केवल मूल्यांकनकर्ता के उपयोग हेतु!

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

32 पृष्ठीय

केवल परीक्षक द्वारा भरा जावे। प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्टी करें।

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)	प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)
1			17		
2			18		
3			19		
4			20		
5			21		
6			22		
7			23		
8			24		
9			25		
10			26		
11			27		
12			28		
13					
14					
15					
16					

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे →

प्रमाणित किया जाता है कि अन्दर के पृष्ठों के अनुरूप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अंकों का योग सही है।
निर्धारित मुद्राः नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदांकित संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा

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परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा

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Question-1 :- Match the column 'A' with column 'B' and write the correct pair :-

Answer-1

'A'		'B'
(a) Intensity of light	→	(iv) No. of photons
(b) Frequency of light	→	(iii) Frequency of photon.
(c) Work function	→	(i) Minimum energy to emit e^- from surface.
(d) Matter waves	→	(v) Moving particle
(e) Threshold frequency	→	(ii) Minimum frequency to emit e^- from surface
(f) Particle nature of light	→	(vi) Photon

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Question 2:- Fill in the blanks with appropriate word and write:-

Answer 2:- (a) 6.25×10^{18} e.

(b) Tangent

(c) Transverse

(d) Diffraction

(e) 90°.

(f) positive.

Question-3:- write true or false:-

Answer-3:- (a) True

(b) True

(c) False

(d) True

(e) True

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Question - 4 ÷ choose and write the correct option from the options given below:-

Answer - 4 ÷ (a) (i) electrons

(b) (iii) ~~Air~~ one

(c) (iii) Magnetic and Electric field both.

(d) (ii) Law of charge conservation.

(e) (i) Photo electric effect.

(f) (iv) Henrich Hertz.

Question-5:- Write answer of each question in one sentence:-

Answer 5:- (a) Mathematical form of quantization of electric charge is

~~q =~~ $\boxed{q = ne}$.

where q ÷ total charge on a body.

n ÷ integer [1,2,3 ..]

e ÷ fundamental charge [1.6×10^{-19} C]

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(b) Degree of ~~order of~~ frequency of visible light is 10^{14} Hz.

(c) Given,
focal length of the lens = +0.5m

We know that,

$$P = \frac{1}{f(m)} \Rightarrow P = \frac{10}{0.5} \Rightarrow 2D \Rightarrow P = 2D \text{ Ans}$$

) SI unit of mutual inductance is Henry (H).

) Root mean square value of alternating current is "Peak value / $\sqrt{2}$" ($I_0/\sqrt{2}$).

Question-6

Answer 6 ⇒ Capacity :- The ability of a conductor to store charge (electrical energy) in it is known as its capacity.

S.I. unit of capacity is :- Farad.

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Question-7

Answer 7 :-

Intrinsic semiconductor	extrinsic semiconductor.
(a) It's pure semiconductor in which no. of electrons in the conduction band is equal to the concentration of holes in the valence band. ($n_e = n_h$)	(a) It's doped semiconductor because due to addition of impurity atoms, no. of electrons in conduction band is not equal to concentration of holes in valence band. + N-type ($n_e >> n_h$) + P-type ($n_h >> n_e$)
(b) They have lesser conductivity than extrinsic semiconductor.	(b) They have higher conductivity than intrinsic semiconductor.

B S E

Question-8

Answer-8 :- **Ionisation energy :-** The amount of energy required to bring an electron present in the ground state, out of the atom. ($n=1$ to $n \to \infty$).

For eg. Ionisation energy of H-atom is 13.6 eV.

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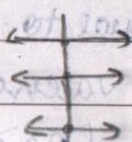
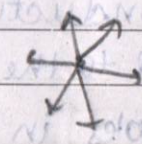
Question-9 (OR)

Answer 9 :- (OR)

Polarised light wave	Unpolarised light wave
(a) A type of light in which all the rays are aligned in the same direction or parallel to each other. 	(a) A type of light in which rays are not aligned & parallel to each other and seem to be scattered. 
(b) They are of Transvere nature, hence, can be polarised.	(b) They are of longitudinal nature, hence, can't be polarised.

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Question-10 (OR)

Answer 10 :- (OR) ⇒ The core of transformer is laminated to avoid energy losses due to eddy currents. It's preferred to make the core of 2-D planks filled with insulating liquid between them so that the area covered by eddy currents can be reduced, thus preventing any energy loss.

