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**.

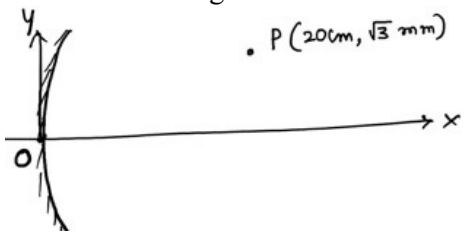
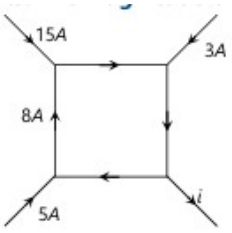
(5) There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C and all three questions in Section E. You have to attempt only one of the choices in such questions.

(6) Use of calculators is not allowed.

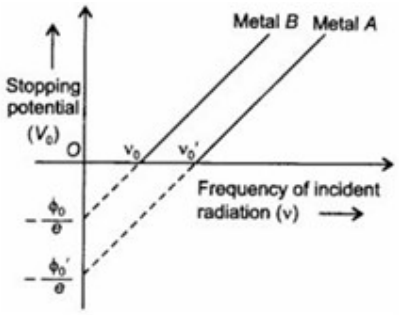
(7) You may use the following values of physical constants where ever necessary

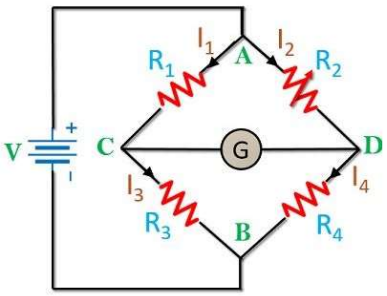
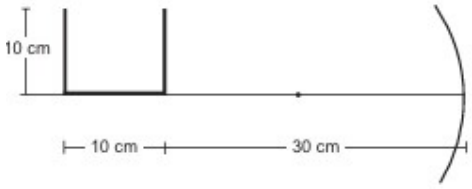
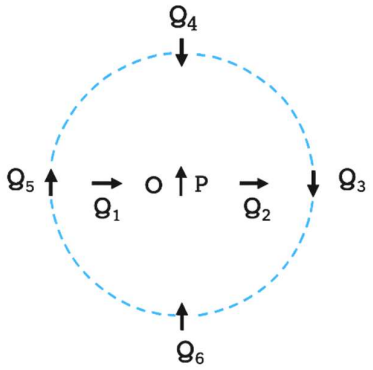
i. $c = 3 \times 10^8$ m/s
ii. $m_e = 9.1 \times 10^{-31}$ kg
iii. $m_p = 1.7 \times 10^{-27}$ kg
iv. $e = 1.6 \times 10^{-19}$ C
v. $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}
vi. $h = 6.63 \times 10^{-34}$ J s
vii. $\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2N^{-1}m^{-2}$
viii. Avogadro's number = 6.023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

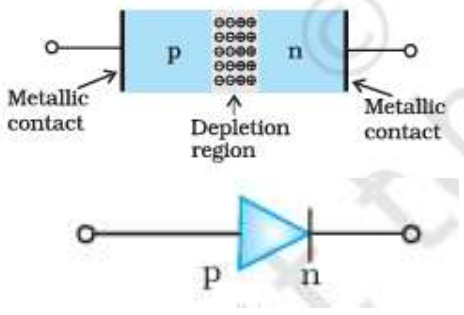
SECTION - A		
Q.NO	**QUESTION**	**MARKS**
1	Identify the wrong statement (A) Inside a conductor, electrostatic field is zero (B) At the surface of a charged conductor, electrostatic field must be tangential to the surface at every point (C) The interior of a conductor can have no excess charge in the static situation (D) Electrostatic potential is constant throughout the volume of the conductor and has the same value (as inside) on its surface	**1**
2	An electron enters a region of space in which there exists an electric field 'E' and magnetic field 'B'. if the electron continues to move in the same direction with the same velocity as before, the NOT possible case among the following (A) $E = O$ & $B = 0$ (B) $E \neq O$ & $B \neq 0$	**1**

