Series P/PB2/1

SET 1

CLASS XII PRE-BOARD EXAMINATION – 2025-26

Q.P. Code: 042/2/1

Roll No. | | | | | | | | |

Candidate must write the Q.P. Code on the title page of the answer-book.

- Please check that this question paper contains **9** printed pages.
- Please check that this question paper contains **33** questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- **Please write down the serial number of the question in the answer-book before attempting it.**
- 15 minute time has been allotted to read this question paper. The students will read the question paper only and will not write any answer on the answer-book during this period.

PHYSICS

Time allowed : 3 hours *Maximum Marks : 70*

General Instructions:

(1) *This question paper contains **33** questions. **All** questions are **compulsory**.*

(2) *This question paper is divided into **five** sections: **A, B, C, D** and **E**.*

(3) *All 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 wherever 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

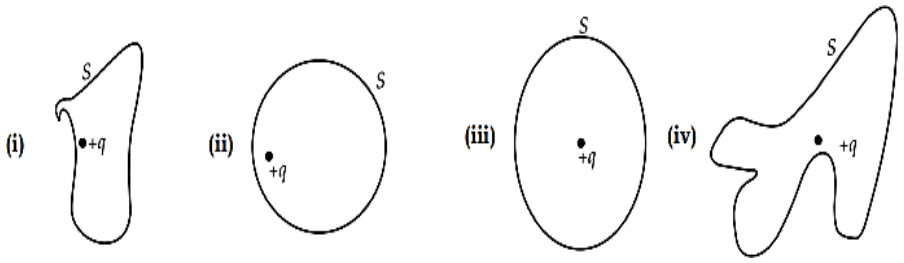
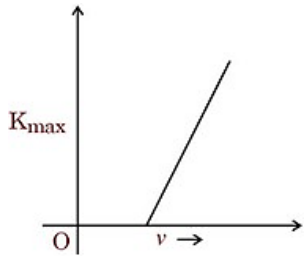
iv. $e = 1.6 \times 10^{-19}$ C

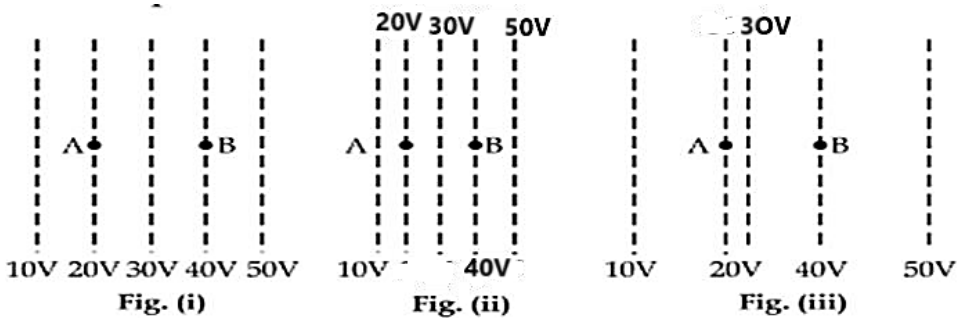
v. $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}

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

vii. $\varepsilon_0 = 8.854 \times 10^{-12}$ $C^2 N^{-1} m^{-2}$

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

Q No:	**SECTION-A** All questions are compulsory. Incase of internal choices, attempt any one of them.	MARKS
1	The electric flux through the surface:  (A)in Figure(iv)is the largest. (B)in Figure(iii) is the least. (C)in Figure (ii) is same as Figure(iii) but is smaller than Figure(iv). (D)is the same for all the figures	1
2	A coil of N turns and radius R carries a current I. It is unwound and rewound to make a square coil of side 'a' having same number of turns(N).Keeping the current I same, the ratio of the magnetic moments of the circular coil and the square coil is (A)$\pi R^2/a^2$ (B)R^2/a^2 (C)$\pi a^2/R^2$ (D)None of the above	1
3	In an N-type semi-conductor, the Fermi level is: (A) Closer to the conduction band (B) Closer to the valence band (C) Exactly in the middle of the energy gap (D) Below the valence band	1
4	The figure shows the variation of maximum kinetic energy (Kmax) of emitted electrons as a function of the frequency υ of radiation incident on a photosensitive surface. The slope of the curve is :  (A) h (B)h/ν (C) h/ e (D)he	1
5	What is the primary characteristic of paramagnetic substances? (A) They are strongly attracted to magnets. (B) They have no magnetic moment. (C) They are weakly attracted to external magnetic fields. (D) They repel magnetic fields.	1

