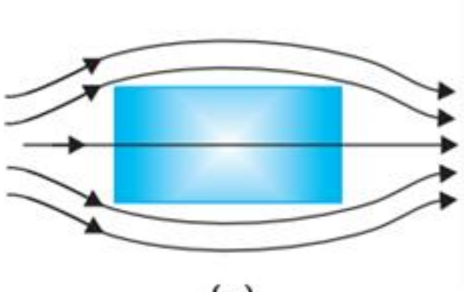
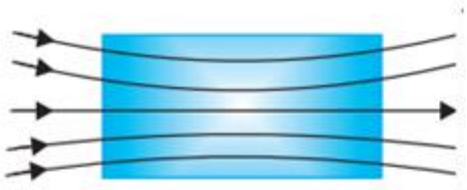
PHYSICS – Code No. 042
MARKING SCHEME
CLASS – XII (2025 – 26)

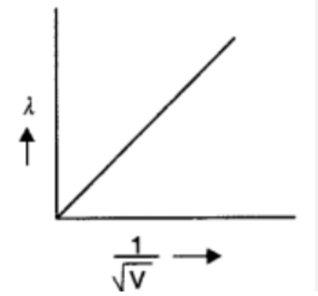
	SECTION A	
Q.No	**Questions**	**Marks**
1.	**Answer: (A)** Both are having equal charges For two bodies to be in equilibrium, both should have same potential(V). As V=$\frac{C}{q}$ Where C of sphere is $4\pi\varepsilon_o r$. Which is independent of all the factors mentioned in options.	1
2.	**Answer: (A)** Diameter of copper wire d, Diameter of cylindrical iron is D No.of turns N,(D>>d) Length=N x Circumference of cylinder L= NπD R= $\frac{\rho L}{A} = \frac{\rho N \Pi D}{d^2 \frac{\Pi}{4}}$ R=$\frac{4\rho ND}{d^2}$	1
3.	**Answer: (A)** When the frequency of the AC source is increased than the impedance of the device decreases. As in phasor diagram current leads the voltage, so given appliance is capacitor.	1
4.	**Answer: (D)** The energy of radio waves is lesser than that of the gamma rays. Since the frequency of radio waves is less than gamma waves. E = hν Hence, energy of radio waves is less than gamma waves	1

5.	**Answer: (A)** Total Internal reflection ***For VI- Students*** **Answer: (D)** $\frac{v_1}{c} = \frac{Sin\Theta_c}{sin\,90}$ cSinΘ	1
6.	**Answer: (D)** Slit width increases hence amplitude will increase, so intensity will also increase. ***For VI- Students*** **Answer: (B)** Interference	1 1
7.	**Answer: (C)** IV Transition III, V, VI corresponds to absorption of energy. Maximum emitted wavelength corresponds minimum energy difference. $\Delta E_I > \Delta E_{II} > \Delta E_{IV}$ Therefore, maximum emitted wavelength corresponds to transition IV. ***For VI- Students*** Transition III, V, VI corresponds to absorption of energy. Maximum emitted wavelength corresponds minimum energy difference. $\Delta E_{II} > \Delta E_I > \Delta E_{IV}$ Therefore, maximum emitted wavelength corresponds to transition IV.	1
8.	**Answer: (D)** The charged particle will move with constant velocity. As charge particle is moving parallel to magnetic field, there will be no acceleration.	1

9.	**Answer: (C)** more for the magnet falling through the solenoid. Emf will be induced in solenoid due to motion of magnet through it. As per Lenz's law induced emf will oppose the motion of magnet.	1
10.	**Answer: (C)** $V=2V_o \sin 2\omega t$ As V= NBAω sin ωt	1
11.	**Answer: (D)** 1:1 Nuclear density does not depend on mass number.	1
12.	**Answer: (B)** The deflection of the magnetic needle at P and Q will be in the opposite directions. As magnetic field at equator is antiparallel to magnetic field at pole.	1
13.	**Answer: (B)** both Assertion and Reason are true but Reason is not the correct explanation of Assertion.	1
14.	**Answer: (C)** Assertion is true but Reason is false.	1
15.	**Answer: (D)** both Assertion and Reason are false	1
16.	**Answer: (B)** both Assertion and Reason are true but Reason is not the correct explanation of Assertion. If three point charges are in equilibrium then forces acting on each charges should be linearly opposite.	1

