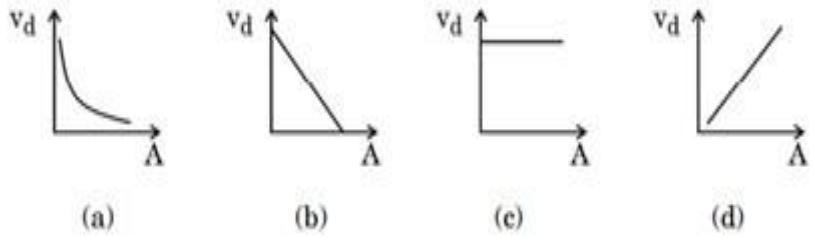
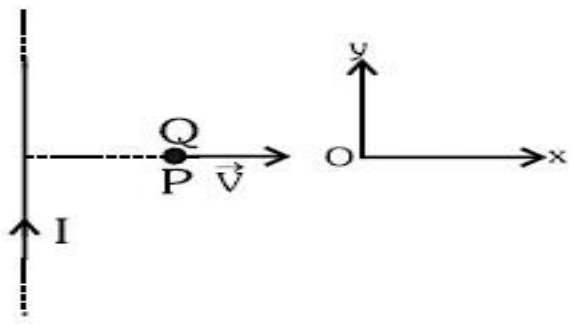
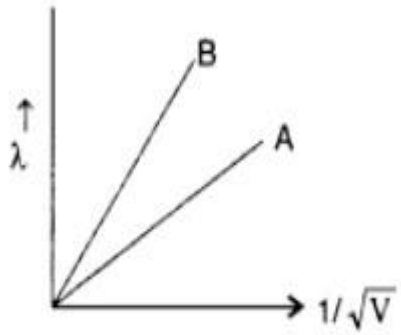
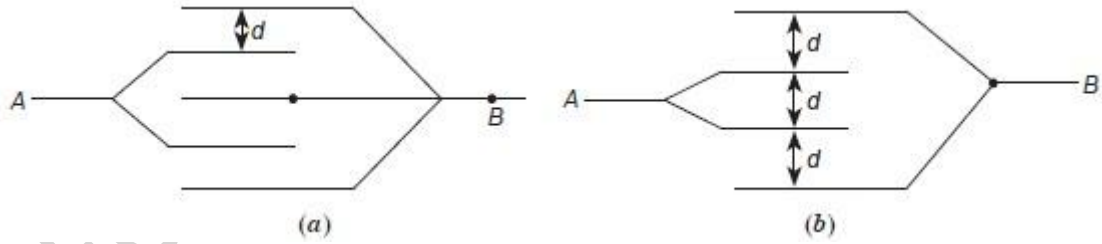
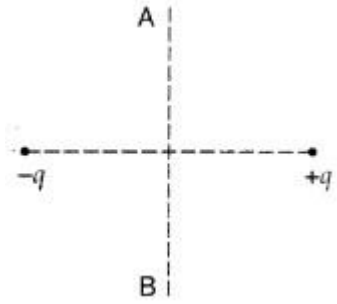
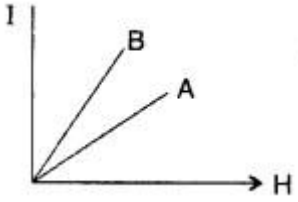
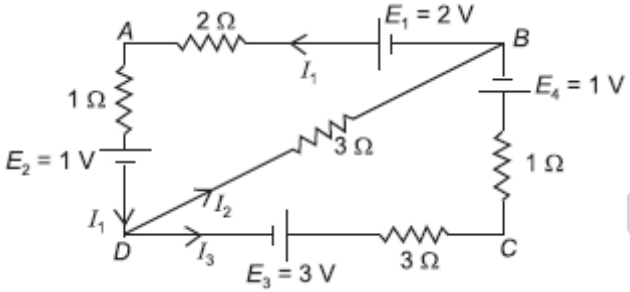
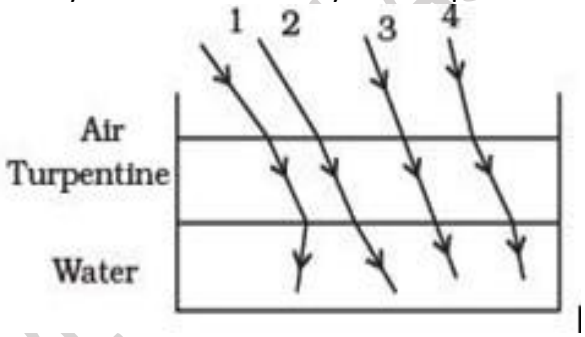
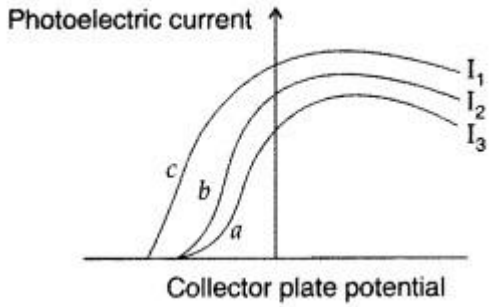
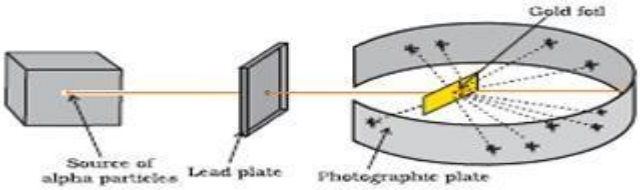
	SPECTRA CLASSES PRACTICE PAPER 2025-26 **CLASS: XII** **SUBJECT: PHYSICS (042)**	
	M.M: 70 **TIME: 3 HRS**	
	General Instructions:- **(1)** There are 33 questions in all. All questions are compulsory. **(2)** This question paper has five sections: Section A, Section B, Section C, Section D and Section E. **(3)** All the sections are compulsory. **(4)** Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study based questions of four marks each and Section E contains three long answer questions of five marks each. **(5)** There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, all three questions in Section D and one question in each CBQ in Section E. You have to attempt only one of the choices in such questions. **(6)** Use of calculator is not allowed.	
	SECTION A	
1	A steady current flows through a metallic wire whose area of cross-section (A) increases continuously from one end of the wire to the other. The magnitude of drift velocity (vd) of the free electrons as a function of 'A' can be shown by  	1
2	A straight wire is kept horizontally along east-west direction. If a steady current flows in wire from east to west, the magnetic field at a point above the wire will point towards: a) East b) West c) North d) South	1
3	The current in a coil of 15 mH increases uniformly from zero to 4 A in 0.004s. The emf induced in the coil will be a) 22.5 V b) 17.5 V c)15.0 V d) 12.5 V	1
4	What is the ratio of the speed of infrared and ultraviolet rays in a vacuum? a) 1:5 b) 2:1 c) 1:1 d) 0	1

