केन्द्रीय विद्यालय संगठन बेंगलुरु संभाग

KENDRIYA VIDYALAYA SANGATHAN BENGALURU REGION

प्रथम प्री-बोर्ड परीक्षा - 2025-2026

FIRST PRE-BOARD EXAMINATION - 2025-2026

कक्षा- बारहवीं CLAS -XII

विषय: भौतिक विज्ञान (042) SUBJECT: PHYSICS (042)

समयावधि : 3 घंटे **अधिकतम अंक: 70**

Time Allowed: 3 hours **Maximum Marks: 70**

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**.

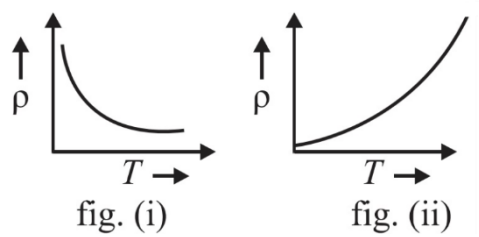
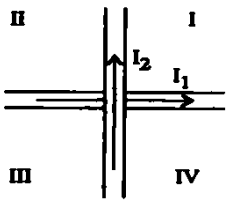
(5) There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C and all three questions in Section E. You have to attempt only one of the choices in such questions.

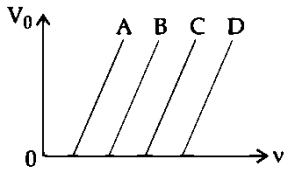
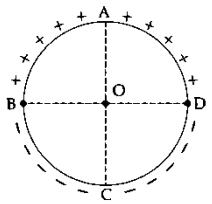
(6) Use of calculators is not allowed.

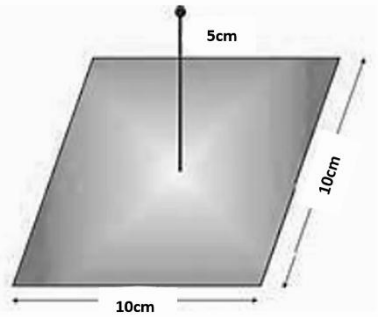
(7) You may use the following values of physical constants where ever necessary

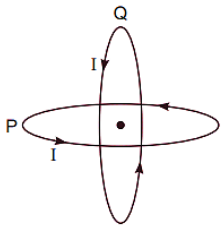
i. $c = 3 \times 10^8$ m/s
ii. $m_e = 9.1 \times 10^{-31}$ kg
iii. $m_p = 1.7 \times 10^{-27}$ kg
iv. $e = 1.6 \times 10^{-19}$ C
v. $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}
vi. $h = 6.63 \times 10^{-34}$ J s
vii. $\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2N^{-1}m^{-2}$
viii. Avogadro's number = 6.023 X 10^{23} per gram mole

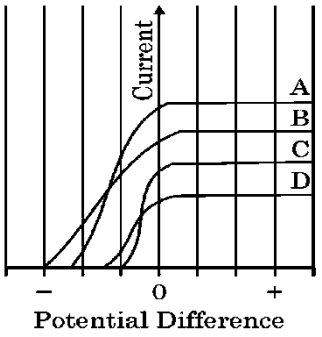
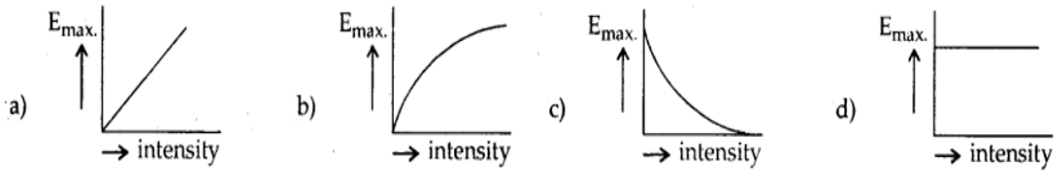
SECTION - A		
Q.NO	**QUESTION**	**MARKS**
1	The magnitude of electric field due to a point charge object at a distance of 4.0 m is 9 NC^{-1} from the same charged object the electric field of magnitude 16 NC^{-1} will be at a distance of a) 1m b) 2m c) 3m d) 4m	**1**
2	A capacitor plates are charged by a battery with 'V' volts. After charging battery is disconnected and a dielectric slab with dielectric constant 'K' is inserted between its plates, the potential across the plates of a capacitor will become a) Zero b) V/2 c) V/K d) KV	**1**