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Question - 11

Answer - 11 :- **Lenz's ~~law~~ law :-** It states that direction of induced current in a coil is such that it ~~opposes~~ magnetic field produced by it opposes the cause of induced current.

→ It's based on conservation of energy.

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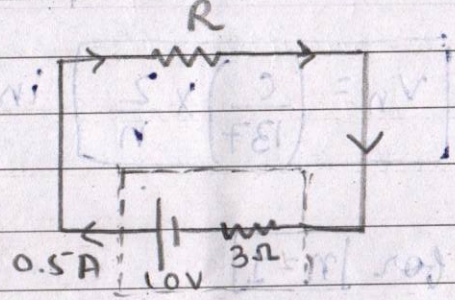
Question-12 (OR)

Answer - 12 :- (OR) Given,

EMF of the battery = 10 V

internal resistance = 3Ω

current in the circuit = 0.5A



According to the question;

Let the external resistance be RΩ.

Since both the resistors are in series combination,

$\therefore$ $R_{eq.} = R + 3$

Now, according to ohm's law :-

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$V = I(R_{eq.})$

$\therefore 10 = \frac{0.5}{10}(R+3)$

$\Rightarrow 20 = R+3$

$R = 17\,\Omega$

$\therefore$ Resistance of Resistor is $17\,\Omega$.

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Question-13

Answer 13 ⇒ Bohr's Model ÷ Using this model of atomic structure, we can calculate the speed of an electron by the following expression ÷

$V_n = \left(\frac{c}{137}\right) \times \frac{Z}{n}$ in m/s ⇒ [where V_n ÷ velocity of e^- in n^{th} orbit
Z ÷ atomic no. of the atom.
n ÷ shell no.
c ÷ speed of light in vacuum
$= 3 \times 10^8$ m/s]

Now, for $n = 1$

$\rightarrow V = \left(\frac{c}{137}\right) \times \frac{1}{1}$ [$\because Z = 1$ for H-atom]

$\Rightarrow 2.18 \times 10^6$ m/s

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[$\because c/137 = 2.18 \times 10^6$ m/s]

- for $n=2$,

$\rightarrow V_2 = 2.18 \times 10^6 \times \frac{1}{2} = 1.09 \times 10^6$ m/s

- for $n=3$,

$V_3 = 2.18 \times 10^6 \times \frac{1}{3} = 7.26 \times 10^5$ m/s

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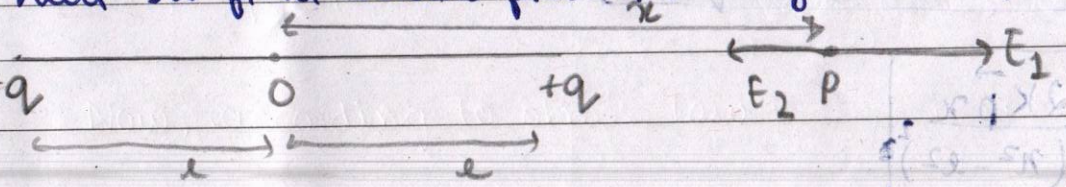
Question-14

Answer-14:- Let us consider an electric dipole

Answer 14:- Electric dipole:- A system of two equal and opposite charges with a very small seperation between them.

Let us consider an electric dipole with $(+q)$ and $(-q)$ as charges and '$2l$' be the seperation between them. Let 'O' be the mid-point of the dipole. Now, let a point 'P' be located on the axis of dipole at a distance x from the centre of dipole.

We need to find electric field intensity at this point 'P'.



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→ $\vec{E}_1$ = Electric field due to charge 'q'

$$= \boxed{\frac{Kq}{(x-l)^2}}$$

→ $\vec{E}_2$ = Electric field due to charge '-q'

$$= \boxed{\frac{Kq}{(x+l)^2}}$$

$\vec{E}_{net}$ at P ⇒ $\vec{E}_1 - \vec{E}_2$ [P is closer to q, ∴ $E_1 > E_2$]

$$\Rightarrow \frac{Kq}{(x-l)^2} - \frac{Kq}{(x+l)^2}$$

$$\Rightarrow Kq\left[\frac{1}{(x-l)^2} - \frac{1}{(x+l)^2}\right] = Kq\left[\frac{(x+l)^2 - (x-l)^2}{(x^2-l^2)^2}\right]$$

$$\Rightarrow Kq\left[\frac{x^2 + l^2 + 2xl - x^2 - l^2 + 2xl}{(x^2-l^2)^2}\right] \Rightarrow Kq\left[\frac{4xl}{(x^2-l^2)^2}\right]$$

Since 'p' (dipole moment) = $q \times 2l$

$$\therefore \boxed{\vec{E}_{net} = \frac{2K\vec{p}x}{(x^2-l^2)^2}}$$

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usually, $l \ll\ll x$,

$$\therefore |\vec{E}_{net}| = \frac{2Kpx}{x^4 x^3} = \frac{2Kp}{x^3}$$

where $K = \frac{1}{4\pi\varepsilon_0} = 9\times10^9\ N\,m^2/C^2$

Question-15 (OR)

Answer :- Mutual inductance :- The phenomenon in which any change in one coil of current induces current in other coil.