5	An electromagnetic wave of frequency 3 MHz passes from vacuum into a medium with dielectric constant k = 4 and μ_r = 1 Then a) both wavelength and frequency remain unchanged b) wavelength is doubled and frequency becomes half c) wavelength is halved and frequency remains unchanged d) wavelength is doubled and the frequency remains unchanged	1
6	Which of the following is a necessary condition for total internal reflection? a) The angle of incidence in the denser medium must be greater than the critical angle for the two media b) The angle of incidence in the rarer medium must be greater than the critical angle for the two media c) The angle of incidence in the denser medium must be lesser than the critical angle for the two media d) The angle of reflection in the denser medium must be greater than the critical angle for the two media	1
7	The fringe width in a Young's double slit experiment is β. If the whole set-up is immersed in a liquid of refractive index 'μ', then the new fringe width will be : (a) β (b) β μ (c) $\frac{\beta}{\mu}$ d) $\frac{\beta}{\mu^2}$	1
8	When a metallic surface is illuminated with radiation of wavelength λ, the Stopping potential is V. If the same surface is illuminated with the radiation of wavelength 2 λ then the stopping potential is V/4 . then find the threshold wavelength of metallic surface a) 3 λ b) $\frac{5}{2}\lambda$ c)4λ d)5 λ	1
9	The slope of stopping potential versus frequency of incident light graph for a given photo sensitive surface will be (h = Planck's constant) (a) h (b) h/e (c) eh (d) e	1
10	An electron is released from rest in a region of uniform electric and magnetic fields acting parallel to each other. The electron will move: a) in a straight line b) move in circle c) remain stationary d) move in a helical path	1

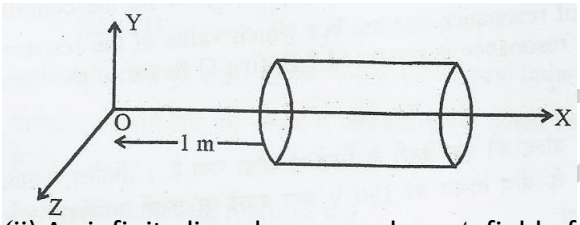
11	The power factor of LCR ac circuit at resonance is (a) 0.5 (b)1 (c) √2 (d) zero	1
12	A metal ring is held horizontally and bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet a) is equal to g b) is less than g c) is more than g d) depends on the diameter of ring and length of magnet	1