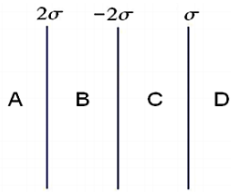
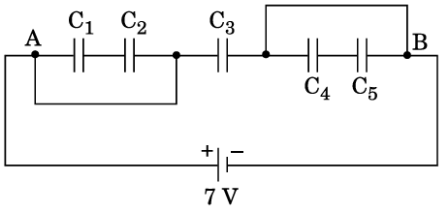
3	The temperature (T) dependence of resistivity of materials A and material B is represented by fig (i) and fig (ii) respectively. Identify material A and material B.  fig. (i) fig. (ii) a) material A is copper and material B is germanium b) material A is germanium and material B is copper c) material A is nichrome and material B is germanium d) material A is copper and material B is nichrome	**1**
4	Two wires carrying currents I_1 and I_2 lie, one slightly above the other, in a horizontal plane as shown in figure. The region of vertically upward strongest magnetic field is-  a) I b) II c) III d) IV	**1**
5	An electron is released from rest in a region of uniform electric and magnetic field acting parallel to each other. The electron will a) move in a straight-line b) move in a circle c) remain stationary d) move in a helical path	**1**
6	The magnetic flux linked with a coil, in weber, is given by the equation: $\phi = 5t^2 + 3t + 16.$ The induced e.m.f. in the coil at t=4 second will be- a) − 27V b) −43 V c) −108 V d) 210 V	**1**
7	The instantaneous values of emf and the current in a series ac circuit are - E = Eo Sin ω t and l = lo sin (ωt+π/3) respectively, then it is- a) Necessarily a RL circuit b) Necessarily a RC circuit c) Necessarily a LCR circuit d) Can be RC or LCR circuit	**1**
8	If $\vec{E}$ and $\vec{B}$ represent electric and magnetic field vectors of the electromagnetic wave, the direction of propagation of electromagnetic wave is along. a) $\vec{E}$ b) $\vec{B}$ c) $\vec{B} \times \vec{E}$ d) $\vec{E} \times \vec{B}$	**1**
9	A biconvex lens of focal length f is cut into two identical plano convex lenses. The focal length of each part will be- a) f b) f/2 c) 2f d) 4f	**1**

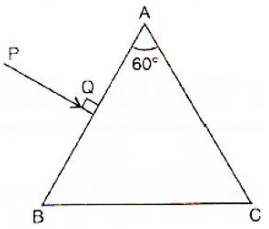
10	In a Young's double-slit experiment, the screen is moved away from the plane of the slits. What will be its effect on the following? (i) Angular separation of the fringes. (ii) Fringe-width. a) Both (i) and (ii) remain constant b) (i) remains constant, but (ii) decreases c) (i) remains constant, but (ii) increases d) Both (i) and (ii) increase	**1**
11	The variation of the stopping potential V_o with the frequency v of the incident radiation for four metals A, B, C and D is shown in the figure.  For the same frequency of incident radiation producing photo-electrons in all metals, the kinetic energy of photo-electrons will be maximum for metal a) A b) B c) C d) D	**1**
12	The ratio of the nuclear densities of two nuclei having mass numbers 64 and 125 is a) $\frac{64}{125}$ b) $\frac{4}{5}$ c) $\frac{5}{4}$ d) 1	**1**
For Questions 13 to 16, two statements are given one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. (A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion. (B) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion. (C) Assertion is true but Reason is false. (D) Both Assertion and Reason are false.		
13	**Assertion (A):** Equal amount of positive and negative charges are distributed uniformly on two halves of a thin circular ring as shown in figure. The resultant electric field at the centre O of the ring is along OC.  **Reason (R):** It is so because the net potential at C is not zero.	**1**
14	**Assertion (A):** Propagation of light through an optical fibre is due to total internal reflection taking place at the core-cladding interface. **Reason (R):** Refractive index of the material of the cladding of the optical fibre is greater than that of the core.	**1**
15	**Assertion (A):** In a Young's double-slit experiment, interference pattern is not observed when two coherent sources are infinitely close to each other. **Reason (R):** The fringe width is proportional to the separation between the two sources.	**1**

