**KENDRIYA VIDYALAYA SANGATHAN, JABALPUR REGION**
**FIRST PRE BOARD 2025- 2026**
**PHYSICS ( THEORY) - 042**
**CLASS – XII**

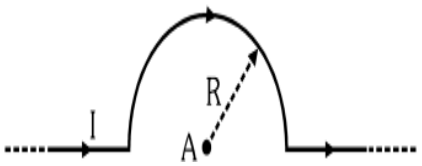
**Time : 3.00 Hrs** **M.M. : 70**

**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. $\varepsilon_0 = 8.854 \times 10^{-12}$ $\boldsymbol{C^2N^{-1}m^{-2}}$
viii. Avogadro's number = 6.023 X $\boldsymbol{10^{23}}$ per gram mole

## SECTION A

| Q.No | Question | Marks |
|---|---|---|
| 1. | ( i) Two charges of magnitude -2Q and +Q are located at points (a, 0) and (4a, 0) respectively. What is the electric flux due to these charges through a sphere of radius '3a' with its Centre at origin?<br>(a) Q/ϵ0 (b) -2Q/ϵ0 (c) 3Q/ϵ0 (d) -3Q/ϵ0 | 1 |
| 2. | In the shown figure magnetic field at point A will be<br>(a) $\frac{\mu_0 I}{4\pi}$ (b) $\frac{\mu_0 I}{4R}$ (c) $\frac{\mu_0 I}{4\pi R}$ (d) Zero<br>  | 1 |
| 3. | A galvanometer of can measure current up to 200μA. if a resistor of 10Ω is connected across it the range of it enhances to 1mA.If a resistor of 20Ω is connected in place of 10Ω the range will be<br>(a) 2mA (b) 0.4mA (c) 0.5mA (d) 0.6mA | 1 |
| 4. | Current in a circuit falls from 5.0 A to 0.0 A in 0.1 s. If an average EMF of 200V is induced, the self-Inductance of the coil is:<br>a) 4H b) 5H c) 3H d) 40H | 1 |

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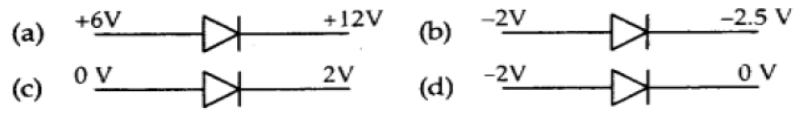
| **5.** | The source of an electromagnetic wave is always associated with:<br>a) A moving electric charge only b) An accelerating electric charge<br>c) A stationary electric charge d) A constant magnetic field | 1 |
| **6.** | The refractive index of the material of a prism is $\sqrt{2}$ and its refracting angle is 30°. One of the refracting surfaces of the prism is made a mirror. A beam of monochromatic light entering the prism from the other face retraces its path, after reflection from mirror surface. The angle of incidence on prism is:<br>(a) 0° (b) 30° (c) 45° (d) 60° | 1 |
| **7.** | In an interference pattern of two waves fringe width is β . If the frequency of source is doubled then fringe width will become :<br>a) (1/2) β b)β c)2β d)(3/2) β | 1 |
| **8.** | In a photoelectric experiment with light of intensity I, the current is $I_0$. When light is filtered to allow only 50% photons through, the current becomes:<br>(A) 2 $I_0$ (B) $I_0/2$ (C) $\sqrt{2}\, I_0$ (D) Remains same | 1 |
| **9.** | Energy required to excite an electron in hydrogen atom to its ground state to its first excited state is .<br>(a). 6.2eV (b). 3.40eV (c). 10.2eV (d). -13.6eV | 1 |
| **10** | The binding energy per nucleon for the parent nucleus is E1 and that for the daughter nuclei is E2. Then<br>(a) E1 > E2 (b) E2 > E1 (c) E1 = 2E2 (d) E2 = 2E1 | 1 |
| **11** | In the energy band diagram of a semiconductor, if more charge carriers are seen near valence band. It would be<br>(a) an intrinsic semiconductor (b) a metal may be n-type or p-type semiconductor<br>(c) an n-type semiconductor (d) a p-type semiconductor | 1 |
| **12** | In which case is the junction diode forward biased.<br>  <br> | 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.**<br>(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.<br>(B) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.<br>(C) Assertion is true but Reason is false.<br>(D) Both Assertion and Reason are false. | |
| **13** | **Assertion:** The resistivity of a semiconductor increases with temperature.<br>**Reason:** The atoms of a semiconductor vibrate with larger amplitude at higher temperatures thereby increasing its resistivity. | 1 |
| **14** | **Assertion (A):** The speed of electromagnetic waves in vacuum is equal to $1/\sqrt{\mu_0\varepsilon_0}$<br>**Reason (R):** The values of μ0 and ε0 determine the properties of vacuum with respect to magnetic and electric fields, respectively | 1 |
| **15** | **Assertion:** When a glass prism is immersed in water, the deviation caused by prism decreases.<br>**Reason:** Refractive index of glass prism relative to water is less than relative to air. | 1 |

