PHYSICS (042)
CODE: 55/4/1

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Senior Secondary School Examination, 2026 (XIIth)
SUBJECT NAME : PHYSICS (Q.P. CODE : 042/55-4-1)

HOME

General Instructions: -

1	The CBSE has decided to introduce On Screen Marking (OSM) for the evaluation of Class XII answer Book with the 2026 Examination.
2	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
3	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, evaluation done and several other aspects. Its leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in Newspaper/Website, etc. may invite action under various rules of the Board and IPC."**
4	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In Class-XII, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.**
5	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
6	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
7	Evaluators will mark (√) wherever answer is correct. For wrong answer CROSS 'X' be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
8	If a question has parts, please award marks on the right-hand side for each part in the OSM Portal. Marks awarded for different parts of the question will be totaled up by the OSM System.
9	If a question does not have any parts, marks must be awarded in the left-hand margin in the OSM Portal. This may also be followed strictly.

HOME

HOME

10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
11	A full scale of marks 0 to 70 (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).This is in view of the reduced syllabus and number of questions in question paper.
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past :- • Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) • Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.
15	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for Spot Evaluation**" before starting the actual evaluation.
16	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.
17	**If a candidate attempts both alternatives/options in a question where only one option/ alternative is required to be attempted, the Evaluator shall award marks in both the options. The system will take the higher of two scores and disregard the other response.**
18	**In a question having two options/alternatives, if a candidate has attempted only one, then the evaluator shall mark "NA" (Not attempted) against the option that has not been attempted by the candidate.**

HOME

HOME

Important Note

In questions provided with choice, main part of the question has been indicated with "OR" against the question number in OSM whereas in its optional part "OR" is not indicated.

HOME

MARKING SCHEME: PHYSICS (042) Session: 2025–26			
Code: 55/ 4 / 1			
	SECTION A		
Q. No.	**VALUE POINTS/EXPECTED ANSWERS**	**Marks**	**Total Marks**
1.	(B) $(\rho_1 + \rho_2)$	1	1
2.	(C) $\frac{m_1}{m_2} < \frac{q_1}{q_2}$	1	1
3.	(B) ne	1	1
4.	(B) $\left[ML^2T^{-3}A^{-1}\right]$	1	1
5.	(A) $-\hat{i}$	1	1
6.	(C) 0 and 10	1	1
7.	(B) $2\times10^8 ms^{-1}$	1	1
8.	(B) cut-off potential will increase	1	1
9.	(B) Only Mo will not show photoelectric emission	1	1
10.	(D) Decrease by 50% of its initial value	1	1
11.	(A) Infrared region	1	1
12.	(C) Depletion region	1	1
13.	(A) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).	1	1
14.	(C) Assertion (A) is true, but Reason (R) is false.	1	1
15.	(D) Both assertion(A) and Reason (R) are false.	1	1

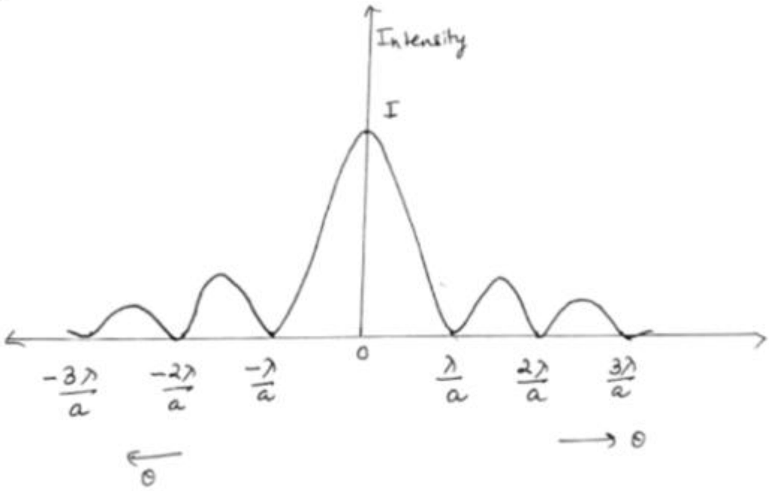
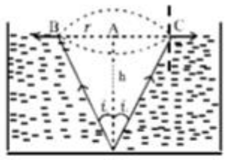
HOME