16	**Assertion (A):** An alpha particle is moving towards a gold nucleus. The impact parameter is maximum for the scattering angle of 180^O **Reason (R):** The impact parameter in an alpha particle scattering experiment does not depend upon the atomic number of the target nucleus.	**1**
	SECTION - B	
17	A point charge +10 μ C is a distance 5cm directly above the centre of a square of side 10cm, as shown in figure. What is the magnitude of the electric flux through the square?  	**2**
18	The potential difference applied across a given conductor is doubled. How will this affect- (i) the mobility of electrons and (ii) the current density in the conductor? Justify your answers.	**2**
19	In a plane electromagnetic wave, the electric field oscillates sinusoidally at a frequency of 2.0×10^{10} Hz and Amplitude $48 Vm^{-1}$. i) What is the wavelength of the wave? ii) What is the amplitude of the oscillating magnetic field?	**2**
20 (I)	Derive an expression for magnetic force $\vec{F}$ acting on a straight conductor of length carrying L, carrying current I in an external magnetic field $\vec{B}$. Is it valid when the conductor is in zig-zag form? Justify.	**2**
	OR	
20 (II)	A uniform magnetic field gets modified as shown in figure when two specimens A and B are placed in it.  i) Identify the specimen A and B. ii) How is the magnetic susceptibility of specimen A different from that of specimen B?	**2**
21(I)	If the frequency of light incident on the cathode of a photo-cell is increased, how will the following be affected? Justify your answer. i) Energy of the photo electrons. ii) Photo current.	**2**

	OR	
21(II)	What is the ratio of radii of the orbits corresponding to first excited state and ground state in a hydrogen atom?	**2**
	SECTION - C	
22	Define relaxation time of the free electrons drifting in a conductor. How is it related to the drift velocity of free electrons? Derive an expression for resistivity of a wire in terms of number density of free electrons and relaxation time.	**3**
23	i) Define the term mutual-inductance and write the S.I. unit. ii) Obtain the expression for the mutual inductance of two long co-axial solenoids S_1 and S_2 wound one over the other, each of length l and radii r_1 and r_2 and n_1 and n_2 number of turns per unit length respectively, when a current I is set up in the outer solenoid S_2.	**3**
24	A convex lens made of a material of refractive index n_1 is kept in a medium of refractive index n_2. A parallel beam of light is incident on the lens. Complete the path of rays of light emerging from the convex lens if (i) $n_1 > n_2$ (ii) $n_1 = n_2$ (iii) $n_1 < n_2$	**3**
25	In Young's double slit experiment, the two slits 0.15 mm apart are illuminated by monochromatic light of wavelength 450 nm. The screen is 1.0 m away from the slits. a) Find the distance of the second i) bright fringe, ii) dark fringe from the central maximum. b) How does the fringe width of interference fringes change, when the whole apparatus of Young's experiment is kept in a liquid of refractive index 1.3?	**3**
26	i) Distinguish between nuclear fission and fusion giving an example of each. ii) Explain the release of energy in nuclear fission and fusion on the basis of binding energy per nucleon curve.	**3**
27(I)	Two identical circular wires P and Q each of radius 'R' and carrying current 'I' are kept in perpendicular planes such that they have a common centre as shown in the figure. Find the magnitude and direction of the net magnetic field at their common centre.  	**3**
	OR	
27(II)	A circular coil of N turns and radius R carries a current I. It is unwound and rewound to make another coil of radius R/2, current I remaining the same. Calculate the ratio of the magnetic moments of the new coil and the original coil.	**3**
28	i) Why is an intrinsic semiconductor deliberately converted into an extrinsic semiconductor by adding impurity atoms?	**3**