6	A positively charged particle is released from rest in a uniform electric field. The electric potential energy of the charge, (A) Remains a constant because the electric field is uniform. (B) Increases because the charge moves along the electric field. (C) Decreases because the charge moves along the electric field. (D) Decreases because the charge moves opposite to the electric field.	1
7	An ac source is connected to a resistor and an inductor in series. The voltage across the resistor and inductor are 8V and 6V respectively. The voltage of the source is : (A) 10 V (B) 12 V (C) 14V (D) 16 V	1
8	The wavelength of a photon is equal to the wavelength associated with an electron. Both will have the same value of : (A) energy (B) angular momentum (C) velocity (D) linear momentum	1
9	If potential difference V has been applied to a copper wire and the potential difference is increased to 2V, the drift velocity of electrons will (A) Be half the initial velocity (B) Remain same (C) Be $\sqrt{2}$ times the initial velocity (D) Be double the initial velocity	1
10	Figure shows some equi-potential lines distributed in space. A charged object is moved from point A to point B.  (A) The work done in Figure (i) is the greatest. (B) The work done in Figure (ii) is least. (C) The work done is the same in Figure (i), Figure (ii) and Figure(iii). (D) The work done in Figure (iii) is greater than Figure (ii), but equal to that in Figure (i).	1
11	Two nuclei have mass number in the ratio1:2.The ratio of the nuclear densities is : (A) 1 : 2 (B) 2 : 1 (C) 1 : 1 (D) Cannot be defined from mass number ratio	1

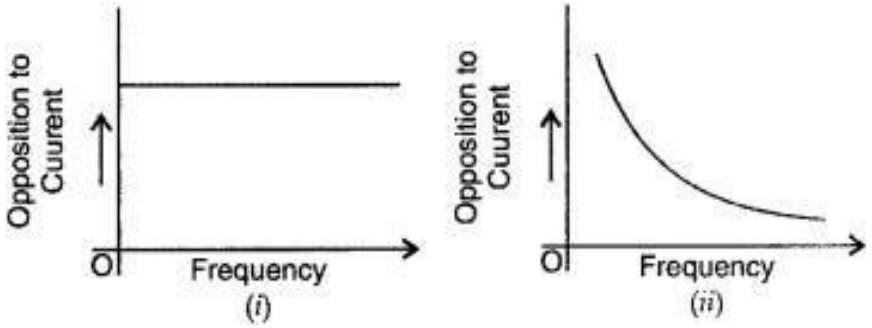
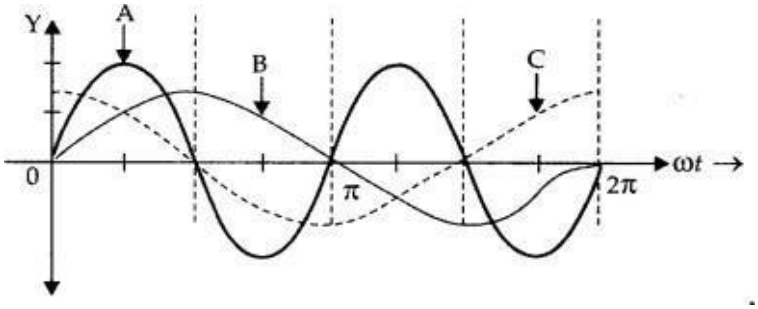
12	Two long, straight, parallel conductors carry the same current and attract each other with a force F per unit length. If the current is doubled in each conductor and their separation is made half, the force per unit length becomes : (A)F/2 (B) 2F (C) 4F (D) 8F	1
	Two statements are given below. One is labeled Assertion (A) and the other is labelled Reason (R). Read the statements carefully and choose the option that correctly describes statements A and R. A. Both assertion and reason are true and reason is the correct explanation for 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) : In a non-uniform electric field, a dipole will have translator as well as rotatory motion. Reason(R):In a non-uniform electric field, a dipole experiences a force as well as torque.	1
14	Assertion (A): A magnetic field cannot do work on a charged particle. Reason(R):The magnetic force acts in the direction of motion of the particle.	1
15	Assertion(A):The electrical conductivity of a pure Ge crystal increases with increase in its temperature. Reason(R):The number of electrons excited by thermal excitation from the valence Band to the conduction band, in a semiconductor, increases with increase in temperature.	1
16	Assertion(A):The image of an object placed between f and 2f from a convex lens can be seen on a screen. If the screen is removed, image is not formed. Reason(R): Rays from a given point on the object placed between f and 2f, after passing through a convex lens, do not converge on a point in space.	1
	SECTION :B	
17	Two large, parallel, infinite sheets of charge are arranged with the following charge densities: • The first sheet has a charge density $\sigma_1=5 \times 10^{-6} C/m^2$ • The second sheet has a charge density $\sigma_2=-3 \times 10^{-6} C/m^2$ Find the electric field: i) To the left of both sheets & ii) Between the two sheets.	2
18	An electron (mass m) with an initial velocity $v=v_0\hat{i}$ is in an electric field, $E=E_0 j$. If its initial de-Broglie wavelength is $\lambda_0=h/mv_0$, calculate the wavelength at time t.	2
19	The radius of the inner most electron orbit of a hydrogen atom is 5.3×10^{-11}m.What is the radius of the orbit in the second excited state? **OR** i) State the limitations of Bohr's atomic model ii) What is Bohr's quantization condition for the angular momentum of an electron in the second orbit?	2

