) of coil.

WORKING:

When the coil moves in magnetic field, current is induced due to electromagnetic induction. The strength of current depends on the number of magnetic lines of force passing through coil. The number of lines is maximum when the loop is perpendicular to the field. The number of lines of magnetic force is minimum when the loop of coil is parallel to the magnetic lines of forces. Thus, the range of current continuously changes from maximum to minimum and back to maximum. This is the working principle of A.C generator.

Q. No. 5 (Page 2/4)

FACTORS EFFECTING INDUCED E.M.F:

According to,

induced emf = VBLsinθ **Induced emf = NWAB**

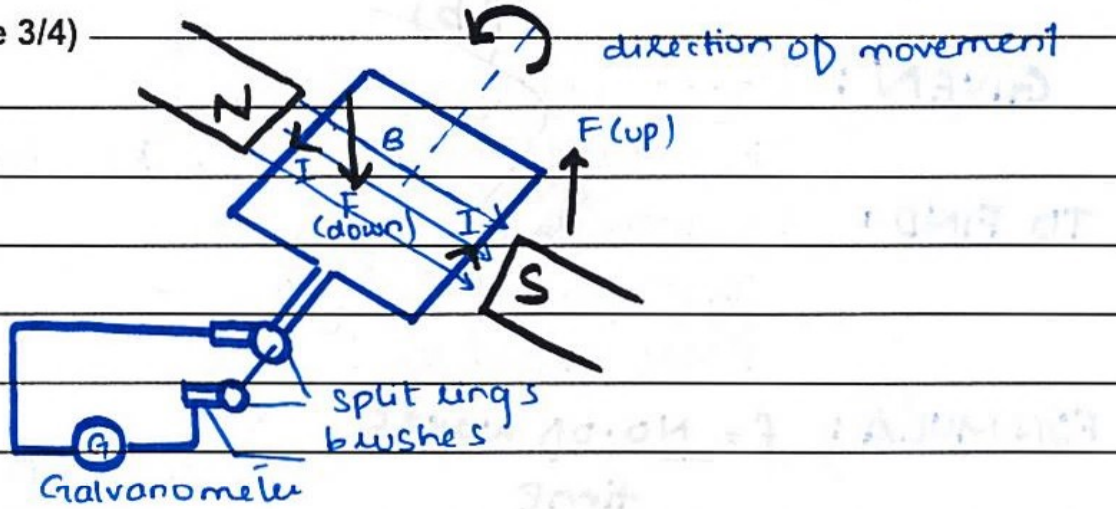
- The induced emf depends on,
- the number of loops (turns) of coil
- the area of coil
- The strength of magnetic field
- The length of wire of coil.

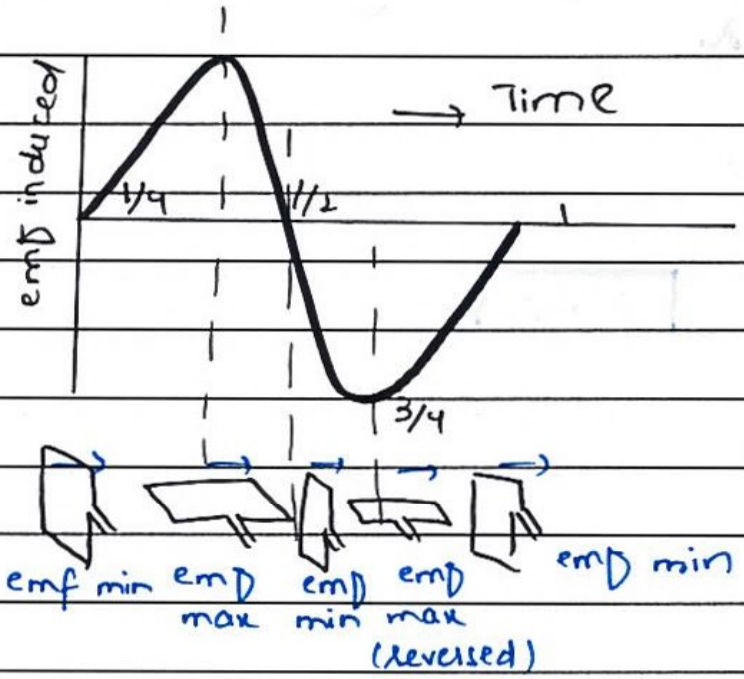
It will be increased if any of it is increased.

FLOW OF CURRENT:

- When the plane of loop is perpendicular to the field, the number of magnetic lines of force passing is maximum but the change in magnetic lines is minimum, so induced emf is zero. The current induced will be minimum.
- When the coil cuts through the magnetic lines of force, it moves through 90° and into the horizontal position and emf is induced. So when the plane of loop is parallel to field, current induced is maximum.
- The coil further moves, the side that was moving up begins to move downwards and so the direction of induced current reverse. The change in direction takes place everytime the coil moves through 180°.
- So the current of A.C generator continuously varies from maximum to minimum and minimum to maximum values in each half turns.

Q. No. 5 (Page 3/4)


direction of movement
N
B
I
F (up)
F (down)
I
S
split rings
brushes
G
Galvanometer


emf induced
Time
1
1/4
1/2
1
3/4

emf min
emf max
emf min
emf max
(reversed)
emf min

Q. No. 5 (Page 4/4) (b)

GIVEN: No. of waves = 100

Time taken t = 20s , λ = 6cm = 0.06m

TO FIND: Frequency f = ?

Time period T = ?

Wave speed v = ?

FORMULA: $f = \frac{\text{No. of waves}}{\text{time}}$

$T = 1/f$

$v = f \times \lambda$

SOLUTION:

$f = \frac{\text{No. of waves}}{\text{time}}$

$f = \frac{100}{20} = \boxed{5\ Hz}$

$T = 1/f$

$= 1/5$

$\boxed{T = 0.2\ s}$

$v = f \times \lambda$

$= 5 \times 0.06$

$\boxed{v = 0.3\ ms^{-1}}$

RESULT:

Frequency of wave is 5 Hz, time period is 0.2s and speed is 0.3 ms^{-1}