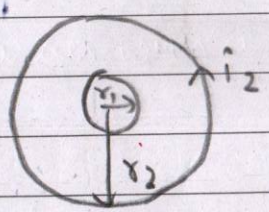
(OR)

Let us consider two concentric circular coils.

→ Radius of first coil = r_1

→ Radius of second coil = r_2

[Assuming $r_1 \ll\ll r_2$
N_1 = no. of turns in 'r_1' coil
N_2 = no. of turns in 'r_2' coil]



By principle of mutual induction,

$\phi_1 \propto i_2$

$$\phi_1 = Mi_2 \quad \rightarrow (1)$$

where · M is the coefficient of mutual induction
· i_2 = current in larger coil
· ϕ_1 = total flux through first coil.

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We know that,

~~$\phi_1 = B_2$~~ → $\phi_1 = B_2 A_1$

→ $$\phi_1 = \left(\frac{\mu_0 N_2 i_2}{2r_2}\right)(N_1 \pi r_1^2) \quad \text{(ii)}$$

[μ_0 is the magnetic permeability of air]

Comparing eq^n (i) & (ii), we get

$$M i_2 = \left(\frac{\mu_0 N_2 N_1 \pi r_1^2}{2 r_2}\right) \times i_2$$

$$\therefore \boxed{M = \frac{\mu_0 N_1 N_2 \pi r_1^2}{2 r_2}}$$ The unit is Henry.

$$\boxed{M \propto \frac{r_1^2}{r_2}}$$

This is the required expression.

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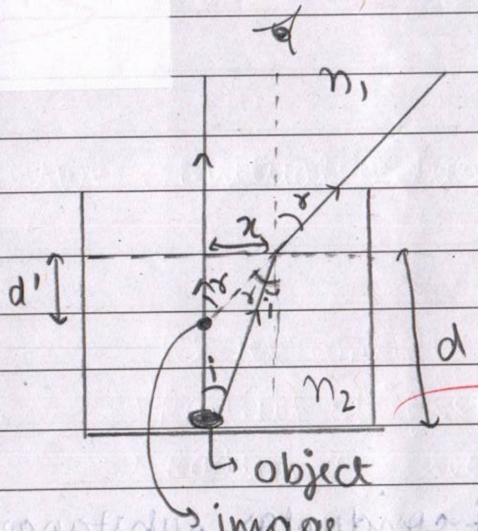
Question-16

Answer 16:- Refractive index :- It is a method of measuring optical density. It the ratio of speed of light in vacuum to the speed of light in any medium.



→ Let

r = angle of refraction

i = angle of incidence

d' = apparent depth

d = real depth

n_2 = R.I. of denser medium

n_1 = R.I. of rarer medium.

As per the snell's law,

$$\boxed{n_2 \sin i = n_1 \sin r} \quad — (1)$$

→ Since rays are paraxial,

∴ 'i' and 'r' are very small,

$\sin i \approx i \approx \tan i$

$\sin r \approx r \approx \tan r$

Substituting the values in ~~eqn~~ equation (1)

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$\rightarrow n_2 \tan i = n_1 \tan r$

$\rightarrow n_2 \left(\frac{x}{d}\right) = n_1 \left(\frac{x}{d'}\right)$

$$\rightarrow \boxed{\frac{n_2}{n_1} = \frac{d}{d'}}$$

Since ~~n₂ is air~~ rarer medium is air,

$\therefore n_1 = 1,$

$$\boxed{n_2 = \frac{d}{d'}}$$ This is the required expression.

