KENDRIYA VIDYALAYA SANGATHAN LUCKNOW REGION

1st PRE BOARD EXAM (2025-2026)

PHYSICS (Code No. 042)

CLASS – XII

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 question 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

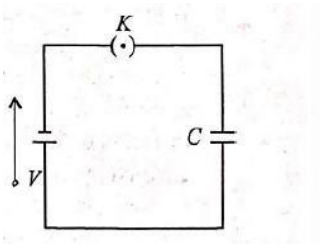
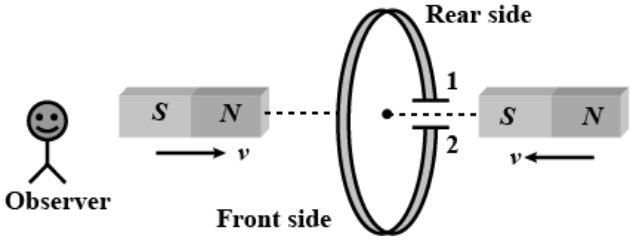
v. $\mu_0 = 4\pi \times 10^{-7}$ T m $\boldsymbol{A^{-1}}$

vi. $h = 6.63 \times 10^{-34}$ J s

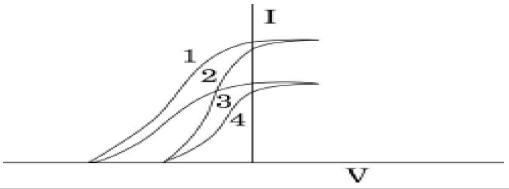
vii. $\varepsilon_0 = 8.854$ x10-12 $\boldsymbol{C^2N^{-1}m^{-2}}$

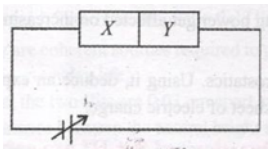
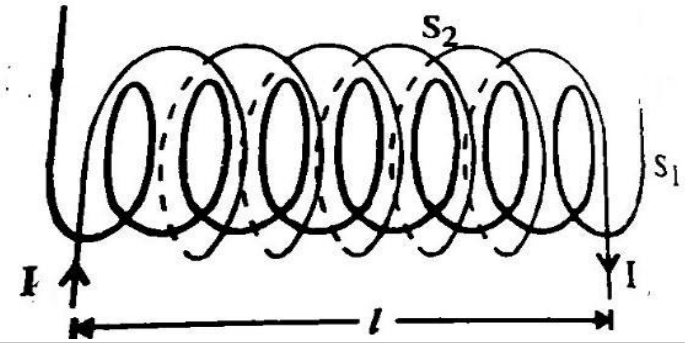
viii. Avogadro's number = 6.023 X $\boldsymbol{10^{23}}$ per gram mole

	SECTION A	
Q.No	**Question**	**Marks**
1	If Ea be the electric field strength of a short dipole at a point on its axial line and Ee that on the equatorial line at the same distance, then (a) $Ee=2Ea$ (b) $Ea=2Ee$ (c) $Ea=Ee$ (d) None of the above	1

2	 A parallel plate capacitor is connected to a battery as shown in Fig. Consider two situations: A: Key K is kept closed and plates of capacitors are moved apart using insulating handle. B: Key K is opened and plates of capacitors are moved apart using insulating handle. Choose the correct option(s). (a) In A : Q remains same but C changes. (b) In B : V remains same but C changes. (c) In A : V remains same and hence Q changes. (d) In B : C remains same and hence V changes.	1
3	The magnetic field at the centre of a circular coil of radius 'R', carrying a current 'I', is 'B'. If the same wire is unwound and bent into a coil of two turns, the magnetic field at the centre becomes: (a) B/2 (b) B (c) 2B (d) 4B	1
4	A charge enters into a uniform magnetic field with a K.E. 'E' and leaves it after some time. The K.E. of the charge while leaving the field will be (a) Lesser than E (b) More than E (c) Equal to E (d) Lesser than or equal	1
5	If B denotes magnetic flux density and H denotes intensity of magnetizing field which of the following is correct (a) $B = \mu H$ (b) $B = H/\mu$ (c) $H.B = \mu$ (d) μBH = constant	1
6	The north and south poles of two identical magnets approach a coil, containing a condenser, with equal speeds from opposite sides. Then (a) Plate 1 will be negative and plate 2 positive (b) Plate 1 will be positive and plate 2 negative (c) Both the plates will be positive (d) Both the plates will be negative 	1