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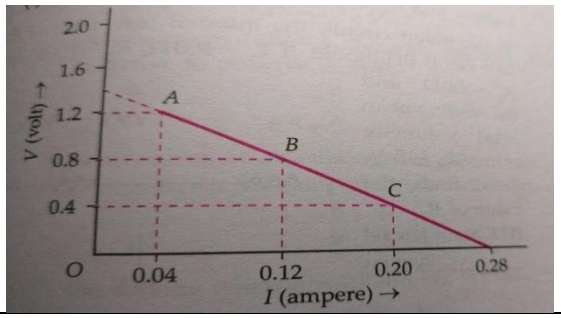
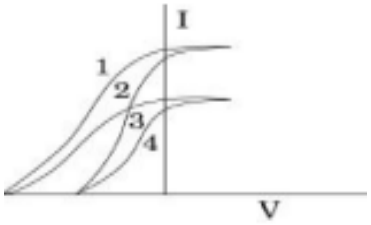
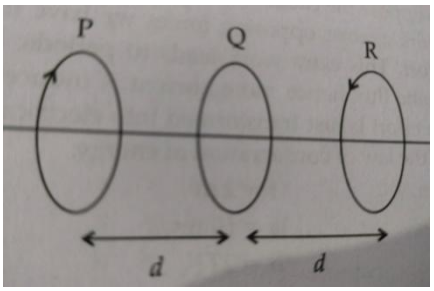
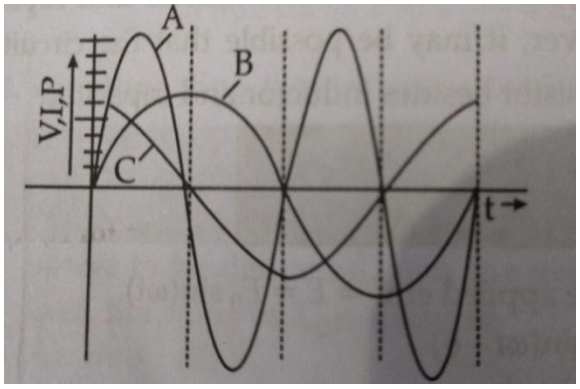
| 16 | **Assertion:** A heavier particle moving slowly can have a longer de Broglie wavelength than a lighter particle.<br>**Reason:** The de Broglie wavelength is independent of the particle's mass and velocity | 1 |
| | **SECTION B** | |
| 17 | It was hot summer day and Rahul was cycling back home from school. he realized that there is water on road at some distance but when he came near , it disappeared .<br>i) What phenomenon this accounts to ?<br>ii)What are the necessary conditions required for this illusion to happen.<br>OR<br>How will the interference pattern in Youngs double slit experiment be affected if<br>i) Screen is moved away from the plane of slits<br>ii) The phase difference between the light waves emanating from the two slits S1 and S2 changes from 0 to π and remains constant. | 2 |
| 18 | Potential difference across the terminals of a cell were measured (in volts)against different current in(amperes)flowing through a cell .A graph was plotted which was straightline ABC as Shown Determine<br>i)EMF of the cell<br>ii)Internal resistance of cell.<br>  | 2 |
| 19 | 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:<br>(i) different materials but same intensity of incident radiation<br>(ii) different intensities but same material.<br>  | 2 |
| 20 | Given three identical coils P,Q and R placed coaxially in vertical plane .Equal and opposite current flows through P and R<br>i)What will be the value of magnetic field at centre of coil Q .<br>ii) coil P is moved towards right keeping Q and R fixed then will flux linked with coilQ increase or decrease ?<br>  <br>OR<br>A device 'X' is connected to an ac source $E = E_0 \sin\omega t$. The variation of voltage, current and power in one complete cycle is shown in the figure<br>i)Which curve shows power consumption over complete cycle<br>ii) Identify the device X<br>  | 2 |