13	**Assertion and Reasoning** : For questions 13–16, choose the correct option: a) Both A and R are true, and R is the correct explanation of A. b) Both A and R are true, but R is not the correct explanation of A. c) A is true, but R is false. d) A is false, but R is true. --- **Assertion:** The total number of electric lines of force passing through a given area in a normal direction is called electric flux. **Reason:** Electric flux is a vector quantity.	1
14	**Assertion(A)**: Gamma rays are used cancer therapy. **Reason (R):** Gamma rays are a type of high-energy radiation that can destroy or damage cancer cells.	1
15	**Assertion (A):** A charge moving in magnetic field experiences a force. **Reason (R):** Magnetic field is always associated with moving charge and the charge will interact with the external magnetic field.	1
16	**Assertion(A):** mutual inductance of two coaxial coils is proportional to the length of the two coils. **Reason(R):** mutual inductance depends on angle between the axes of coils.	1
	SECTION B	
17	(i) What is meant by Equi potential surface? (ii) What is the work done in moving a charge of + 1 nC in between two points located on equipotential surface and are separated by a distance of 4 cm? Draw the Equi potential surface for an electric dipole.	2
18	A very long straight wire carries a current I. At the instant when a charge +Q at point P has velocity $\vec{v}$, as shown, then find the direction of the force on the charge?  	2
19	(a)State Huygens principle. (b) Consider a plane wave front incident on a thin convex lens. Draw a proper diagram to show how the incident wave front traverses through the lens and after	2

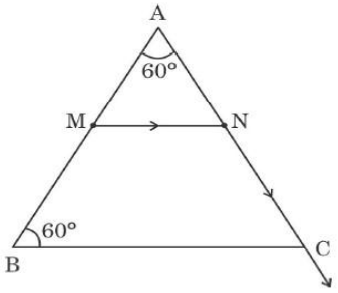
	refraction focuses on the focal point of the lens, giving the shape of the emergent wave front. (OR) How will the interference pattern in Young's double-slit experiment be affected if, **(i)** The screen is moved away from the plane of the slits. **(ii)** The source slit is moved away from the plane of the slits.	