7	8 A voltage $v=v_o \sin wt$ applied to a circuit drives a current $i=i_o \sin (wt + \varphi)$ in the circuit. The average power consumed in the circuit over a cycle is a) Zero b) $i_o v_o \cos \varphi$ c) $i_o v_o /2$ d) $(i_o v_o \cos \varphi) /2$	1
8	A student wants to identify diode from a mixed collection of diodes, resistors, inductors, switch, thyristors,bulb etc using a multimeter. choose the correct statement out of the following about the diode : (a) It is two terminal device which conducts current in both directions. (b) It is two terminal device which conducts current in one direction only. (c) It does not conduct current gives an initial deflection which decays to zero. (d) It is three terminal device which conducts current in the direction only between central terminal and either of the remaining two terminals.	1
9	You are given four sources of light each one providing a light of a single colour – red, blue, green and yellow. Suppose the angle of refraction for a beam of yellow light corresponding to a particular angle of incidence at the interface of two media is 90°. Which of the following statements is correct if the source of yellow light is replaced with that of other lights without changing the angle of incidence? (a) The beam of red light would undergo total internal reflection. (b) The beam of red light would bend towards normal while it gets refracted through the second medium. (c) The beam of blue light would undergo total internal reflection. (d) The beam of green light would bend away from the normal as it gets refracted through the second medium	1
10	In photoelectric emission, a radiation whose frequency is 2 times threshold frequency of a certain metal is incident on the metal. Then the maximum possible velocity of the emitted electron will be: (a) $\sqrt{(h\nu_0 /m}$) (b) $\sqrt{(2h\nu_0 /m}$) (c) $2\sqrt{(h\nu_0 /m)}$ (d) $\sqrt{(6h\nu_0 /m)}$	1
11	When alpha particles are sent through a thin gold foil, most of them go straight through the foil, because (a) Alpha particles are positively charged (b) Mass of alpha particle is more than mass of electron (c) Most of the part of an atom is empty space (d) Alpha particles moves with high velocity	1
12	A uniform electric field pointing in positive x-direction exists in a region. Let A be the origin, B be the point on the x-axis at x = + 1 cm and C be the point on the y-axis at y = + 1 cm. Then, the potentials at the points A, B and C satisfy (a) VA < VB (b) VA > VB (c) VA < VC (d) VA > VC	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 current carrying coil in a uniform magnetic field feels maximum torque when it is kept in the field parallel to its plane **Reason:** Torque on a current carrying coil in magnetic field does not depend on the shape of the coil.	1
14	**Assertion :** Electromagnetic waves carry both energy and momentum. **Reason :** The energy and momentum in EM waves are carried by the magnetic field only.	1
15	**Assertion:** At a fixed frequency above the threshold, doubling the intensity of light doubles the stopping potential. **Reason:** Stopping potential is proportional to the energy of the photoelectrons, which increases with intensity.	1
16	**Assertion :** According to Bohr's theory in the hydrogen atom, the electron revolves in circular orbits. **Reason** : The centripetal force is provided by the electrostatic attraction between the proton and the neutron.	1
	SECTION B	
17	A cell of emf (E) and internal resistance (r) is connected across a variable external resistance (R). Plot graphs to show variation of (i) E with R, (ii) Terminal p.d. of the cell (V) with R.	2
18	The given graph shows the variation of photoelectric current (I) with applied voltage (V) for two different materials and for two different intensities of the incident radiations. Identify the pair of curves that corresponds to (i) different materials but same intensity of incident radiation (ii) different intensities but same material. 	2
19	Draw a labelled diagram of an optical fibre. Explain how light propagates through the optical fiber.	2
20(1)	A convex lens made up of glass of refractive index 1.5 is dipped, in turn, in (i) a medium of refractive index 1.65, (ii) a medium of refractive index 1.33. Will the lens behave a converging or diverging lens in the two cases ? Give reason. **OR**	2
20(II)	The focal length of a convex lens made of glass(μ=1.5) is 22 cm. What will be its new focal length when placed in a medium of refractive index 4/3 ?	2
21(1)	Two semiconductor materials X and Y shown in given figure are made by doping germanium crystal with Indium and Arsenic respectively. The two are joined end to end and connected to a battery as shown.	2

	 (i) Will the junction be forward biased or reverse biased ? (ii) sketch V-I graph for this arrangement. **OR**	
21(II)	Define the terms 'depletion region' in a p-n junction. How the width of depletion region in a p-n junction diode changes, when the junction is- (i) forward biased (ii) reverse biased.	2
	SECTION C	
22	Define term mobility of charge carriers in a current carrying conductor. Obtain the relation for mobility in terms of relaxation time. Explain how electron mobility changes for a good conductor when the temperature of the conductor is decreased at constant potential difference.	3
23	Considering magnetic field along the axis of a circular loop of radius 1 metre, at what distance from the centre of the loop the magnetic field is $\frac{1}{2\sqrt{2}}$ times of its value at the centre?	3
24	Obtain an expression for the mutual inductance of two long coaxial solenoids S_1 and S_2 wound over one another each having length L, radii r_1 and r_2 and n_1 and n_2 be number of turns per unit length when current I is set up in outer solenoid S_2. 	3
25	It is found experimentally that 13.6 eV energy is required to separate a hydrogen atom into a proton and an electron. Compute the orbital radius and the velocity of the electron in a hydrogen atom.	3
26	Three point charges q, 2q and nq are placed at the vertices of an equilateral triangle. If the potential energy of the system is zero, find the value of n.	3
27(I)	How are Infrared waves produced? Why are these waves referred to as heat waves? Give any two uses of infrared waves. **OR**	3
27(II)	Identify the following electromagnetic radiations as per the frequencies given below. Write one application of each. (a) 10^{20} Hz (b) 10^{9}Hz (c) 10^{11}Hz	3