HOME

16.	(A) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).	1	1
	SECTION B		
17.	Calculating the amount of work done 2 Work done in turning the dipole in an external field = - pE(cos θ_2 - cos θ_1) Given: $\theta_1 = 0°$ (stable equilibrium) and $\theta_2 = 180°$(unstable equilibrium) Net work done in turning the dipole from its position of stable equilibrium to the position of unstable equilibrium = 2pE= 2(2qa)E $= 2 \times 1 \times 10^{-6} \times 10 \times 10^{-2} \times 100$ Net work done = 2×10^{-5} J	½ ½ ½ ½	2
18.	(a) Stating Huygens' Principle 1 Justifying the absence of the back wave 1 According to Huygens' principle, each point of the wavefront is the source of a secondary disturbance and the wavelets emanating from these points spread out in all directions with the speed of the wave. These wavelets emanating from the wavefront are usually referred to as secondary wavelets and if we draw a common tangent to all these spheres, we obtain the new position of the wavefront at a later time. The amplitude of the secondary wavelets is maximum in the forward direction and zero in the backward direction. **Alternatively:** Amplitude (A) ∝ (1 + cos θ); for back wave θ = 180° ⇒ Amplitude = 0 **OR** (b) (i) Depicting the variation of intensity 1 (ii) Effect on linear width 1	 1 1	

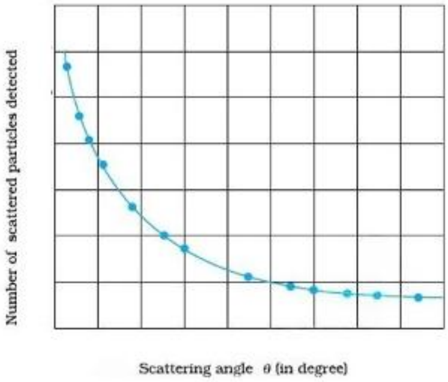
HOME

HOME

	(i) 	1	
	(ii) The linear width of the central maximum will decrease. **Note: Award ½ mark if the student gives only the formula.**	1	2
19.	Calculating the area 2  $r = h \times \tan i$ [as $i = i_c$] $\sin i_c = \frac{1}{\mu} = \frac{1}{\sqrt{2}} \Rightarrow i_c = 45°$ $r = h$ $\text{Area} = \pi r^2$ $= 3.14 \times (1)^2$ Area = 3.14 m²	½ ½ ½ ½	2

HOME

HOME

20.	Drawing graph 1 Two conclusions ½ + ½		
		1	
	Conclusions from the graph 1. Many of the α-particles pass through the foil, without suffering any collisions. 2. Only a few incident α-particles scatter by more than 1°. 3. About 1 in 8000 α-particles deflect by more than 90°. **(Any Two)**	½ + ½	2
21.	Finding the new value of hole concentration 1 ½ Identifying the semiconductor ½		
	$n_e n_h = n_i^2$	½	
	Hole concentration $(n_h) = \frac{n_i^2}{n_e}$	½	
	$= \frac{5\times10^8 \times 5\times10^8}{4\times10^{12}}$ $n_h = 6.25 \times 10^4\ m^{-3}$	½	
	The new semiconductor formed is n-type semiconductor.	½	2

HOME

HOME

	SECTION C		

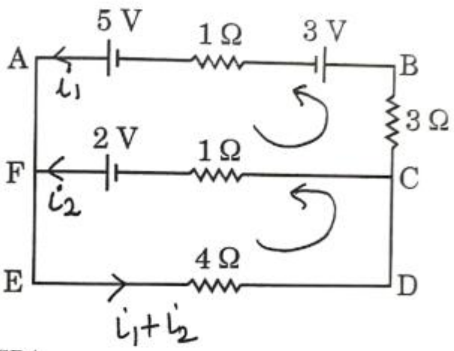
22.

Stating Kirchoff's Rules	½ + ½
Finding Current flowing through branch FC	2

Junction Rule: At any junction, the sum of the currents entering the junction is equal to the sum of the currents leaving the junction. ½

Loop Rule: The algebraic sum of changes in potential around any closed loop involving resistors and cells in the loop is zero. ½

Note:- Full credit to be given if stated mathematically.