20	a) Two lines, A and B, in the plot given below show the variation of de-Broglie wavelength, λ versus 1/√V, Where V is the accelerating potential difference, for two particles carrying the same charge. Which one of two represents a particle of smaller mass? Justify your answer  	2
21	Define critical angle and derive the relation between critical angle and refractive index.	2
	SECTION C	
22	Five identical horizontal square metal plates each of area *A* are placed at a distance d apart in air and connected to the terminals *A* and *B* as shown in the figures (a) and (b). Find the effective capacitance between the two terminals *A* and *B* in each figure  OR a) Derive the expression for potential at a point due to an electric dipole. (b) A charge 'q' is moved from a point A above a dipole of dipole movement 'p' to a point B below the dipole in equatorial plane without acceleration. Find the work done in the process  	3

23	(a)The figure shows the variation of intensity of magnetisation versus the applied magnetic field intensity, H, for two magnetic materials A and B:  Identify the materials A and B. (b) A circular coil of N turns and diameter 'd' carries a current 'I'. It is unwound and rewound to make another coil of diameter '2d', current I remaining the same. Calculate the ratio of the magnetic moments of the new coil and the original coil.	3
24	In the given network, find the values of the currents, I_1, I_2 and I_3.  	3
25	a) The power of a thin lens is +5D. When it is immersed in a liquid, it behaves like a concave lens of focal length 100 cm. Calculate the refractive index of the liquid. Given refractive index of glass = 1.5. (b) The optical density of turpentine is higher than that of water while its mass density is lower shows a layer of turpentine floating over water in a container.  For which one of the four rays incident on turpentine in the path shown is correct? And Justify your answer.	3
26	a) Find the intensity at a point on a screen in Young's double slit experiment where the interfering waves of equal intensity have a path difference of (i) λ/4 (ii) λ/3. (b) write any two differences between fringe pattern in interference and diffraction?	3
27	a) The figure shows a plot of three curves a, b, c, showing the variation of photocurrent vs collector plate potential for three different intensities I_1, I_2 and I_3	3

	having frequencies v_1, v_2 and v_3 respectively incident on a photosensitive surface.  Point out the two curves for which the incident radiations have same frequency but different intensities. Substantiate your answer. b) A proton and an electron have same kinetic energy. Which one has smaller de-Broglie wavelength and why?	
28	a) State Kirchhoff's laws in electricity. (b) With a neat circuit diagram, Derive the expression for the balanced condition of Wheatstone bridge.	3
	SECTION D	
29	Rutherford's Nuclear Model of Atom Rutherford in 1911, performed some scattering experiments in which he bombarded thin foils of metals like gold, silver, platinum or copper with a beam of fast moving α -particles. The thin gold foil had a circular fluorescent zinc sulphide screen around it. Whenever α-particles struck the screen, a tiny flash of light was produced at that point.  The important observations are: (i) Most of the α -particles passed through the foil without undergoing any deflection, (ii) A few α -particles underwent deflection through small angles. (iii) Very few were deflected back i.e., through an angle of nearly 180°. **Conclusions**: (i) Since most of the α -particles passed through the foil without undergoing any deflection, there must be sufficient empty space within the atom. (ii) A small fraction of α -particles was deflected by small angles. The positive charge has to be concentrated in a very small volume that repelled and deflected a few positively charged α -particles. This very small portion of the atom was called nucleus. (iii) The volume of nucleus is very small as compared to total volume of atom. i) How did the actual results of the gold foil experiment differ from the expected results? a)There was no difference between the expected and actual results. b) Rutherford expected particles to travel through the atoms, but instead, they ricocheted and rebounded in unexpected directions.	4

	c)The alpha particles caused the gold foil to undergo nuclear fusion instead of fission. d)None of these answers are correct. ii) If an α-particle collides head-on with a nucleus, what is its impact parameter? a) Zero b) Infinite c) 10^{-10} m d) 10^{10} m iii) An α-particle of energy 5 MeV is scattered through 180° by a fixed uranium nucleus. Calculate the order of distance of the closest approach? a) 10^{-20}cm b) 10^{-12}cm c) 10^{-11}cm d)10^{12}cm iv) Why was very thin gold foil used in an alpha scattering experiment? a) To minimize effects of multiple scattering, i.e. scattering the alpha particle on many atoms, because Rutherford wanted ultimately to measure the deflection by a single atom. b) Gold is a ductile material and it can be used to prepare thin sheets or foils c) In case of thin foil , the value of impact parameter and distance of closest approach will be maximum d) If we use a thin foil, then alpha particle will easily penetrate through it and It is easy to observe the scintillations when the alpha particle strikes the ZnS Screen (Fluorescent scree)	