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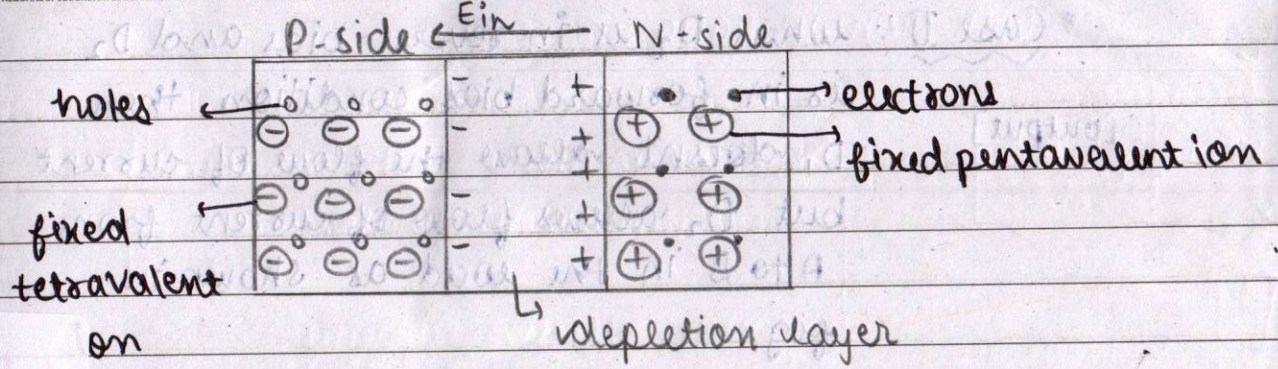
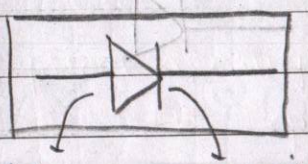
Question-17

Answer 17 :- P-N junction diode :- When a crystal of semi-conductor substances like Si or Ge is doped at ~~t~~ one side with trivalent impurities ~~and~~ forming P-type semiconductor and at other side with pentavalent impurities forming N-type semiconductor. Such a crystal where both P-side and N-side of a semiconductor are present is known as P-N junction diode.





"Symbol of P-N junction diode"

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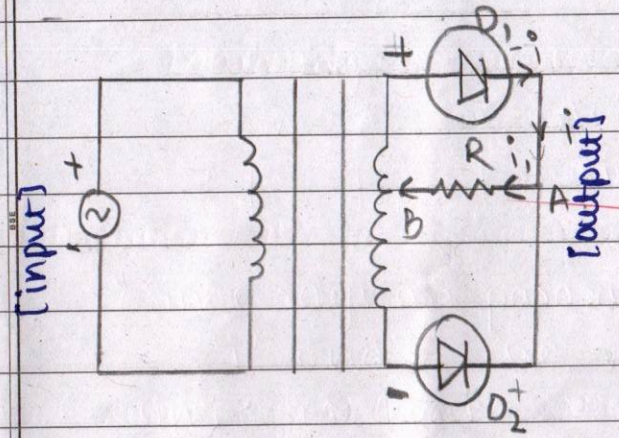
→ **Use of P-N junction diode as a full-wave rectifier:-** Rectifier is a device that converts Alternating [bidirectional] current to direct (unidirectional) current. A full-wave rectifier is the one that converts both the half-cycles of AC-current to DC-current.



• **WORKING:-** Let's consider two cases:-

→ **Case I:-** When D_1 is forward-biased and D_2 is reverse-bias, then D_1 offers negligible resistance to the current but D_2 offers infinite resistance to the flow current. In this case, current flows from A to B as shown in the figure.

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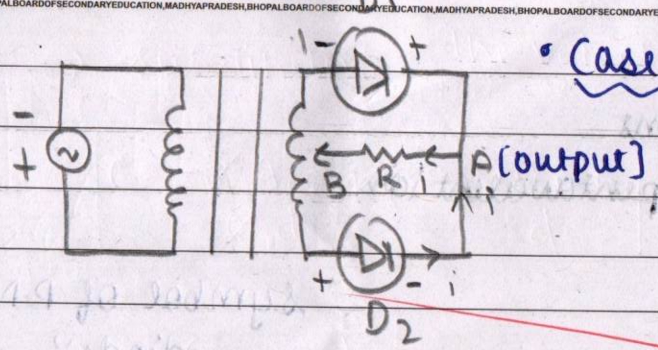
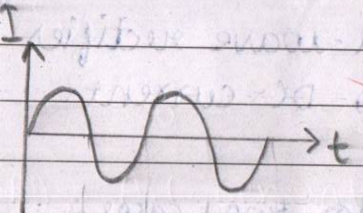


• Case II :- when D_1 is in reverse-bias and D_2 is in forward bias condition, then D_1 doesn't allow the flow of current but D_2 allows flow of current from A to B in the load as shown in fig.