For loop AFCBA

$$3i_1 + i_1 - i_2 = -3 + 5 - 2$$

$$4i_1 - i_2 = 0$$

$$4i_1 = i_2 \quad \text{-------(i)}$$ ½

For loop FEDCF

$$i_2 + 4(i_1 + i_2) = 2$$

$$4i_1 + 5i_2 = 2 \quad \text{-------(ii)}$$ ½

Solving equations (i) and (ii),

$$i_1 = \frac{1}{12}\text{A}$$

$$i_2 = \frac{1}{3}\text{A}$$ 1

Note: Award full marks if a student solves using another appropriate current distribution in the above circuit.

3

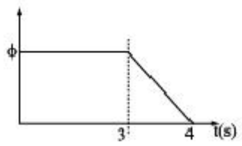
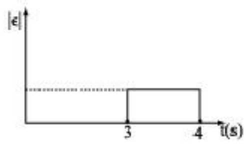
HOME

HOME

23.	(a) Finding the magnitude and direction of: (i) Net magnetic field at a point on conductor (1). 1½ (ii) Net force per unit length on conductor (1). 1½ (i) Magnetic field due to conductor (2) at a point on conductor (1) is $B_1 = \frac{\mu_0 I}{2\pi d}$ along positive z - axis. Magnetic field due to conductor (3) at a point on conductor (1) is $B_2 = \frac{3\mu_0 I}{4\pi d}$ along negative z - axis. Magnitude of net magnetic field is $B_2 - B_1 = \frac{3\mu_0 I}{4\pi d} - \frac{\mu_0 I}{2\pi d} = \frac{\mu_0 I}{4\pi d}$ along negative z – axis. Direction will be along negative z axis/ into the plane of the paper. (ii) Force per unit length on conductor (1) due to conductor (2) $= \frac{\mu_0 I_1 I_2}{2\pi d}$ $= \frac{\mu_0 I^2}{\pi d}$ (attractive) Force per unit length on conductor (1) due to conductor (3) $= \frac{3\mu_0 I^2}{2\pi d}$ (repulsive) Magnitude of net force per unit length on conductor (1) due to (2) & (3) $= \frac{\mu_0 I^2}{2\pi d}$ Direction of the net force per unit length will be repulsive or along positive y-axis.	½ ½ ½ ½ ½ ½	
	OR (b) (i) Deriving expression for induced emf 1 ½ (ii) Finding the effective value of current 1 ½ (i) Induced emf $= \lvert\varepsilon\rvert = \frac{d\phi}{dt}$ $= \frac{d}{dt}\left(\vec{B}.\vec{A}\right)$	½	

HOME

HOME

	$\lvert\varepsilon\rvert = \frac{d}{dt}(B_0 \sin\omega t \times \ell b)$ $= B_0\omega\ell b \cos\omega t$ (ii) Instantaneous value of current $= \frac{\lvert\varepsilon\rvert}{R} = \frac{B_0\omega\ell b \cos\omega t}{R}$ $I_{eff} = \frac{I_0}{\sqrt{2}}$ $= \frac{B_0\omega\ell b}{R\sqrt{2}}$	½ ½ ½ ½ ½	3
24.	(a) Finding: Direction of induced current 1 Time for which current persists in the loop. 1 (b) Plotting graphs showing variation of magnetic flux, magnitude of induced emf as a function of time. 1 (a) As the magnetic flux linked with the loop is decreasing, hence in accordance with Lenz's Law, the induced current will be in the clockwise direction. $t = \frac{25\,cm}{25\,cm/s} = 1s$ (b)  	 1 1 ½+½	3
25.	Defining infrared waves 1 Reason for being referred to as heat waves 1 Two uses ½ + ½ Infrared waves are the waves produced by hot bodies and molecules. **Alternatively:** They are electromagnetic (em) waves whose wavelength lies between 1mm to700nm. They are referred to as heat waves because water molecules present in most materials readily absorb infrared waves. After absorption, their thermal motion increases, that is, they heat up and heat their surroundings.	 1 1	