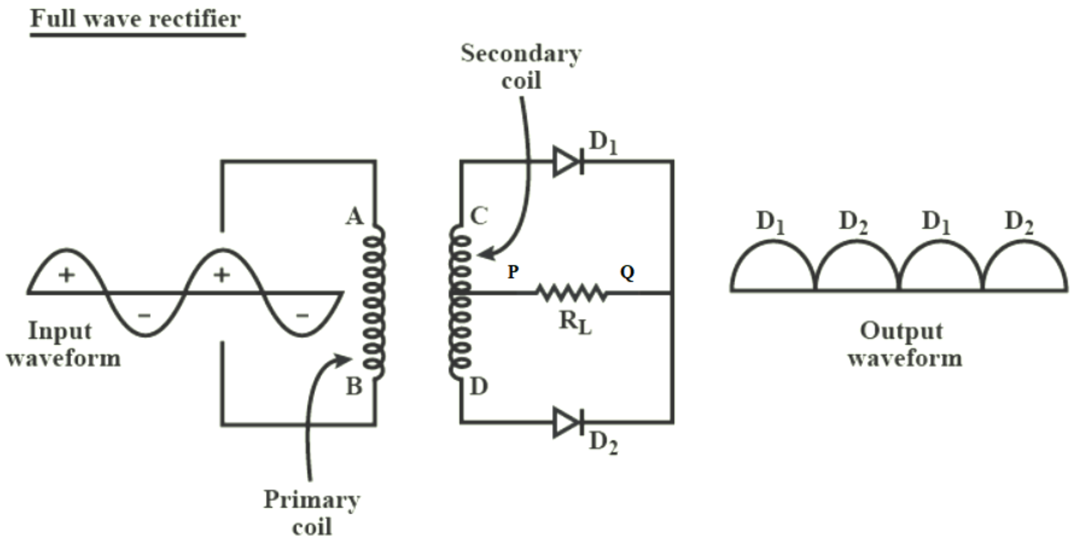
SECTION B		
17.	Given, B_o = 510 nT = 510 x 10^{-9} T ω = 60 x 10^6 rad/sec E_o = cB_o = 153 N/C k = ω/c = 20 x 10^{-2}rad/m E = E_o sin (ωt – kz) E = 153 sin (60 x 10^6 t – 20 x10^{-2}x) N/C	 1 1
18.	(I) E.m.f of the cell is 6V, As when load current is zero potential difference becomes equal to emf of the cell. (II) Explanation: The internal resistance of a cell can be determined as the negative slope of its voltage–current graph. First, we can determine the slope by choosing two points on the line: **Slope = $\frac{0-6}{12-0}$ = - 0.5** This means that the internal resistance must be 0.50 ohm (Ω). **<u>For VI-Candidates</u>** E = V + v = IR + Ir (where V is potential drop in the external circuit and v is potential drop in the cell) Or, E = I (R + r) Or, I = E / (R + r) This is the relation.	1 1 1 1
19.	From Gauss's theorem $\text{Ø}=\frac{q}{\varepsilon_r\varepsilon_o}$ [Where ε_r is relative permittivity of medium inside Gaussian surface] For sphere, $\text{Ø}_{sphere}=\frac{q}{\varepsilon_{water}\varepsilon_o}$ ……………..(i) For cube $\text{Ø}_{cube}=\frac{2q}{\varepsilon_o}$ …………………(ii) Dividing (i) by (ii) $\frac{\text{Ø}sphere}{\text{Ø}cube}=\frac{1}{2\varepsilon_{water}}=\frac{1}{160}$	 ½ ½ 1