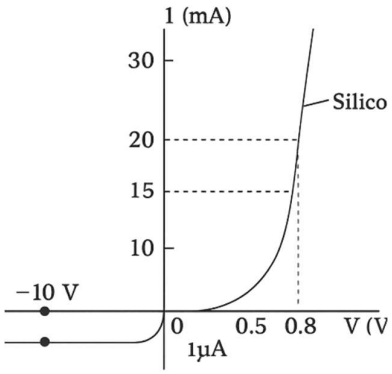
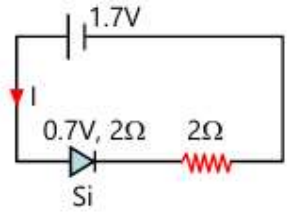
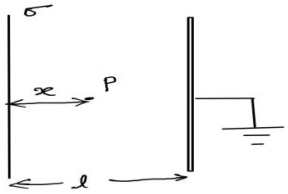
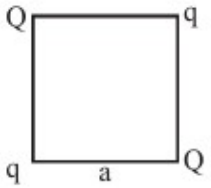
	(C) $E \neq O$ & $B = 0$ (D) $E = O$ & $B \neq 0$	
3	In an A.C. circuit V and I are given by $V = 100\sin(100t)V$ and $i = 100\sin(100t + \frac{\pi}{3})$ mA. Find power dissipated in the circuit? (A) 2500 W (B) 250 W (C) 25 W (D) 2.5 W	**1**
4	Ozone layer absorbs (A) Visible light (B) U.V. Radiation (C) Infra-red radiation (D) Microwave Radiation	**1**
5	The coordinates of the image of point object P formed by a concave mirror of radius of curvature 20cm as shown in figure is  (A) $(15cm, -\frac{\sqrt{3}}{2}mm)$ (B) $(20cm, \sqrt{3}\,mm)$ (C) $(20cm, -\sqrt{3}\,mm)$ (D) $(15cm, \frac{\sqrt{3}}{2}mm)$	**1**
6	The diffraction patterns due to a straight edge contains (A) alternate bright and dark bands of same width (B) alternate bright and dark bands with decreasing width as the order of the band increases in the illuminated part (C) alternative bright and dark bands with increasing width as the order of the band increases (D) None of the above is true.	**1**
7	If the number turns per unit length of a coil of a solenoid is doubled, then the self-inductance of the solenoid will be (A) become four times (B) becomes doubled (C) becomes half (D) unchanged	**1**
8	The figure shows a network of currents. The magnitude of currents is shown here. The current i will be A. 3 A B. 13 A C. 23 A D. -3A 	**1**
9	Coulomb's law between two electric charges is valid for A. Stationary charges B. Point charges C. Spherical bodies **D.** Both (a) and (b)	**1**
10	In photoelectric effect, the K.E. of electrons emitted from the metal surface depends upon (A) Intensity of light	**1**

	(B) Frequency of incident light (C) Velocity of incident light (D) Both intensity and velocity of light	
11	If a long hollow copper pipe carries a direct current, the magnetic field associated with the current will be (A) only inside the pipe (B) only outside the pipe (C) both inside and outside the pipe (D) neither inside nor outside the pipe	**1**
12	A nucleus ruptures into two nuclear parts which have their velocity ratio equal to 2 : 1. What will be the ratio of their nuclear radius. (A) $2^{1/3}$: 1 (B) 1 : $2^{1/3}$ (C) $3^{1/2}$: 1 (D) 1 : $3^{1/2}$	**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):** Within a glass slab a double convex air bubble is formed. This air bubble behaves like a converging lens. **Reason (R):** Refractive index of air is more than the refractive index of glass.	**1**
14	**Assertion (A):** In interference light energy is redistributed. **Reason (R):** There is no gain or loss of energy, which is consistent with the principle of energy conservation.	**1**
15	**Assertion (A):** For the scattering of a-particle at a large angle only nucleus of the atom is responsible. **Reason (R):** Nucleus is very heavy is comparison to electrons.	**1**
16	**Assertion (A):** In electrostatics, electric field lines can never be closed loops. **Reason (R):** The number of electric field lines originating from or terminating on a charge is proportional to the magnitude of charge.	**1**
SECTION – B		