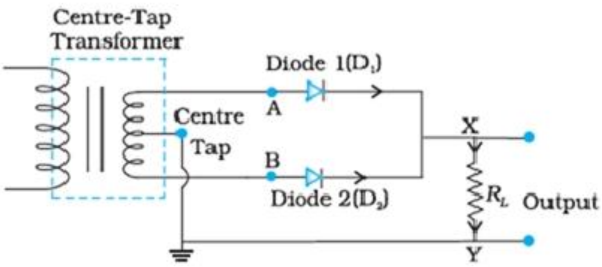
HOME

HOME

	Alternatively: When infrared waves pass through a medium, they heat up the medium. **Uses:** 1. Infrared lamps are used in physical therapy. 2. They help in maintaining Earth's average temperature. 3. They are used in satellites for military purpose. 4. They are used in satellites to observe growth of crops. 5. They are used in remote switches. **(Any Two)**	½ + ½	3
26.	(a) Explaining the dual aspect of matter — 1 (b) Finding de Broglie wavelength of emitted electrons — 2 (a) According to the de Broglie relation, wavelength λ associated with a particle of momentum p is given as: $\lambda = \frac{h}{p} = \frac{h}{mv}$ λ is the characteristic of a wave whereas momentum p is a typical characteristic of a particle. The de Broglie relation connects the two characteristics.	½ ½	
	(b) Kinetic energy of the electron $= \frac{1}{2}mv^2$ $\frac{1}{2}mv^2 = \frac{hc}{\lambda}$ $v = \sqrt{\frac{2hc}{m\lambda}}$ De Broglie wavelength of the electron $(\lambda') = \frac{h}{mv}$ $\lambda' = \frac{h}{m\sqrt{\frac{2hc}{m\lambda}}}$ $\lambda' = \sqrt{\frac{h\lambda}{2mc}}$	½ ½ 1	3

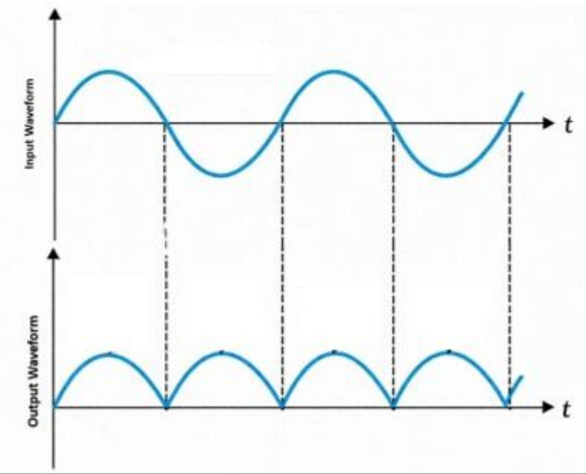
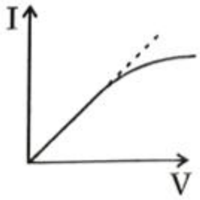
HOME

HOME

27.	(a) Finding the value of A 1 (b) Calculating the amount of energy released 2 (a) ${}_{1}^{2}\text{H} + {}_{1}^{2}\text{H} \rightarrow {}_{2}^{A}\text{X} + {}_{0}^{1}n$ Mass number of reactants = Mass number of products $\therefore A = 3$ (b) Mass defect, ΔM = Mass of reactants − Mass of products $= \left[2\times m({}_{1}^{2}H)\right] - \left[m({}_{2}^{A}X) + m({}_{0}^{1}n)\right]$ $= [2\times 2.014102] - [3.016049 + 1.0086654]$ $\Delta M = 0.00349\ u$ Energy released = $\Delta M \times 931.5\ MeV/c^2$ $= 0.00349 \times 931.5$ Energy released = 3.25 MeV	1 ½ ½ ½ ½	3
28.	Explaining the working with the help of circuit diagram 1+1 Depicting the input and output waveforms ½ + ½  Let the input voltage A with respect to the centre tap at any instant is positive. At that instant, voltage at B being out of phase will be negative. So, diode D_1 gets forward biased and conducts (while D_2 being reverse biased is not conducting). Hence, during this positive half cycle we get an output current. When voltage at A becomes negative w.r.t. centre tap, the voltage at B would be positive. In this part of the cycle diode D_1 would not conduct but diode D_2 would be giving output current.	1 1	