20. (I)	$\frac{F}{L} = \frac{\mu_0 I_1 I_2}{2\pi r}$ (I_1 is the current in first wire and I_2 is the current in second wire) Thus we define ampere as the current flowing in each conductor separated by a unit distance so that one conductor applies a force of 2 x 10^{-7} N on a unit length of another parallel conductor. **Or**	1 1
20 (II)	 (a)  (b) **<u>For VI-Candidates</u>** Gauss's law for magnetism is: The net magnetic flux through any closed surface is zero. Hence magnetic flux linked to given sphere will also be zero.	1 1 1 1
21A.	Smaller is the impact parameter, larger is the angle at which α – particles scatters. Larger is the impact parameter, α – particles scatter less keeping its original trajectory. For head on collision, the value of impact parameter is zero. **OR**	1 1

<table>
<tr><td>21B.</td><td>


$\lambda = \frac{h}{mv}$
$\lambda = \frac{h}{\sqrt{2mqV}}$, comparing this equation with y = mx
slope= $\frac{h}{\sqrt{2mq}}$.</td><td>1

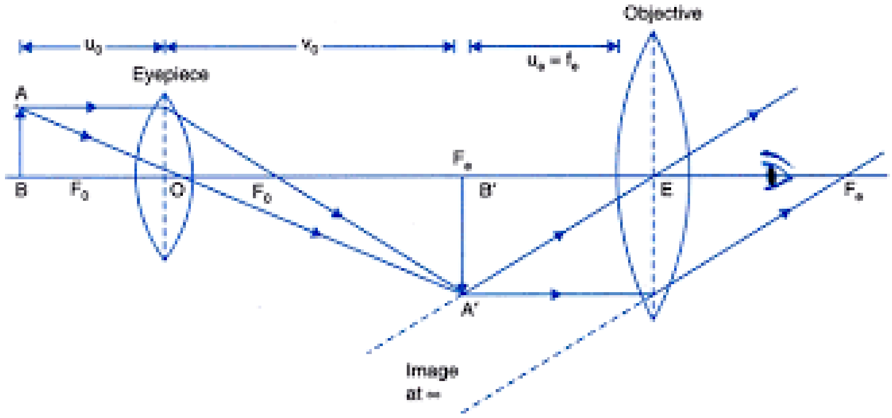
1</td></tr>
<tr><td colspan="3">SECTION C</td></tr>
<tr><td>22.</td><td>In the full wave rectifier:D_1 and D_2 are pn junction diode which allow current to pass only in forward biasing.
During odd half cycle the diode D_1 will be forward biased hence potential at the Q will be more then Potential at P and during this cycle D_2 will not permit current through it.
During even half cycle the diode D_2 will be forward biased hence potential at the Q will be more then Potential at P and during this cycle D1 will not permit current through it.
Hence we will get DC as output as shown in diagram.

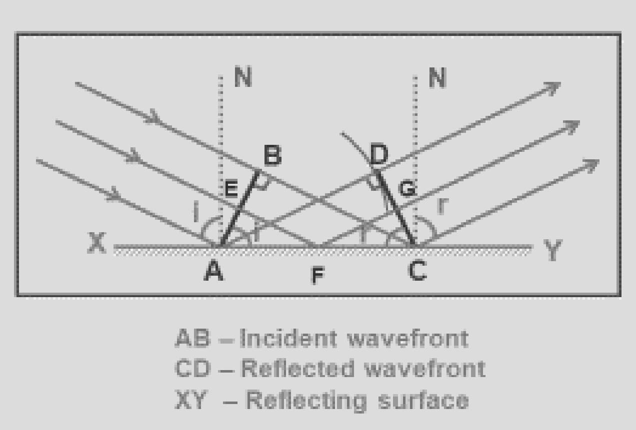


</td><td>1

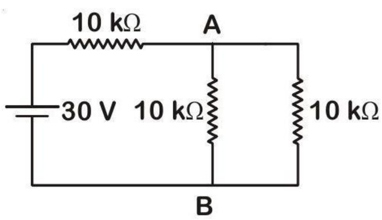
2</td></tr>
<tr><td>23.</td><td>(I) (A)Conservation of electric charge
(B) KVL is obeys law of conservation of energy as it is supplied voltage is equal to the voltage across each component in the loop. (OR) algebraic sum of voltages equal to zero.
(II) No change in balancing condition is observed.</td><td>1
1

