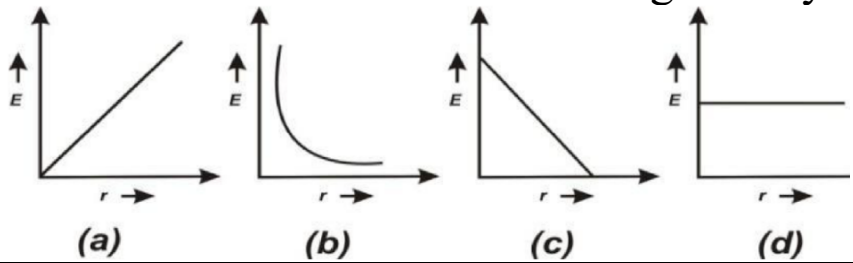
|CBSE-XII |Test No-02 Vidyarthi & Shiksha

Pre-Board Examination : 2025-26

Sub : Physics

(The figures in the margin indicate full marks for the questions)

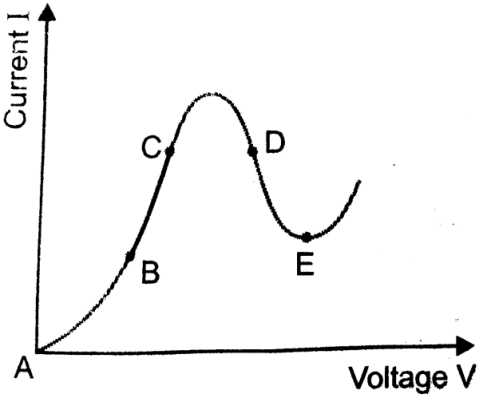
Time – 3 hours **Full marks-70**

Section -A (Each question carries 1 mark)	
1	An electric dipole of dipole moment 2×10^{-8} C m in a uniform electric field experiences a maximum torque of 6×10^{-4} Nm. The magnitude of electric field is – (a) 2.2×10^{3} Vm^{-1}. (b) 1.2×10^{4} Vm^{-1} (c) 3×10^{4} Vm^{-1} (d) 4.2×10^{3} Vm^{-1}
2	For a point charge, the graph between electric field versus distance is given by: - 
3	Equipotential surfaces due to a uniform linear charge distribution are approximately (a) Spheres (b) Planes (c) Cylindrical (d) Circular
4	A charge q with velocity $\vec{v} = (3\hat{i} + 4\hat{j})$

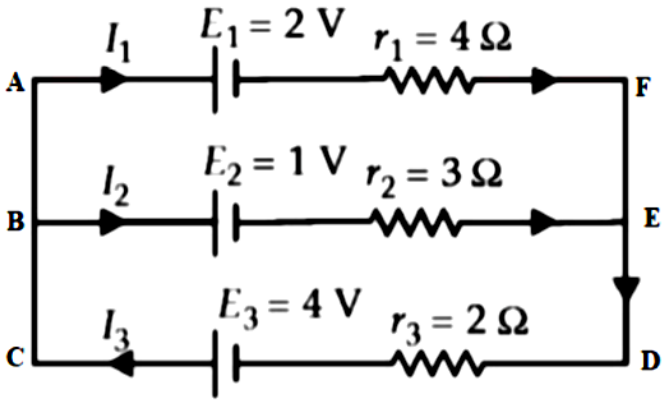
	moves through a magnetic field $\vec{B} = 3\hat{k}\,T$. The force F on charge is – (a) $\left(12\hat{i} - 9\hat{j}\right)N$ (b) $\left(12\hat{i} + 9\hat{j}\right)N$ (c) $\left(-12\hat{i} + 9\hat{j}\right)N$ (d) $\left(-12\hat{i} - 9\hat{j}\right)N$
5	If a galvanometer is to be used in place of a voltmeter, then we must connect with the galvanometer a - (a) Low resistance in parallel. (b) High resistance in series. (c) High resistance in parallel. (d) Low resistance in series
6	Which material has negative susceptibility (a) Paramagnetic (b) Ferromagnetic (b) Diamagnetic (d) None of these
7	In a ferromagnetic material at room temperature (a) magnetic moment of each molecule is zero. (b) the individual molecules have non-zero magnetic moment which are all perfectly aligned. (c) domains are partially aligned. (d) domains are all perfectly aligned.