28	Draw a plot of binding energy per nucleon (B.E/A) as a function of mass number A. Use this graph to explain the release of energy in both the processes of nuclear fission and fusion.	3
	SECTION D	
29	Huygen's principle is the basis of wave theory of light. Each point on a wavefront acts as a fresh source of new disturbance, called secondary waves or wavelets. The secondary wavelets spread out in all directions with the speed light in the given medium. An initially parallel cylindrical beam travels in a medium of given refractive index , I is the intensity of the light beam. Q(i) The initial shape of the wavefront of the beam from the sun is (a)Planar (b)convex (c) concave (d)spherical Q(ii) According to Huygens Principle, the surface of constant phase is (a) called an optical ray (b) called a wave (c) called a wavefront (d) called a wavelet Q(iii) As the parallel beam enters the denser medium, it will (a)becomes narrower (b) diverges (c) converges (d) becomes broader Q(iv) Two plane wavefronts of light, one incident on a thin convex lens and another on the refracting face of a thin prism. After refraction at them, the emerging wavefronts respectively become (a) plane wavefront and plane wavefront (b) plane wavefront and spherical wavefront (c) spherical wavefront and plane wavefront (d) spherical wavefront and spherical wavefront	4
30	**p-n junction diode :** p-n junction is a semiconductor diode. It is obtained by bringing p-type semiconductor in close contact with n- type semiconductor. A thin layer is developed at the p- n junction which is devoid of any charge carrier but has immobile ions. It is called depletion layer. At the junction a potential barrier appears, which does not allow the movement of majority charge carriers across the junction in the absence of any biasing of the junction. p-n junction offers low resistance when forward biased and high resistance when reverse biased. Q (i). In the middle of depletion layer of reverse biased p- n junction, the a. Electric field is zero b. Potential is zero c. Potential is maximum d. Electric field is maximum Q (ii). The energy band gap is maximum in a. Metals b. Superconductors c. Insulators	4

	d. Semiconductors Q (iii). The number of majority carriers crossing the junction of diode depends primarily on the a. Concentration of doping impurities b. Magnitude of potential barriers c. Magnitude of the forward bias voltage d. Rate of thermal generation of electron –hole pairs Q (iv). Hole is a. Antiparticle of electron b. A vacancy created when an electron leaves covalent bond c. Absence of free electrons d. An artificially created particle.	
	SECTION E	
31(I)	(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) Show a plot of variation of (a) magnetic flux and (b) alternating emf versus time generated by a loop of wire rotating in a magnetic field in an ac generator. **OR**	3+2
31(II)	i) you are given three circuit elements X , Y and Z. They are connected one by one across a given ac source. It is found that V and I are in phase of element X. V leads I by $\pi/2$ for element Y where I leads V by $\pi/2$ for element Z. Identify elements X,Y and Z. ii) Establish the expression for total opposition offered to circuit when elements X , Y and Z are connected in series to an ac source. iii) In a series LCR circuit obtain, the conditions under which impedance is minimum, justify why circuit becomes purely resistive at resonance?	1.5+2.5+ 1
32(I)	(i) Draw a schematic diagram of a reflecting telescope. (ii) State the advantages of reflecting telescope over refracting telescope (iii) What is its magnifying power ? **OR**	2+2+1
32(II)	(i) Draw a ray diagram to show the refraction of light through a glass prism. Hence derive the relation $\mu = \sin((A+\delta m)/2)/\sin(A/2)$ (ii) A ray of light incident on an equilateral glass prism propagates parallel to the base line of the prism inside it. Find the angle of	3+2

	incidence of this ray. Given refractive index of material of glass prism is $\sqrt{3}$).	
33(I)	(i) Using Gauss's law derive an expression for the electric field due to an infinitely long straight uniformly charged wire having linear charge density λ C/m. (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. **OR**	3+2
33(II)	(i) An electric dipole is held in a uniform electric field. Using suitable diagram show that it does not undergo any translatory motion. Derive the expression for the torque acting on it. (ii) An electric dipole of length 10 cm having charges $\pm$ 6 x10^{-3}C, placed at 30˚ with respect to a uniform electric field, experiences a torque of $6\sqrt{3}$ Nm. Calculate the magnitude of the electric field.	3+2