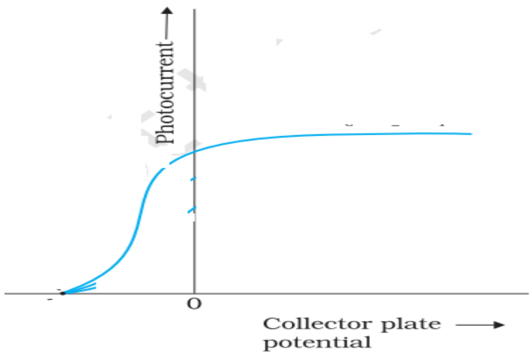
1</td></tr>
</table>

24.	A fast-moving neutron collides with the nucleus of Plutonium (Pu), thereby producing Xenon (Xe) and Zirconium (Zr) along with neutrons. (I) Nuclear fission reaction. $^{239}_{94}Pu + {}^{1}_{0}n \rightarrow {}^{134}_{54}Xe + {}^{103}_{40}Zr + 3\ {}^{1}_{0}n$ (II) $\Delta\, m$ = [m ($^{239}_{94}Pu$) + m ($^{1}_{0}n$)] - [m ($^{134}_{54}Xe$) + m ($^{103}_{40}Zr$) + 3 m ($^{1}_{0}n$)] = [239.052157 + 1.00866] - [133.905040 + 102.926597 + 3 X 1.00866] = 240.060817 – 239.857617 = 0.2032 amu Q value = $\Delta\, mc^2$ = 0.2032 x 931.5 MeV = 189.2808 MeV	1 1 1
25.	(I) $\frac{1}{v_0} = \frac{1}{f_0} - \frac{1}{u_0}$ v_0= 8.3 cm Angular magnification M=m_0xm_e M=$\frac{v_0}{u_0}(\frac{D}{fe}+1)$ M= -$\frac{8.3}{0.91}$ X $(\frac{25}{2.9} + 1)$ M= -87.7 (II) 	1 1 1

26.	 If c be the speed of light, t be the time taken by light to go from B to C or A to D or E to G through F, then $t=\frac{EF}{C}+\frac{FG}{C}$ $t = \frac{AF \text{ Sin i}}{C} + \frac{FC \text{ Sinr}}{C}$ $t = \frac{AC \text{ Sin r}+AF(\text{Sin i}-\text{Sin r})}{C}$ For rays of light from different parts on the incident wavefront, the values of AF are different. But light from different points of the incident wavefront should take the same time to reach the corresponding points on the reflected wavefront. So, t should not depend upon AF. This is possible only if sin i – sin r = 0. i.e. sin i = sin r or i = r Hence proved. **<u>For VI candidates</u>** (i) A wavefront is the locus of points (wavelets) having the same phase of oscillations (ii) Each point on a wavefront acts as a fresh source of disturbance of light known as wavefront. (iii) Planer.	1 1 1 1 1 1
27. (I)	As charge particle is moving perpendicular to magnetic field it will follow circular trajectory in clock wise direction. Magnetic force will act as centripetal force. Given: Q=1C; M=10^{-3}kg; v=2m/s & B=-0.1T$\hat{k}$	

	Radius of trajectory is given by R= $\frac{mv}{qb}$ = 2cm (A) Quarter Circle (B) It will cross the X axis at 2cm. (C) As work done by B is on charge particle is zero it's kinetic energy(K) will remain same K= $\frac{1}{2}mv^2$ Or, K = $\frac{1}{2}x10^{-3}x2^2J = 2 \times 10^{-3}J$	 1 1 1
27 (II)	Given: μ_r=200 I=1A N=200turn/m (A) H=nI Or,H=2000/m X 1A=2 X 10^3A/m (B) B= $\mu_o\mu_r$H Or, B=200 x 4π x 10^{-7}x 2 X 10^3A/m Or, B= 0.50T (C) Magnetisation is given by M=(μ_r-1)H=199 x 10^3 A/m Or,M = 1.99 x 10^5 A/m	 1 1 1
28.	Given: No of turns of coil N_c=50 Area of coil= $\frac{5}{\pi}$ cm^2=$\frac{5}{\pi}$ x $10^{-4}m^2$ For solenoid: N_s=2000, L=0.5m, n = N/L=4000turns/m, I= 5A	