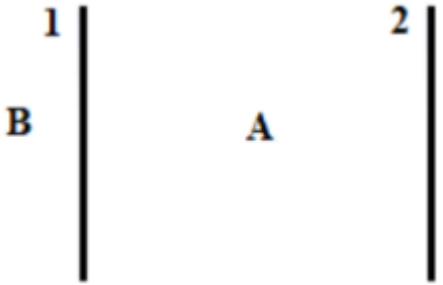
8	When a 12 W light bulb is connected with a step-down transformer with output of 24 V. The value of the peak current through the bulb is (a) 1/ √2 A (b)√ 2 A (c) 2 A (d) 2√ 2 A
9	A beam of light travels from air into a medium, its speed and wavelength in the medium are 1.5 $\times 10^8$ $ms^{-1}$and 230 nm respectively.The wavelength of light in air will be - (a) 230 nm (b) 345 nm (c) 460 nm (d) 690 nm
10	A proton, a neutron, an electron and an α-particle have same energy. Then their de Broglie wavelengths compare as (a) $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$ (b) $\lambda_\alpha < \lambda_p = \lambda_n < \lambda_e$ (c) $\lambda_e < \lambda_p = \lambda_n > \lambda_\alpha$ (d) $\lambda_e = \lambda_p = \lambda_n = \lambda_\alpha$
11	Taking the Bohr radius as a_0 = 53pm, the radius of Li^{++} ion in its ground state, on the basis of Bohr's model, will be about (a) 53 pm (b) 27 pm (c)18 pm (d) 13 pm
12	Piece of copper and of silicon are initially at room temperature. Both are heated to temperature T. The conductivity of –

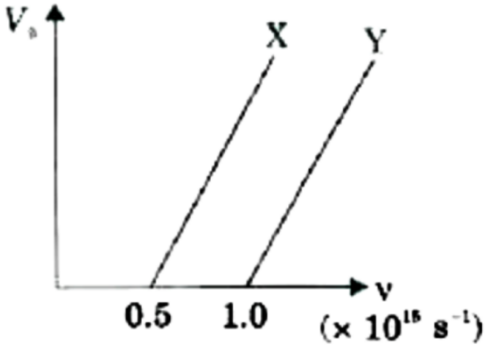
	(a) Both increases (b) Copper increases and silicon decreases (c) Both decreases (d) Copper decreases and silicon increases
13	**Assertion:** According to Bohr's atomic model the ratio of angular momenta of an electron in first excited state and in ground state is 2:1. **Reason:** In a Bohr's atom the angular momentum of the electron is directly proportional to the principal quantum number.
14	**Assertion:** The focal length of an equi-convex lens of radius of curvature R made of material of refractive index 1.5, is equal to R. **Reason :** The radius of curvature of both the surfaces of equi-convex lens is positive.
15	**Assertion:** On increasing the intensity of light, the number of photoelectrons emitted is more. Also the kinetic energy of each photon increases but the photoelectric current is constant. **Reason:** Photoelectric current is independent of intensity but increases with increasing

	frequency of incident radiation.
16	**Assertion:** The energy gap between the valence band and conduction band is greater in silicon than in germanium. **Reason:** Thermal energy produces fewer minority carriers in silicon than in germanium.
Section B (Each question carries 2 marks)	
17	 Graph showing the variation of current versus voltage for a material GaAs as shown in figure. Identify the region of (i) Negativeresistance (ii) Where Ohm's law is obeyed. Also justify your answer.
18	A convex lens of focal length 25 cm is placed coaxially in contact with a concave lens of focal length 20 cm. Determine the