20	In a single slit experiment, how is the angular width of central bright fringe Maximum changed when, a) The slit width increased& b) Light of a smaller wavelength is used. Justify. **OR** A narrow slit is illuminated by a parallel beam of monochromatic light of wavelength λ equal to 6000 Å and the angular width of the central maximum in the resulting diffraction pattern is measured. When the slit is next illuminated by light of wavelength λ′ the angular width decreases by 30%. Calculate the value of the wavelength λ′.	2
21	Which constituent radiation of the electromagnetic spectrum is used? i) To take Photographs in hazy situations ii) To photograph internal parts of Human body- iii) For air craft navigation iv) To uncover the old walls' secret writings.	2
	SECTION:C	
22	A tank is filled with a liquid of refractive index$\sqrt{2}$ up to a height of 30 cm. A tiny bulb is glowing at the bottom of the tank. Calculate the diameter of an opaque disc floating symmetrically on the liquid surface that can cut off completely the light from the bulb that comes out of the liquid surface	3
23	Calculate the momentum and the de-Broglie wavelength in the following cases: i) An electron with kinetic energy 2eV. ii) A bullet of 50g fired from rifle with a speed of 200 m/s Hence show that the wave nature of matter is important at the atomic level but is not really relevant at macroscopic level.	3
24	Consider interference between two sources of intensities I and 4I.What will be the intensity at points where phase differences are: i) $\pi/2$ ii) π	3
25	A battery of EMF 12V and internal resistance 0.5Ω is connected to an external load of 4.5 Ω. Calculate: i. The power delivered to the external load. ii. The power dissipated inside the battery due to its internal resistance. iii, The efficiency of the battery.	3
26	The total energy of an electron in the first excited state of the hydrogen atom is about -3.4eV. i) What are the kinetic energy and potential energy of the electron in this state? ii) Which of the answers from above would change if choice of zero of potential energy is changed? Why?	3
27	An equi-convex lens of radius of curvature R is cut in to two equal parts by a vertical plane, so it becomes a plano-convex lens. If f is the focal length of equi-convex lens, then what will be focal length of the plan convex lens? **OR** Using Huygens's principle, deduce the laws of refraction.	3

28	i) Mention various energy losses in a transformer. (ii) The primary coil of an ideal step up transformer has 100 turns and transformation ratio is also 100.The input voltage and power are respectively 220V and 1100 W. Calculate: (A) Number of turns in secondary (B) Current in primary (C) Voltage across secondary (D) Current in secondary	3
29	**SECTION: D** A capacitor is an arrangement which can store a large amount of charge in a small space. In a parallel plate capacitor, the two plates are plane and parallel to each other. When a dielectric slab is inserted between the plates of a capacitor, the electric field inside the dielectric decreases and the capacitance of the capacitor increases. Also the capacitance of the capacitor increases on introducing a conducting slab between the two plates of the capacitor**.** **(i)** If the separation between the plates of capacitor is increased, the electric field intensity inside the capacitor : (A) increases (B) decreases (C) remains same (D) first increases, then decreases. **(ii)** An electric field E is established between the plates of an air filled parallel plate capacitor, with charges Q and -Q , V is the volume of the space enclosed between the plates. The energy stored in the capacitor is capacitor is : **(A)** $\frac{1}{2}\varepsilon_0 E^2$ **(B)** $\varepsilon_0 Q^2 E$ **(C)** $\frac{1}{2}\varepsilon_0 E^2 V$ **(D)** $\varepsilon_0 EQV$ **(iii)** A slab (area A and thickness d1) of a linear dielectric of dielectric constant K is inserted between charged plates (charge density σ) of A parallel plate capacitor [plate area A and plate separation d (> d1)] and opposite charges with charge density of magnitude σp appear on the faces of the slab. The dielectric constant K is given by: **(A)** $\frac{\sigma+\sigma_p}{\sigma}$ **(B)** $\frac{\sigma}{\sigma-\sigma_p}$ **(C)** $\frac{\sigma+\sigma_p}{\sigma_p}$ **(D)** $\frac{\sigma}{\sigma_p}$ **(iv)** A capacitor is charged by a battery and the charging battery is disconnected and a dielectric slab is inserted in it. Then for the capacitor (A) Charge remains constant (B) Charge increases (C) Potential difference remains constant (D) Potential difference increases	