	Magnetic field due to solenoid 'B'=μ_onI Or,B=4000 x 4π x 10^{-7} x 5 T Or,B= 8π x 10^{-2} T Flux linked to coil $\emptyset_B = N_c\vec{B}.\vec{A}$ Or, $\emptyset_B = N_cBA\cos\omega t$ Emf $\varepsilon = \frac{d\emptyset_B}{dt} = N_cBA\omega \sin \omega t$ *Or,* $\varepsilon_{max} = N_cBA$ *Or,* ε_{max} = 50 x 8π x 10^{-2} T x $\frac{5}{\pi}$ x 10^{-4}m^2 *Or,* ε_{max} = 2Mv	1 1 1
	SECTION - D	
29.	(I) (B) Voltage drop across diode will change from 0.3 to 0.7 V. Value of V_0 changes by 0.4 V. (II) (D) 11V, 1.96Ma $V_0 = E - V_{si} - V_{Ge} = 12.07 - 0.3 = 11V$ $I_d = V_0/R = 11/5.6 \times 10^{-3} = 1.96$ Ma (III) (B) $I = \frac{6}{50+150+100} = \frac{6}{300}$ A $= 0.02$ A (IV) (C)  Here the diode is in forward bias. So we replace it by a connecting wire. $V_a - V_b = \frac{l}{2} \times 10$ $= \frac{30}{15 \times 2} \times 10$ V $= 10$ V	1 1 1 1

30.	(I) If infrared radiation is used as incident radiation, determine the reading $W_o = h\nu_o$ Threshold frequency, $\nu_o = \frac{Wo}{h} = \frac{6.35 \times 1.6 \times 10^{-19}}{6.63 \times 10^{-34}} = 1.5 \times 10^{15}$ hz Frequency of infrared radiation < threshold frequency (ν_o) , hence no emmision of photoelectrons will take place, therefore reading of the microammeter = 0 (II) Photoelectric current decreases with decrease in potential. At some stage, for a certain potential of plate A, all the emitted electrons are stopped by the plate A and the photoelectric current becomes zero. (III)  **(for V.I. candidates)** No change in Kinetic Energy.	1 1 1 1 1
	SECTION E	
31. (I)	(A) In absence of dielectric slab, the capacitance of parallel plate capacitor is given by $C = \frac{A\varepsilon_0}{d}$ When a dielectric slab of thickness t(t < d) is introduced between the plates without touching the plates , the electric field in air $E_o = \frac{\sigma}{\varepsilon_0}$ $(\sigma \text{ is charge density given by } \frac{q}{A})$ but on account of polarisation of dielectric the electric field inside the dielectric changes to $E = \frac{Eo}{K}$ If potential difference between the plates of capacitor be V. now , then clearly	½

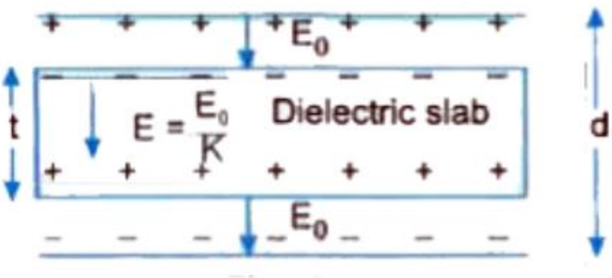
$V = E_o(d-t) + Et;$ 1

Or, $V = E_o(d-t) + \frac{Eo}{K} t;$

Or, $V = E_o(d-t+\frac{t}{k}) = \frac{\sigma}{\varepsilon_0}(d-t+\frac{t}{k})$

Or, $V = \frac{q}{A\varepsilon_0}(d-t+\frac{t}{k})$

½



(B) Capacitance of sphere will Increase. 1

Justification:

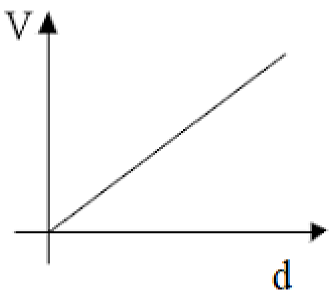
As $C = \frac{q}{V}$

& $V = \int \vec{E}.\overrightarrow{dl}$

As, electric field will decrease, due to polarization of water. Resulting in decrease in potential.