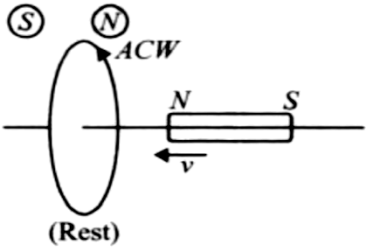
	power of the combination. Will the system be converging or diverging in nature? OR Ray of light passing through an equilateral triangular glass prism from air undergoes minimum deviation when angle of incidence is 3/4th of the angle of prism. Calculate the speed of light in the prism.
19	Draw the intensity pattern for single slit diffraction and double slit interference. Hence state two differences between interference and diffraction patterns.
20	Calculate the velocity of an electron in the ground state of the hydrogen atom.
21	Write any two distinguishing features between conductors and semiconductors in the basis of energy band diagram.
Section C (Each question carries 3 mark)s	
22	(a) Explain with the help of a diagram the formation of depletion region and barrier potential in a p-n junction. (b) A student wants to use two p-n junction diodes to convert alternating current into direct current. Draw the labelled circuit diagram used. Also draw the input and

	output voltage waveforms.
23	On the basis of electron drift, derive an expression for resistivity of a conductor in terms of number density of free electrons and relaxation time. Also explain the dependence of resistivity of metals using obtained expression. Or, Use Kirchhoff's rules to find the currents I_1, I_2 and I_3 in the circuit diagram shown. 
24	State the principle of working of a moving coil galvanometer. Also write formula of its current sensitivity. (i) What is the function of uniform radial field and how is it produced in a moving coil galvanometer? (ii) Why is it necessary to introduce a

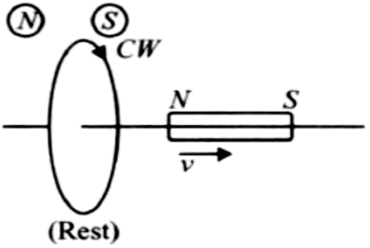
	cylindrical soft iron core inside the coil of a galvanometer?
25	Define electric dipole moment and write its SI unit. Derive an expression for the electric field on the equatorial line due to an electric dipole. Or, Two thin infinite sheets 1 and 2 having surface charge densities + σ and – 2σ respectively are as shown in the diagram. Find the magnitude and direction of electric field at points A and B. 
26	Which constituent radiations of electromagnetic spectrum is used – (i) in RADAR systems used in aircraft navigation (ii) in photographs of internal parts of human body/as a diagnostic tool in medicine (iii) for taking photographs of sky, during

	night and fog conditions. Give reason for your answer in each case.
27	The following graph shows the variation of stopping potential (V_o) with frequency (**ν**) of the incident radiation for two photosensitive surfaces X and Y. (i) Which of the metals has larger threshold wavelength? Give reason. Explain giving reason, which metal gives out electrons having larger kinetic energy, for the same wavelength of incident radiation? (iii) If the distance between the light source and metal X is halved, how will the kinetic energy of emitted from it change? Give reason 
28	Draw a plot of binding energy per nucleon (B.E/A) as a function of mass number A. (a) Write two important conclusions that can

	be drawn regarding the nature of nuclear force. (b) Use this graph to explain the release of energy in both the processes of nuclear fission and fusion.
Section D (Each question carries 4 marks)	
29	**Read the text carefully and answer the questions** The phenomena of induction of emf across a coil due to change in magnetic flux linked with it is called electromagnetic induction. The current produced due to this induced emf is called induced current. Lenz's law states that the direction of induced current in a circuit is such that it opposes the change which produces it. Thus, if the magnetic flux linked with a closed-circuit increase, the induced current flows in such a direction that magnetic flux is created in the opposite direction of the original magnetic flux. If the magnetic flux linked with the closed-circuit decreases, the induced current flows in such a direction so as to create magnetic flux in the direction of the original flux.



(Coil face behaves as North pole to oppose the motion of magnet.)



(Coil face behaves as South pole to oppose the motion of magnet.)

(a) Which of the following statements is correct?

(i)The induced e.m.f is not in the direction opposing the change in magnetic flux so as to oppose the cause which produces it.

(ii)The relative motion between the coil and magnet produces change in magnetic flux.

(iii)Emf is induced only if the magnet is moved towards coil.

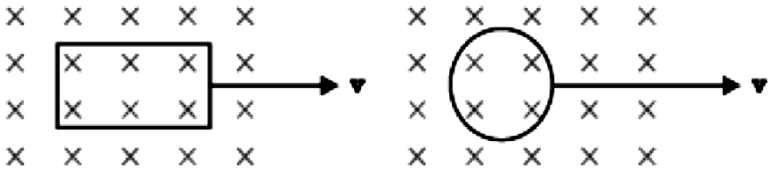
(iv) Emf is induced only if the coil is moved towards magnet.