	ii) Explain briefly the two processes that occur in p-n junction region to create a potential barrier.	
	SECTION - D	
29	Figure shows the variation of photoelectric current measured in a photo cell circuit as a function of the potential difference between the plates of the photo cell when light beams A, B, C and D of different wavelengths are incident on the photo cell. Examine the given figure and answer the following questions:  **(I)** Which light beam has the highest frequency a) A b) B c) C d) D	**1**
	(II) Which light beam ejects photoelectrons with maximum momentum a) D b) C c) B d) A	**1**
	(III) Which one of the following graphs represent correctly the variation of maximum kinetic energy E_{max} with the intensity of incident radiations having a constant frequency.  	**1**
	(IV) The threshold frequency for a certain metal is v_0. When light of frequency $v = 2v_0$ is incident on it, the maximum velocity of photo electrons is 4×10^6 ms^{-1}. If the frequency of incident radiation is increased to $5\ v_0$, then the maximum velocity of photo electrons (m/s) is- a) 8×10^5 b) 2×10^6 c) 2×10^7 d) 8×10^6	**1**
30	A p-n junction diode is composed of a semiconductor crystal, typically made of silicon, with specific impurities added to create two distinct regions. One side, known as the n-type semiconductor, is doped to have an excess of negative charge carriers (electrons). Whereas the other side, called the p-type semiconductor, is doped to have an excess of positive charge carriers (holes). When the n-type and p-type materials are joined, a brief flow of electrons occurs from the n-side to the p-side, resulting in the formation of a depletion region at the junction. If a sufficiently high voltage is applied with the positive terminal connected to the p-side and the negative terminal to the n-side, the potential difference causes the diode to conduct, allowing current to flow. In contrast, when the voltage is applied in the reverse direction (positive terminal to n-side and negative terminal to	

	p-side), the diode blocks the flow of current, preventing the electrons from moving in the opposite direction. **(I)** Give two points of difference between forward biasing and reverse biasing of p-n junction diode.	**2**
	(II) What is depletion region?	**1**
	(III) In an unbiased p-n junction, electrons diffuse from the n-region to p-region. Why?	**1**
	SECTION - E	
31(I)	i) State Gauss' law in electrostatics. Use this law to derive an expression for the electric field due to an infinitely long straight wire of linear charge density λ. ii) In the figure there are three infinite long thin sheets having surface charge density +2σ, -2σ and +σ respectively. Give the magnitude and direction of electric field at a point to the left of sheet of charge density +2σ and to the right of sheet of charge density +σ. 	**3+2**
	OR	
31(II)	i) A capacitor of 4 μF is charged by a battery of 12 V. The battery is disconnected and a dielectric slab of dielectric constant 8 is inserted in between the plates of the capacitor to fill the space completely. Find the change in the a) charge stored in the capacitor, b) potential difference between the plates of the capacitor, and c) energy stored in the capacitor. ii) In the figure given below, find the - a) equivalent capacitance of the network between points A and B. Given: $C_1 = C_5 = 8$ μF, $C_2 = C_3 = C_4 = 4$ μF. b) maximum charge supplied by the battery 	**3+2**
32 (I)	i) Derive an expression for the force acting on a current carrying straight conductor kept in a magnetic field. State the rule which is used to find the direction of this force. Give the condition under which this force is (1) maximum, and (2) minimum. ii) Two long and parallel straight wires A and B carrying currents of 8·0A and 5·0A in the same direction are separated by a distance of 4·0cm. Estimate the force on a 10cm section of wire A.	**3+2**

	OR	
32(II)	i) A device is used to decrease high ac voltage into a low ac voltage. Identify the device and state its working principle. ii) Write four sources of energy loss in this device. iii) A small town with a demand of 1200 kW of electric power at 220 V is situated 20 km away from an electric plant generating power at 440 V. The resistance of the two-wire line carrying power is 0.5 Ω per km. The town gets the power from the line through a 4000 – 220 V step-down transformer at a sub-station in the towns. Estimate the line power loss in the form of heat.	**1+2+2**
33(I)	a) Draw the ray diagram showing refraction of ray of light through a glass prism. Derive the expression for the refractive index μ of the material of prism in terms of the angle of prism A and angle of minimum deviation δ_m. b) A ray PQ is incident normally on the face AB of a triangular prism of refracting angle of 60°, made of a transparent material of refractive index $\frac{2}{\sqrt{3}}$, as shown in the figure. Trace the path of the ray as it passes through the prism. Also calculate the angle of emergence and angle of deviation. 	**3+2**
	OR	
33(II)	a) i) Draw a labelled ray diagram of an astronomical telescope in the near point adjustment position. ii) Write two limitations of a refracting telescope over a reflecting telescope. b) A compound microscope consists of an objective lens of focal length 1cm and an eyepiece of focal length 5 cm with a separation of 10 cm. Find out the distance between an object and the objective lens, at which the strain on the eye is minimum.	**3 + 2**