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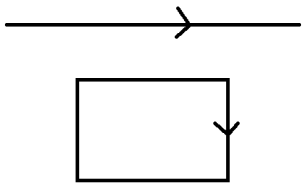
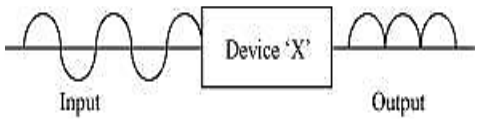
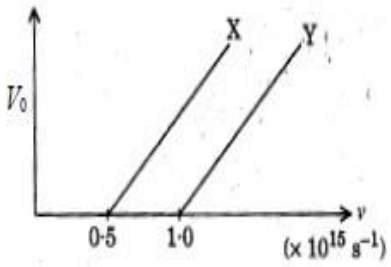
| **21** | Draw the energy band diagrams for n type and p type semiconductor at T > 0K | 2 |
| | **SECTION C** | |
| **22.** | Derive expression lens makers formula and why it is called so ? | 3 |
| **23.** | Show that an electric dipole held in uniform electric field will not undergo any translator motion. Hence derive an expression for the torque experienced by the dipole.. | 3 |
| **24.** | A square loop of side 'a' is kept near a long charged wire in a plane such that a side of it is parallel to the wire (kept in same plane) at a distance 'a' from it. Find the force on the wire due to the loop. If Current in wire is $I_1$ and in loop is $I_2$ in clockwise direction  | 3 |
| **25.** | In the figure given below the input waveform is converted into the output waveform by a device 'X'. Name the device and draw its labeled circuit diagram.   | 3 |
| **26.** | Using the curve for the binding energy per nucleon as a function of mass number A, State clearly how the release of energy in the processes of nuclear fission and nuclear fusion can be explained.<br>**OR**<br>Calculate the shortest wavelength in the Balmer series of hydrogen atom. In which region (infra-red, visible, ultraviolet) of hydrogen spectrum does this wavelength lie? | 3 |
| **27.** | The following graph shows the variation of stopping potential $V0$ with the frequency $\nu$ of the incident radiation for two photosensitive metals X and Y:<br>i)Which of the metals has larger threshold wavelength? Give reason.<br>ii)Explain, giving reason, which metal gives out electrons, having larger kinetic energy, for the same wavelength of the incident radiation.<br>iii)If the distance between the light source and metal X is halved, how will the kinetic energy of electrons emitted from it change? Give reason   | 3 |
| **28.** | Electromagnetic wave with wavelength<br>(i) λ1 is used in satellite communication.<br>(ii) λ2 is used to kill germs in water purifier.<br>(iii) λ3 is used to detect leakage of oil in underground pipelines.<br>(a) Identify and name the part of electromagnetic spectrum to which these radiations belong.<br>(b) Write one more application of each. | 3 |
| | **SECTION D** | |
| **29.** | DRIFT VELOCITY<br>In a conductor the atoms are quiet close to each other and are strongly bound to one another. Valence electrons in an atom of conductor do not remain attached to a particular atom of conductor. These electrons are free to move through the lattice of positive ions. These free electrons are always in a continuous random motion. Due to the random motion the free electrons | 4 |