17	A system has two charges $Q_A = 2.5 \times 10^{-7}$ C and $Q_B = -2.5 \times 10^{-7}$ C located at points A: (0, 0, –15 cm) and B: (0,0, +15 cm), respectively. Calculate the net electric field at the point C (0,2m,0)	**2**
18	Two cells of EMFs E_1 and E_2 and internal resistance r_1 and r_2 are connected in series .Find the expression for equivalent e.m.f. and internal resistance.	**2**
19	The oscillating electric field of an electromagnetic waves is given by $E_y = 30\sin\pi(6\times10^{10}t - 200x)V/m$ (i) Calculate the wavelength of electromagnetic wave. (ii) Write down the expression for oscillating magnetic field.	**2**
20 (I)	A long thin wire carrying current I, Calculate the magnetic field produced by the wire at a perpendicular distance r from the wire by using Ampere's circuital law? Assume thickness of the wire is negligible.	**2**
	OR	
20 (II)	A. What is relative magnetic permeability of paramagnetic material? **B.** Draw the graph for the variation of magnetic susceptibility with temperature in case of para magnetic substances?	**1+1**
21(I)	The time period of revolution of electron in first orbit of hydrogen atom is T. what is the time period of revolution of same electron if it is orbiting in the third orbit of hydrogen atom.	**2**
	OR	
21(II)	A. The graph shows the variation of stopping potential with frequency of incident radiation for two photosensitive metals A and B. Which one of the two has higher value of work function?  B. If I_1 and I_2 are the saturation currents at two different frequencies f_1 and f_2 ($f_1 > f_2$) for the same intensity of incident radiation. What is the relation between saturation currents I_1 and I_2?	**1+1**
	SECTION - C	
22	A plane wave front is propagating from a rarer into a denser medium is incident at an angle of incidence on a refracting surface. Draw a diagram showing incident wave front and refracted wave front. Hence verify Snell's Laws of refraction.	**3**

23	Four resistances R_1, R_2, R_3 *and* R_4 are connected as shown in figure. By using Kirchhoff's laws Establish the relation between R_1, R_2, R_3 *and* R_4 when the current flowing through the galvanometer is zero. 	**3**
24	A. Write the necessary condition required for fusion reaction. B. Write the characteristic properties of nuclear force.	**1+2**
25	Two concentric circular coils, one of small radius r_1 and the other of large radius r_2, such that $r_1 << r_2$, are placed co-axially with centers coinciding. Obtain the mutual inductance of the arrangement.	**3**
26	A U-shaped wire is placed before a concave mirror having radius of curvature 20 cm as shown in figure. Find the total length of the image. 	**3**
27(I)	A circular coil of 30 turns and radius 8.0 cm carrying a current of 6.0 A is suspended vertically in a uniform horizontal magnetic field of magnitude 1.0 T. The field lines make an angle of 60° with the normal of the coil. (i) Calculate the magnitude of the counter torque that must be applied to prevent the coil from turning. (ii) Calculate the magnetic moment of the circular coil.	**3**
	OR	
27(II)	Figure shows a small magnetized needle P placed at a point O. The arrow shows the direction of its magnetic moment. The other arrows show different positions (and orientations of the magnetic moment) of another identical magnetized needle Q. (a) In which configuration the system is not in equilibrium? (b) In which configuration is the system in (i) stable, and (ii) unstable equilibrium? 	**3**
28	What is meant by rectification? Explain with the help of a neat diagram how a single diode can be used as rectifier?	**3**
	SECTION - D	
29	De Broglie reasoned that nature was symmetrical and that the two basic physical entities – matter and energy, must have symmetrical character. If radiation shows	**1**