HOME

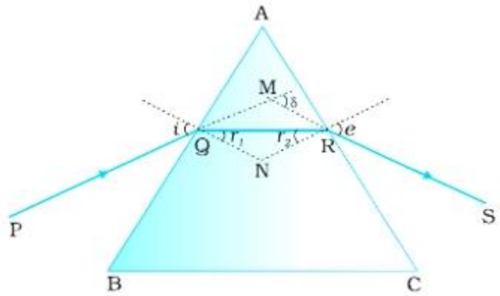
HOME

		½ ½	3
	SECTION D		
29.	(i) (C)  (ii) (C) equal to the sum of error in voltmeter reading and the error in ammeter reading. (iii) (B) readings in both voltmeter and ammeter increase. (iv) (B) $v_2 > v_3 > v_1$ OR (C) $E_2 > E_3 > E_1$	1 1 1 1	4

HOME

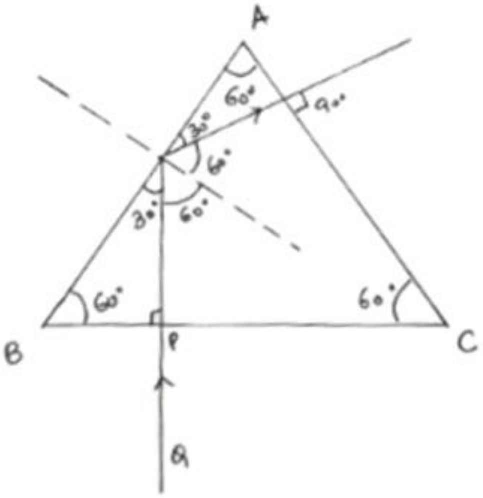
HOME

HOME

30.	(i) (B) real, virtual (ii) (D) apertures of objective lens and eyepiece (iii) (C) The distance between two lenses is more than $(f_0 + f_e)$ (iv) (A) 84 cm OR (D) 20	1 1 1 1	4
	SECTION E		
31.	(a) (i) Defining refractive index 1 (ii) Deriving relation between refractive index in terms of δ_m and A. 2 (iii) Tracing path of light and relevant explanation. 1+1 (i) Refractive index of a medium is the ratio of the speed of light in vacuum to the speed of light in the medium. **Alternatively** $n_{21} = \frac{c}{v}$ (ii) 	1 ½	

HOME

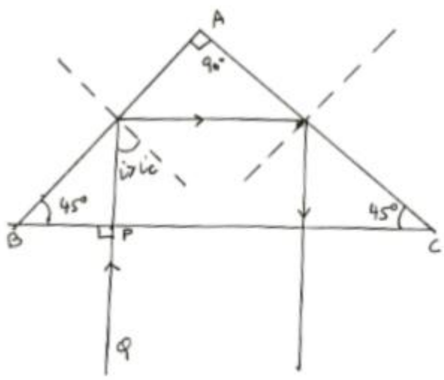
HOME

	In the quadrilateral AQNR, two of the angles (at the vertices Q and R) are right angles. Therefore, the sum of the other angles of the quadrilateral is 180°. $\angle A + \angle QNR = 180°$ From the triangle QNR, $r_1 + r_2 + \angle QNR = 180°$ Comparing these two equations, we get $r_1 + r_2 = A$ ………………(i) The total deviation δ is the sum of the deviations at the two faces. $\delta = i + e - A$ ………………(ii) For $\delta = \delta_m$; i = e which implies $r_1 = r_2$ From equation (i) and (ii) $r = \frac{A}{2}; i = \frac{A + \delta_m}{2}$ Refractive index of the prism $n_{21} = \frac{n_2}{n_1} = \frac{\sin\frac{(A+\delta_m)}{2}}{\sin\frac{A}{2}}$	½ ½ ½	
	(iii)  	1	
	The ray QP strikes the face BC normally and hence goes undeviated. As $i > i_c$, it undergoes TIR. It strikes the face AC normally and comes out undeviated.	1	

HOME

HOME

Alternatively



The ray QP strikes the surface BC normally and hence goes undeviated. As $i > i_c$, it undergoes TIR. As at face AC, $i > i_c$, it undergoes TIR. The ray comes out of the face BC undeviated.