→ Thus, in both the condition, current flows in every cycle in same direction.



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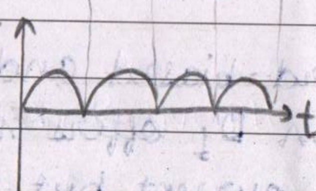

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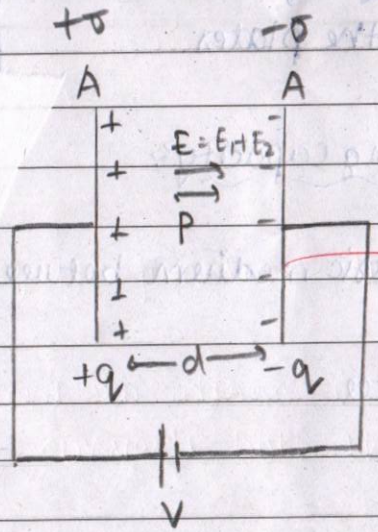
Question-18

Answer 18 :- Parallel plate - capacitor :- A device made up of two parallel conducting plates used to store electrical energy in a circuit.



Let :-
→ σ be the surface charge density of each plate.
→ 'A' be the overlapping area of each plate.
→ 'q' be the magnitude of charge on each plate.
→ 'd' be the seperation between plates.

Now, ∵ d <<< A, therefore both the plates can be treated as infinite sheets.

∴ Net Electric field at point P = $E_1 + E_2$

$$= \frac{\sigma}{2\varepsilon_0 K} + \frac{\sigma}{2\varepsilon_0 K}$$

{ K is the dielectric constant of the medium between plates }

$$E_{net} = \boxed{\frac{\sigma}{\varepsilon_0 K}}$$

$$\left\{\sigma = \frac{Q}{A}\right\} \Rightarrow \boxed{Q = \sigma \times A} \quad -(1)$$

Now, V (potential ~~of the~~ difference between the plates = $E_{net} \times d$

$$\Rightarrow \boxed{\frac{\sigma d}{\varepsilon_0 K}} \quad -(2)$$

We know that, $\boxed{C = \frac{Q}{V}}$

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→ substituting the values from equation: ① & ②,

$$C = \frac{\varepsilon A(\varepsilon_0 K)}{\varepsilon d} = \frac{A\varepsilon_0 K}{d}$$

{ ε_0 ÷ permittivity of the medium between the plates }

$$\Rightarrow C = \frac{A\varepsilon_0 K}{d}$$

Its S.I. unit is Farad (F).

• Two factors affecting capacity ÷

→ Presence of di-electric medium between plates.

→ Area of the plates.

Question ~~Ko~~ -19 (OR)

Answer 19 (OR) ÷ A.C. Generator ÷ It is a device that converts mechanical energy to electrical energy.

→ ~~CON~~ PRINCIPLE ÷ A.C. generator works on the principle of Electromagnetic Induction.

→ CONSTRUCTION ÷ Materials required to construct an A.C. generator are two slip ~~tino~~ rings, two bar magnets, an armature coil, two carbon brushes and a load.

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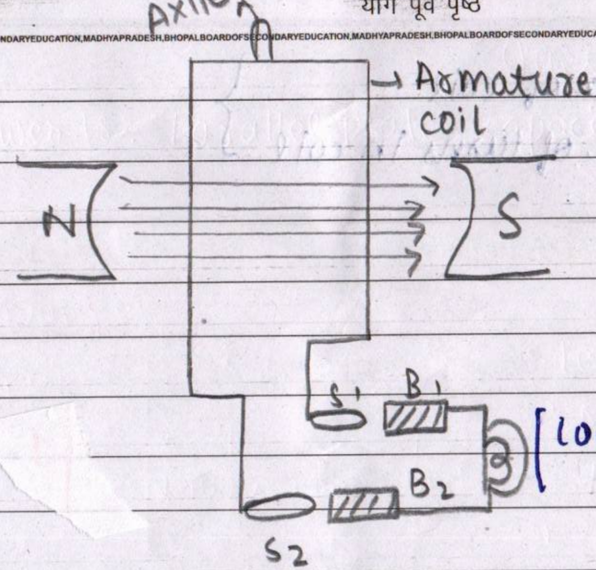

• Slip rings :- They maintain the contact between armature coil and carbon brushes. $[S_1, S_2]$

• carbon brushes :- They maintain the contact between slip rings and load. $[B_1, B_2]$

• Magnet :- provides necessary magnetic field.