30	Whenever an electric current is passed through a conductor, it becomes hot after some time. The phenomenon of the production of heat in a resistor by the flow of an electric current through it is called heating effect of current or Joule heating. Thus, the electrical energy supplied by the source of e .m. f is converted into heat. In purely resistive circuit, the energy expended by the source entirely appears as heat. But if the circuit has an active element like a motor, then a part of energy supplied by the source goes to do useful work and the rest appears as heat. Joule's law of heating forms the basis of various electrical appliances such as electric bulb, electric furnace, electric press etc. (i) Which of the following is correct statement? a) Heat produced in a conductor is independent of the current flowing. b) Heat produced in a conductor varies inversely as the current flowing. c) Heat produced in a conductor varies directly as the square of the current flowing. d) None (ii) If the coil of a heater is cut to half, what would happen to heat produced? (a) Doubled (b) Halved (c) Remains same (d) Becomes four times. (iii) A 25 W and 100 W are joined in series and connected to the mains. Which bulb will glow brighter? (a) 25 W (b) 100 W (c) Both bulbs will glow brighter (d) None will glow brighter	4

	(iv) A rigid container with thermally insulated wall contains a coil of resistance 100 Ω, carrying 1 A. Change in its internal energy after 5 min will be (a) 0 kJ (b) 10 kJ (c) 20 kJ (d) 30 kJ (OR) The heat emitted by a bulb of 100 W in 1 minute is (a) 36000 J (b) 1000 J (c) 600 J (d) 6000 J	
	SECTION E	
31	(i)A dielectric slab of dielectric constant 'K' and thickness 't <d' is inserted between plates of a parallel plate capacitor of plate separation d and plate area A. Obtain an expression for its capacitance. (ii)Two capacitors of different capacitances are connected first (1) in series and then (2) in parallel across a dc source of 100 V. If the total energy stored in the combination in the two cases are 40 mJ and 250 mJ respectively, find the capacitance of the capacitors. **OR** (I) A hollow cylindrical box of length 1 m and area of cross – section 25 cm^2 is placed in a three dimensional coordinate system as shown in the figure. The electric field in the region is given by $E = 50\,xi$, where E is in NC^{-1} and x is in meters. Find: (i) Net flux through the cylinder (ii) Charge enclosed by the cylinder.  (ii) An infinite line charge produces a field of 9×10^4 N / C at a distance of 2 cm. Calculate the linear charge density?	5
32	(i)Explain with the help of a labelled diagram, the principle and working of an ac generator and obtain expression for the emf generated in the coil. (ii) The coil of an a.c. generator consists of 100 turns of wire, each of area 0.5 m^2. The resistance of wire is 100Ω. The coil is rotating in the magnetic field of 0.8 T perpendicular to its axis of rotation, at a constant angular speed of 60 rad/sec. Calculate the maximum emf generated and power dissipated in the coil. **OR** (i) With the help of a diagram, explain the principal of a device which changes a low a.c. voltage into a high voltage. Deduce the expression for the ratio of secondary voltage to the primary voltage in terms of the ratio of the number of primary and secondary windings. For an ideal transformer, obtain the ratio of primary and secondary currents in terms of the ratio of the voltage in the secondary and primary coils. (ii) How much current is drawn by the primary of a transformer connected to 220 V supply when it delivers power to 100 V – 550 W refrigerator?.	5

33	a)A ray is incident on a prism of material of refractive index 2 at point M such that it grazes along NC after emerging from the prism, as shown in the figure. then find (i) the critical angle for the prism. (ii) the angle of refraction at face AB.  b) With the help of a ray diagram, show the formation of image of a point object by refraction of light at a spherical surface separating two media of refractive indices n_1 and n_2 ($n_2 > n_1$) respectively. Using this diagram, derive the relation between n_2, n_1, the object distance u, image distance v and radius of curvature R. **(OR)** (a)(i) Draw a labelled ray diagram of a compound microscope when image is formed at least distance of distinct vision. (ii) Define its magnifying power and deduce the expression for the magnifying power of the microscope. (b) A compound microscope has a magnifying power of 100 when the image is formed at infinity. The objective has a focal length of 0.5 cm and the tube length is 6.5cm. Find the focal length of the eyepiece.	5