(Award full credit of this part if the student takes the value of A other than 60° or 90° and traces the path correctly and according to the angle taken)

OR

(b)

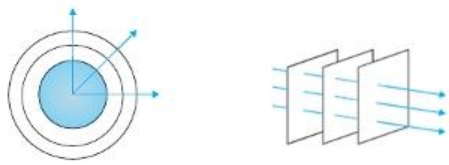
HOME

(i) Differentiating between a ray and a wavefront	1
(ii) Showing reflected wavefront	1
Verifying the law of reflection	2
(iii) Depiction of refraction	1

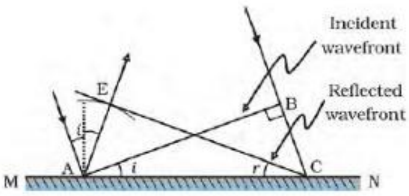
(i) Ray – It is a straight line depicting the rectilinear propagation of light. ½

Wavefront – It is the locus of points which oscillate in same phase. ½

Alternatively

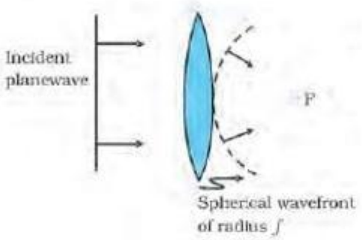


(ii)



1

HOME

	If v represents the speed of the wave in the medium and τ represents the time taken by the wavefront to advance from the point B to C then the distance $BC = v\tau$ Let CE represent the tangent plane drawn from the point C to this sphere. Then, $AE = BC = v\tau$ If we now consider the triangles EAC and BAC we will find that they are congruent. Therefore, the angles i and r would be equal. (iii)  	½ 1 ½ 1	5
32.	(a) (i) Defining: (I) Resonant frequency 1 (II) Power factor of series LCR circuit 1 Value of power factor when power dissipated is maximum. 1 (ii) Calculating: (I) Impedance of the circuit 1 (II) rms value of the current 1 (i) (I) For series LCR circuit, the frequency at which the current amplitude is maximum. **Alternatively** The frequency at which the impedance is minimum (Z=R). **Alternatively** Frequency at which $X_L = X_C$	1	

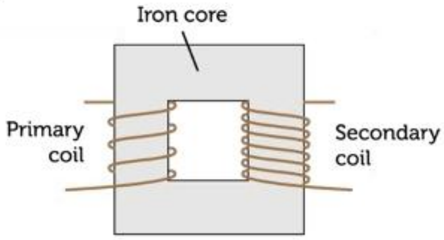
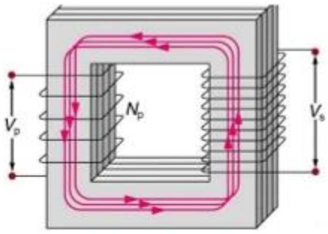
HOME

HOME

	(II) Power factor: It is the ratio of resistance to impedance of the series LCR circuit. **Alternatively** $\cos\phi = \frac{R}{z}$, where ϕ is the angle between the voltage and the current. **Alternatively** $\cos\phi = \frac{V_R}{V}$ $P = V_{eff} I_{eff} \cos\phi$, P is maximum when $\cos\phi$ is unity.	1 1	
	(ii) (I) $Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega c}\right)^2}$ $= \sqrt{(400)^2 + \left(100\pi \times \frac{5}{\pi} - \frac{1\times\pi}{100\pi\times 50\times 10^{-6}}\right)^2}$ $= \sqrt{160000 + 90000}$ $= \sqrt{250000}$ $= 500\Omega$	½ ½	
	(II) $I_{rms} = \frac{V_0}{Z\sqrt{2}}$ $= \frac{140}{500 \text{ x } 1.4} = 0.2A$	½ ½	
	OR (b) (i) Drawing Labelled diagram — 1 Obtaining the ratio $\frac{V_S}{V_P}$ — 2 (ii) Finding (I) Current in the primary coil — 1 (II) Output voltage — 1		