Hence, capacitance of sphere will increase 1

(C)



1

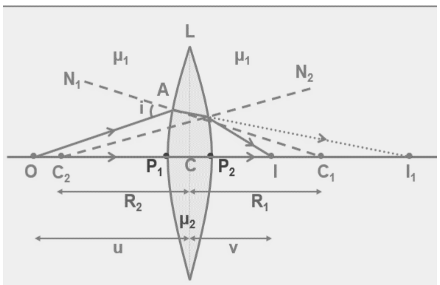
For VI Candidates

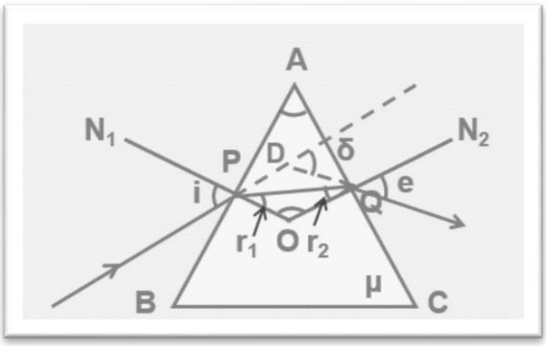
(C) energy stored in capacitor will decrease.

Justification

Energy$= \frac{Q^2}{2C}$

When separation is increased capacitance will increase and charge will remain same.

	Or	
31 (II)	(A) U=$\frac{Kq_1q_2}{r_{12}}$+$q_1V(r_1)$+ $q_2V(r_2)$ Or, U=$\frac{Kq_1q_2}{r_{12}}$+q_1 (E r_{1-0})+ q_2(E r_{2-0}) Or, U=($\frac{9X10^9X10^{-6}X3X10^{-6}}{20}$ + 0 +3 x 10^{-6} x 40x20) J Or, U=37.5 x 10^{-4}J (B) Work done will be same for both paths, as electric field is conservative in nature. (C) As electric field inside the conductor is zero so there will be no work needed in moving unit positive charge inside or on the surface.	1 1 1 1 1
32. (I)	(A) Lens Maker's Formula: For refraction at LP_1N, $\frac{\mu_1}{CO}+\frac{\mu_2}{CI1}=\frac{\mu_2-\mu_1}{CC1}$ (as if the image is formed in the denser medium) For refraction at LP_2N $\frac{\mu_2}{-CI_1}+\frac{\mu_1}{CI}=\frac{\mu_2-\mu_1}{CC_2}$ (as if the object is in the denser medium and the image is formed in the rarer medium) Combining the refractions at both the surfaces. $\frac{\mu_1}{CO}+\frac{\mu_2}{CI}=\ \mu_2-\mu_1(\frac{1}{CC_1}+\frac{1}{CC_2})$ Substituting the values with sign convections, $\frac{1}{-u}+\frac{1}{v}=\frac{\mu_2-\mu_1}{\mu_1}(\frac{1}{R_1}-\frac{1}{R_2})$  Since $\frac{\mu_2}{\mu_1}$=μ $\frac{1}{-u}+\frac{1}{v}=\frac{\mu_2-\mu_1}{\mu_1}(\frac{1}{R_1}-\frac{1}{R_2})$ (or)	1 1