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→ WORKING :- (a) Let us initially consider that magnetic field lines are parallel to the plane of coil. So, normal to the plane ⊥ to them.

$\therefore \phi = BS\cos\theta \quad [\theta = 90°]$

$\boxed{\phi = BS\cos 90° = 0}$

(b) Now, rotate the armature coil using axile manually such that normal to the plane (Area vector) makes an angle 'θ' with magnetic field lines. Consider rate of rotation 'ω' be constant. after time 't'.

$\therefore \omega = \frac{\theta}{t} \Rightarrow \boxed{\theta = \omega t}$

(c) By Faraday's law of EMI, we know that

$$\boxed{\varepsilon_{in} = \frac{-d\phi}{dt}}$$

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$\boxed{\phi_t = BS\cos\theta = NBA\cos\omega t}$ { A : Area of coil, N : No. of turns in coil }

Now,

$\varepsilon_{in} = -\frac{d\phi_t}{dt} = \frac{-d(NBA\cos\omega t)}{dt}$

B → $\boxed{\varepsilon_{in} = NBA\omega\sin\omega t}$

S

E Here, $\varepsilon_0 = NBA\omega$ (peak value of induced EMF)

$\therefore \boxed{\varepsilon_{in} = \varepsilon_0 \sin\omega t}$

and current thus induced $= \frac{\varepsilon_{in}}{R} = \frac{\varepsilon_0 \sin\omega t}{R}$

→ I_0 (peak value of current) $= \varepsilon_0/R = \boxed{NAB\omega/R}$

$\Rightarrow \boxed{I = I_0 \sin\omega t}$

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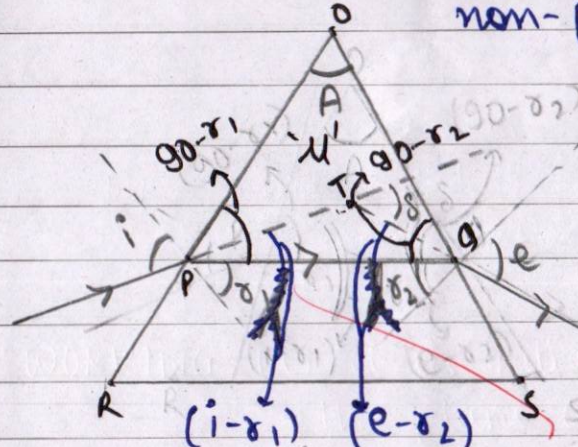
Question-20

Answer 20÷ PRISM÷ A thin transparent material bounded by three or more surfaces out of which atleast two refracting surfaces are non-parallel.



→ we can find the refractive index of prism in the condition of δ minimum deviation.

→ Let A = Refracting angle of the prism.
→ e = angle of emergence
→ i = angle of incidence.
→ r_1 & r_2 = angle of refraction.
→ δ = minimum deviation angle.
→ μ = R.I. of the prism

• In ΔOPQ,

$A + 90° - r_1 + 90° - r_2 = 180°$

$\boxed{A = r_1 + r_2}$

In condition of minimum deviation,

$\boxed{r_1 = r_2 = \frac{A}{2}}$

$\boxed{i = e}$

→ In ΔTPQ,

$\delta = i - r_1 + e - r_2$ [exterior angle property of Δ]

$\delta = i + e - (r_1 + r_2)$

At δ min

~~$\delta = 2i - \frac{A}{2}$~~ $\boxed{\delta = 2i - A}$ ⇒ $\boxed{i = \frac{\delta + A}{2}}$

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Applying Snell's law at first surface,

$\mu_1 \sin i = \mu_2 \sin r,$

$\Rightarrow (1) \sin i = \mu \sin\left(\frac{A}{2}\right)$

$\Rightarrow \sin\left(\frac{\delta + A}{2}\right) = \mu \sin \frac{A}{2}$

$$\boxed{\mu = \frac{\sin\left(\frac{\delta + A}{2}\right)}{\sin \frac{A}{2}}}$$

If this is a thin prism, then angles are very small,

$\therefore \boxed{\sin \theta \approx \theta}$

{ δ : angle of minimum deviation }

$\mu = \frac{\frac{\delta + A}{2}}{\frac{A}{2}} \Rightarrow$ ~~$\mu = \frac{\delta + A}{A}$~~ $\boxed{\mu = \frac{\delta_{min} + A}{A}}$

↳ This is the required expression.