HOME

HOME

	(i)  	1	
	(Anyone of the above) The induced emf or voltage across secondary with N_S turns is: $\varepsilon_s = -N_s \frac{d\phi}{dt}$	½	
	The alternating ϕ flux also induces an emf, called back emf. This is: $\varepsilon_P = -N_P \frac{d\phi}{dt}$ $\varepsilon_P = v_P$ [∵ primary coil has zero resistance] $\varepsilon_s = v_s$ [∵ secondary coil is an open circuit]		
	$v_s = -N_s \frac{d\phi}{dt}$ ------(i)	½	
	$v_P = -N_P \frac{d\phi}{dt}$ ------(ii)	½	
	Dividing (i) by (ii) $\frac{v_s}{v_P} = \frac{N_s}{N_P}$	½	
	(ii) (I) $P = V_P I_P$	½	
	$3.3\times10^3 = 220\times I_P$ $I_P = \frac{3.3\times10^3}{220} = 15A$	½	
	(II) $\frac{v_s}{v_P} = \frac{N_s}{N_P}$	½	
	$\frac{220}{v_s} = \frac{100}{5000}$ $v_s = 11000V$	½	5

HOME

HOME

33.	(a) (i) Reason for: (I) Electric field perpendicular to the equipotential surface at a point. 1 (II) Reduction of electric field inside the dielectric. 1 (III) Potential difference decreases when the plates of a capacitor are brought closer. 1 (ii) Obtaining expression for the work done. 2 (i) (I) If the field were not normal to the equipotential surface, it would have non-zero component along the surface. To move a unit test charge against the direction of the component of the field, work would be done. This is in contradiction to the definition of equipotential surface.	1	
	Alternatively $\oint \vec{E}.\vec{dl} = V_A - V_B; V_A = V_B$ for equipotential surface $\oint \vec{E}.\vec{dl} = 0 \Rightarrow \cos\theta = 0$ as $E \neq 0 \,\&\, dl \neq 0$ and $\theta = 90^0$		
	(II) When a dielectric is placed in an external electric field, due to polarization of its molecules, an electric field is induced in a direction opposite to the external field, hence net electric field inside is reduced. **Note: Full credit to be given if explained diagrammatically.** **Alternatively** $\varepsilon = \varepsilon_0 - \varepsilon_P$	1	
	(III) Potential difference $(V) = \frac{Q}{C}$ $V = \frac{Qd}{A\varepsilon_0}$ $V \propto d$	1	

(ii) Work done $= k\left[\frac{q_1q_2}{a}+\frac{q_1q_3}{a}+\frac{q_2q_3}{a}\right]$ ½

$= \frac{k}{a}\left[(q)(-4q)+(q)(2q)+(-4q)(2q)\right]$ 1

$= -\frac{k(10q^2)}{a}$

Work done to dissociate is $+\frac{k(10q^2)}{a}$. ½

OR

(b)

(i) Reason for:	
(I) Instantaneous establishment of current.	1
(II) Low internal resistance.	1
(III) assertion not true.	1
(ii) Calculating:	
Emf	1
Internal resistance	1

(i)

(I) Electric field is established throughout the circuit, almost instantly (with the speed of light) causing at every point a local electron drift. Establishment of a current does not have to wait for electrons from one end of the conductor travelling to the other end. However, it does take a little while for the current to reach its steady value. 1

(II) $I = \frac{\varepsilon}{R+r}$

The maximum current that can be drawn from a cell is for R=0 and it is $I_{max} = \frac{\varepsilon}{r}$ 1

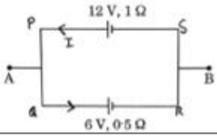
(III) The Ohm's law asserts that the plot of I vs V is linear i.e. R is independent of V. But this condition is not applicable for diodes. 1

(ii) $\varepsilon_{AB} = \frac{\varepsilon_1 r_2 + \varepsilon_2 r_1}{r_1 + r_2}$ ½

$= \frac{12\times0.5+6\times1}{1.5}$

$= 8V$ ½

Alternatively (for emf only)



HOME

HOME

	In loop PQRSP, $-6-0.5I+12-1\times I=0$ $-1.5I+6=0$ $I=\frac{6}{1.5}=4A$ $V_{AB}=\varepsilon-Ir=12-4\times1$ $=8\ V$ Internal resistance $=\frac{r_1r_2}{r_1+r_2}$ $=\frac{0.5\times1}{1.5}$ $=\frac{1}{3}\Omega$	½ ½	5

HOME

HOME