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| | keep on suffering collisionwith positive ions in the conductor so frequently that the net flow of electrons in any particular direction is zero.<br>When some potential difference is applied across the two ends of the conductor an electric field is set up and free electrons experience of force in direction opposite to the electric field.<br>So the free electrons accelerate and acquire a velocity in direction opposite to electric field for a very short time as it suffers collision with positive ions and then start afresh.<br><br>i) If potential difference V applied across a conductor is increased to 2 V with its temperature kept constant the drift velocity of the free electron in the conductor will<br>a)be remain the same<br>b)becomes half of its previous value<br>c) be the double of its initial value<br>d)becomes zero<br><br>ii)A battery is connected to the conductor of non uniform cross-sectional area the quantities or quantity which remains constant is /are<br>a)electric field only<br>b)drift speed and electric field<br>c)electric field and current<br>d)current only<br><br>iii) The mobility of charge carrier increases with<br>a)increase in the average collision time<br>b)increase in the electric field<br>c) increase in the mass of the charge carrier<br>d)decrease in the charge of mobile career<br><br>iv ) Drift velocity $V_d$ varies with the intensity of electric field<br>a) $V_d \alpha E$ b) ) $V_d \alpha 1/E$ ) $V_d$ =constant ) $V_d \alpha E^2$ | |
| **30.** | **The moving coil galvanometer:**<br>Moving coil galvanometer operates on Permanent Magnet Moving Coil (PMMC) mechanism and was designed by the scientist Darsonval.<br>Moving coil galvanometers are of two types- (i) Suspended coil. (ii) Pivoted coil type or tangent galvanometer.<br>Its working is based on the fact that when a current carrying coil is placed in a magnetic field, it experiences a torque. This torque tends to rotate the coil about its axis of suspension in such a way that the magnetic flux passing through the coil is maximum. The galvanometer consists of a coil, with many turns, free to rotate about a fixed axis , in a uniform radial magnetic field. Its working is based on the fact that when a current carrying coil is placed in a magnetic field, it experiences a torque. This torque tends to rotate the coil about its axis of suspension in such a way that the magnetic flux passing through the coil is maximum. There is a cylindrical soft iron core which not only makes the field radial but also increases the strength of the magnetic field. When a current flows through the coil, a torque acts on it.<br><br>i) Galvanometer can be converted into an ammeter by<br>a) Connecting it with a low resistance in series.<br>b) Connecting it with a high resistance in series.<br>c) Connecting it with a low resistance in parallel.<br>d) Connecting it with a high resistance in parallel.<br><br>ii) The sensitivity of the galvanometer can be increased by- | 4 |

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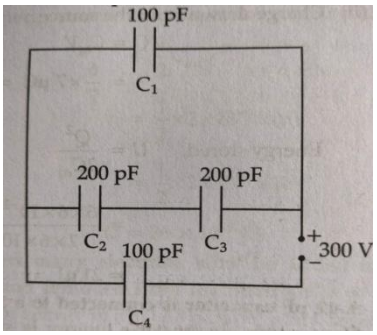
| | a) Increasing the current through it<br>b) Increasing the number of turns in the coil of galvanometer.<br>c) Decreasing the area of the coil.<br>d) Using plane magnetic poles.<br><br>iii) A current loop of area 0.01 $m^2$ is carrying current of 10 A is held perpendicular to a magnetic field of intensity 0.1 tesla.The torque in N/m acting on loop is<br>a) 0 b) 0.001 c) 0.01 d) 01.1<br>iv) Current sensitivity of a MCG is 5 div/mA and voltage sensitivity is 20 div /V.The resistance of galvanometer is<br><br>a)40Ω b)500 Ω c)250 Ω d)25 Ω | |
| | **SECTION E** | |
| **31.** | a)State Gauss law on electrostatics and derive an expression for the electric field due to along straight thin uniformly charged wire with linear charge density λ at a point lying at a distance r from the wire.<br>b)The magnitude of electric field (in N/C) in region varies with distance r (in meters ) as<br>E= 10r + 5<br>By how much does electric potential increases in moving from point r =1m to r=10 m<br>  <br><br>OR<br>a)Derive an expression for the capacitance of a parallel plate capacitor with air present between two plates.<br>b)Obtain equivalent capacitance of the network shown for 300 V supply . | 5 |
| **32.** | a)State the principal of ac generator .<br>b) Explain with help of well labeled diagram its working and obtain expression for the Emf generated in the coil.<br>c) Is it possible to generate EMF without rotating the coil? Explain<br>OR<br>a)In series LCR circuit connected across an ac source of variable frequency ,obtain expression for its impedance .<br>b)What is phase difference between voltage across inductor and voltage across capacitor at resonance in series LCR circuit?<br>c)In series RC circuit withR= 200 Ω and C= **50/π** μF is connected across peak ac voltage $V_0$= 100 V and frequency 50 Hz.Calculate Impedance of the circuit. | 5 |
| **33.** | a)Draw a ray diagram to show the working of a compound microscope. Obtain the expression for the total magnification for the final image to be formed at the near point.<br>b) In compound microscope and object is placed at a distance of 1.5 cm from the objective of focal length 1.25 cm .<br>If the eye piece has the focal length of 5 cm and the final images formed at near point find magnifying power of the microscope.<br>OR<br><br>a)Draw a ray diagram for the formation of image of an object by an astronomical telescope at normal adjustment .Obtain the expression for its magnifying power .<br>b)The magnifying power of an astronomical telescope at normal adjustment is 2.9 and the objective and the eye piece are separated by distance of 150 cm find focal length of the two lens | 5 |