	$\frac{1}{-u}+\frac{1}{v} = (\mu - 1)(\frac{1}{R_1}-\frac{1}{R_2})$ When the object is kept at infinity, the image is formed at the principal focus. i.e. $u = -\infty$, $v = +f$. $\frac{1}{f} = (\mu - 1)(\frac{1}{R_1}-\frac{1}{R_2})$ This equation is called 'Lens Maker's Formula'. (B) Refractive index of glass, $\mu = 1.55$ Focal length of the convexo-concave lens, f = 10 cm Radius of curvature of one face of the first Convex surface = R_1 Radius of curvature of the other face of the second convex surface = $-R_1$ Therefore, $R_1 = R$ and $R_2 = -R$ The value of R can be calculated from Lens – Maker formula: $(1/f) = (\mu - 1) [(1/R_1) - (1/R_2)]$ $(1/10) = (1.55 - 1) [(1/R) + (1/R)]$ $(1/10) = 0.55 \times (2/R)$ Therefore $R = (0.55 \times 2 \times 10)$ $= 11cm$ Hence, the radius of curvature of the convexo-concave is 11cm **(OR)**	1 1 1
32 (II)	(A)The **angle of deviation** represents the angle by which a light ray is deviated after passing through a prism. (B) Refraction of light through prism :  In quadrilateral APOQ, $A + O = 180°$ …….(1) In triangle OPQ, $r_1 + r_2 + O = 180°$ …….(2)	1 1

	In triangle DPQ $\delta = (i - r_1) + (e - r_2)$ $\delta = (i + e) - (r_1 + r_2)$ …….(3) From (1) and (2), $A = r_1 + r_2$ From (3), $\delta = (i + e) - (A)$ $i + e = A + \delta$ Sum of angle of incidence and angle of emergence is equal to the sum of angle of prism and angle of deviation. (C) When angle of incidence increases, the angle of deviation decreases. At a particular value of angle of incidence the angle of deviation becomes minimum and is called 'angle of minimum deviation'. At δ_m, • $i = e$ and $r_1 = r_2 = r$ (say) • At minimum deviation, refracted ray become parallel to incident ray. (Award full marks if either of condition is mentioned)	1 1 1
33. (I)	(A) Torque due to current carrying coil. Modification in designing of galvanometer are (i) Poles of magnet are made spherical (ii) Iron ore is placed inside the coil. (B) Given: $R_g = 49.5\Omega$; Range=0.05A For ammeter let resistance needed be R_a. As per requirement Range x $R_g = R_a(5-0.05)$ $R_a = \frac{0.5 X 49.5}{4.95} = 0.5\ \Omega$ (C) R_a will be connected in series & R_v is connected in parallel. **Or**	1 ½ ½ 1 1 1
33 (II)	(A)Given: In load circuit, $R=4\Omega$, $X_c=2\ \Omega$, $X_l=6\ \Omega$, $N_p=1000$,	

N_s=100,

V_{in}=200Vsin$100\pi t$ 1

(i) Output voltage Across Load Circuit

$\frac{V_{out}}{V_{in}} = \frac{N_s}{N_p}$=0.1

Or, V_{out}=0.1 x 200Vsin$100\pi t$,

Or, V_{out}=20Vsin$100\pi t$.

(ii) Current flowing through load circuit

As, I=$I_m$sin(ωt+Ø)

Where,

I_m= $\frac{V_m}{Z}$,

Z=$\sqrt{R^2 + ({X_c}^2 - {X_L}^2)}$ 1

Or,Z=4$\sqrt{2}$ Ω,&

I_m= $\frac{20}{4\sqrt{2}}$A = $\frac{5\sqrt{2}}{2}$A;

Ø = tan$^{-1}\frac{X_c - X_L}{R}$ = tan^{-1} 1 = $\frac{\pi}{4}$

I=$\frac{5\sqrt{2}}{2}$Asin($100\pi t$+$\frac{\pi}{4}$)'

1

(iii) Find the Power supplied to load circuit By the transformer.

P= $\frac{V_m I_m}{2}$CosØ

Where, CosØ=cos$\frac{\pi}{4}$ = $\frac{1}{\sqrt{2}}$

P=20V x $\frac{5\sqrt{2}}{2}$ Ax$\frac{1}{\sqrt{2}}$ =50W

(B) Ac transformer works on the principal of ' Mutual Induction' 1

A.C transformer can increase output potential.

As P=V/I

So increase in output potential results in decrease in output current, 1

resulting in significant decrease in power loss in transmission wires between power plants and

Cities. In respective cities they are stepped down.