	dual aspects, so should matter. De Broglie proposed that the wave length associated with a particle of momentum p is given as $$\lambda=\frac{\mathrm{h}}{\mathrm{p}}=\frac{h}{mv}$$ where m is the mass of the particle and v its speed. The above Equation is known as the de Broglie relation and the wavelength of the matter wave is called de Broglie wavelength. The dual aspect of matter is evident in the de Broglie relation. **(I)** Which of the following statement are true: (a) The dual aspect of matter is evident in the de Broglie relation $\lambda=\frac{\mathrm{h}}{\mathrm{p}}$ (b) Wave nature of macroscopic particles are not visible in daily life. (c) $\lambda=\frac{\mathrm{h}}{\mathrm{p}}$ is not satisfied by a photon (A) (a,b,c) (B) (a,b) (C) (a,c) (D) (b,c)	
	(II) A proton and an electron are accelerated through the same potential difference if λ_e and λ_p are denote de Broglie wavelength of electron and proton then (A) $\lambda_e=\lambda_p$ (B) $\lambda_e<\lambda_p$ (C) $\lambda_e>\lambda_p$ (D) none of these	**1**
	(III) A particle X moving with a certain velocity has a de Broglie wavelength of $1A^0$. If the particle Y has a mass of 25% and that of X and velocity 75% that of X De Broglie wavelength of Y will be (A) $1A^0$ (B) $5.33A^0$ (C) $6.88A^0$ (D) $48A^0$	**1b**
	(IV) If E_1, E_2, E_3 are the respective kinetic energy of electron and an Alpha particle and a proton each having the same de Broglie wavelength then (A) $E_1>E_3>E_2$ (B) $E_2>E_3>E_1$ (C) $E_1>E_2>E_3$ (D) $E_2\geq E_3=E_1$	**1a**
30	A semiconductor diode is basically a p-n junction with metallic contacts provided at the ends for the application of an external voltage. It is a two terminal device. A p-n junction diode is symbolically represented as shown in fig.  When an external voltage V is applied across a semiconductor diode such that p-side is connected to the positive terminal of the battery and n-side to the negative terminal it is said to be forward biased.	**2**

	When an external voltage (V) is applied across the diode such that n-side is positive and p-side is negative, it is said to be reverse biased (I) The V-I characteristic of a silicon diode is shown in the Fig. Calculate the resistance of the diode at (a) I_D = 15 mA and (b) V_D = –10 V. 	
	(II) Find the value of current I in given circuit. 	**1**
	(III) When forward bias is applied to a P-N junction, then what happens to the potential barrier V_B, and the width of charge depleted region x ?	**1**
	SECTION - E	
31(I)	A. Define electric capacity. Two large parallel pates each of area A are separated by a distance d in vacuum (A>>d) Calculate the capacitance of the capacitor between the plates by using suitable diagram. B. A large metallic plate is facing a charged sheet having charge density σ placed parallel to a plate at a distance l from the plate. Calculate potential at point P at a distance x from the sheet as shown in the figure? 	**3+2**
	OR	
31(II)	A. Define equipotential surfaces? B. Write any two properties of Equipotential surfaces? C. Draw a sketch of Equipotential surface due to a single charge (–q), depicting the electric field lines due to the charge. D. Four point charges Q, q, Q and q are placed at the corners of a square of side 'a' as shown in the figure. Calculate the potential energy of this system. 	1+1+1+2
32 (I)	A. State Biot-Savart's law. Using this law derive the expression for the magnetic field due to a current carrying circular loop of radius R at a point which is at a distance 'x' from its centre along the axis of loop?	**3+2**

	B. Two long and parallel straight wires A and B carrying currents of 8.0 A and 5.0 A in the opposite direction are separated by a distance of 6.0 cm. Estimate the magnitude force on a 10 cm section of wire A. Is the force between the two wires is attractive and repulsive?	
	OR	
32(II)	A. A series LCR circuit is connected to a source having voltage $V = V_0 Sin\omega t$. Calculate the maximum current flowing through the series circuit in terms of V_0,L,C,R and ω by using phasor diagram. B. Write the expression for frequency where power in LCR series circuit is maximum? C. An ideal inductor L of inductive reactance X_L is connected in series with a bulb and an ac source. How would brightness of the bulb change when (i) Number of turns per unit length is increased **(ii)** By replacing the inductor with capacitance having capacitive reactance $X_C=X_L$.	2+1+2
33(I)	A. A point object 'O' is kept in a medium of refractive index n_1 in front of a convex spherical surface of radius R separating the two media of refractive index n_1 and n_2. (i) Draw the ray diagram showing the image formation (ii) Deduce the relationship between the object distance (u) and the image distance(v) in terms of n_1, n_2 and R. **B.** Two media A and B are separated by a plane boundary. The speed of light in medium A and B is $2x10^8$ ms $^{-1}$ and $3x10^8$ ms^{-1} respectively. Calculate the critical angle for a ray of light going from medium A to medium B.	**3+2**
	OR	
33(II)	A. Draw the labelled ray diagram for the formation of image formed at far point by a compound microscope. B. Deduce an expression for the total magnification of a compound microscope when final image formed at infinity. C. Calculate the angle of incidence ' i' for an equilateral prism of refractive index $\sqrt{3}$ so that the ray is parallel to the base inside the prism?	**1+2+2**