30	A diode is a two-terminal electronic device that allows electric current to flow predominantly in one direction while blocking it in the opposite direction. The most commonly used diode is the PN junction diode, formed by joining p-type and n-type semiconductor materials. The p-side contains a large number of holes as majority charge carriers, whereas the n-side contains electrons as majority charge carriers. PN junction diodes are widely used in electronic circuits for rectification (conversion of AC to DC)**,** signal clipping, and voltage regulation. Special-purpose diodes such as Light Emitting Diodes (LEDs) emit light when forward biased, while Zener diodes are designed to operate in the reverse breakdown region and are used for voltage regulation.   i) A silicon diode is connected in forward bias in series with a 100 Ω **resistor** to a 10 V DC supply. The forward voltage drop across the diode is **0.7 V**. ii) A PN junction diode is reverse biased with a voltage greater than its breakdown voltage. State what happens to the current through the diode. iii) When a PN junction diode is forward biased, what happens to the depletion layer at the junction?	2 1 1

	SECTION:E	
31	(a) (i) The electric field in a region is given by $\vec{E} = 40x\ \hat{\imath}\ N/C$. Find the amount of work done in taking a unit positive charge from a point (0, 3m) to the point (5m, 0). (ii) A charge Q is distributed over two concentric hollow spheres of radii r and R (>r) such that their surface charge densities are equal. Find: (I) the electric field, and (II) the potential at their common centre. **OR** (b) (i) Obtain the expression for the capacitance of a parallel plate capacitor with a dielectric medium between its plates. (ii) A charge of 6 μC is given to a hollow metallic sphere of radius 0.2 m. Find the potential at (i) the surface and (ii) the centre of the sphere.	5

32	a) A series LCR circuit is connected to an ac source. Using the phasor diagram, derive the expression for the impedance of the circuit. Plot a graph to show the variation of current with frequency of the source, explaining the nature of its variation. b) The graphs (i) and (ii) shown in the figure represent variation of opposition offered by the circuit elements, X and Y, respectively to the flow of alternating current vs. the frequency of the applied emf. Identify the elements X and Y.  Write the expression for the impedance offered by the series combination of these two elements connected to an ac source of voltage $V = V_0 \sin \omega t$. **OR** A device 'X' is connected to an ac source $V = V_0 \sin \omega t$. The variation of voltage, current and power in one cycle is shown in the following graph: (a) Identify the device 'X'. (b) Which of the curves A, and C represent the current and the power consumed in the circuit, if B represents voltage? Justify your answer.  (c) How does it impedance vary with frequency of the ac source? Show graphically. (d) Obtain an expression for the current in the circuit and its phase relation with ac voltage.	5
33	i) Derive the expression for the angle of deviation for a ray of light passing through an equilateral prism of refracting angle A. ii) Draw a graph to show that variation of angle of deviation δ_{min} with that of angle of incidence i for a monochromatic ray of light passing through a glass prism of refracting angle A. **OR**	5

i) Draw a labelled diagram of telescope when the image is formed at the least distance of distinct vision? Hence derive the expression for its magnifying power.

ii) Four double convex lens with following specifications are available.

	Lens Focal Length	**Aperture**
A	100 cm	10 cm
B	100 cm	5 cm
C	10 cm	2 cm
D	5 cm	2 cm

Which of the given four lenses should be selected as objective and eyepiece to construct an astronomical telescope and why? What will be the magnifying power and length of the tube of this telescope?