(b) Current in a circuit falls from 5.0 A to 0.0 A in 0.1 s. If an average emf of 200 V induced, give an estimate of the self-inductance of the circuit.

(i) 50 H (ii) 40 H (iii) 4 H (iv) 20 H

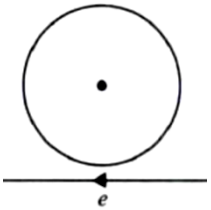
© A rectangular loop and a circular loop are moving out of a uniform magnetic field region to a field-free region with a constant

velocity v. In which loop do you expect the induced emf to be constant during the passage out of the field region? The field is normal to the loops.



(i) Circular (ii) Rectangular
(iii) Both of them (iv) None of them

(a) Near a circular loop of conducting wire as shown in the figure, an electron moves along a straight line. The direction of the induced current if any in the loop is

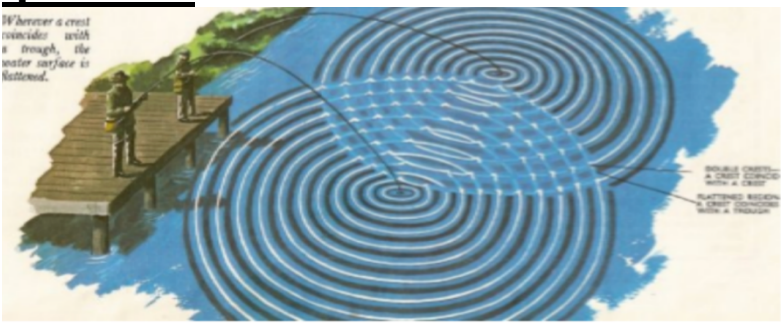


(i) Variable (ii) Clockwise
(ii) Anticlockwise (iv) Zero

Or,

Two coils A and B are kept in a horizontal tube along the axis of tube without touching each other. The mutual inductance between the coils depends upon.

(i) Number of turns in coils
(b) Geometrical Shapes of coils

	(c) Relative orientation of coils (iv) All of these
30	**<u>Read the text carefully and answer the questions</u>**  Rohit and Rajiv were both creating a series of circular waves by jiggling their legs in water. The waves form a pattern similar to the diagram as shown. Their friend, Anita, poured an oil drop on surface of water they all amazed to see the beautiful patterns of ripples which became very colourful.. **(a)** Name the phenomenon involved in the activity (i) Reflection (ii) Refraction (ii) Interference (iv) Polarization **(b)** When the distance between slits in

	Young's double slit experiment decreases the fringe width – (i) increases (ii) decreases (iii) remains same (iv) Becomes zero © Ratio of amplitudes of two waves from two coherent sources propagating simultaneously in a medium is 1:2 then the ratio of maximum intensity to the minimum intensity due to superposition of waves is – (i) 1:2 (ii) 1:9 (iii) 4:1 (iv) 9:1 **(d)** When a monochromatic source of light of wave length 650 nm is replaced by another source of wavelength 780 nm. The ratio of width of central maximum in these cases is – (i) 6:5 (ii) 5:6 (iii) 3:1 (iv) 5:3 Or, The width of fringes obtained in Young's double slit experiment does not depend upon- (d) Distance between plane of slits and screen slits © Medium in which the setup is placed (b) Distance between (d) None of these

Section E (Each question carries 5 marks)	
31	(a) Derive an expression for the electric potential at any point due to an electric dipole. (b) An electric dipole of length 4cm, when placed with its axis making an angle of 60^0 with a uniform electric field, experiences a torque of $4\sqrt{3}$ Nm. Calculate the potential energy of the dipole, if it has a charge of ± 8 nC. **Or,** (a) Obtain expression for capacitance of parallel plate capacitor when no dielectric is placed between the plates. (b) A capacitor of capacity C is charged fully by connecting it to a battery of emf E. It is then disconnected from the battery. If the separation between the plates of the capacitor is doubled then how the following parameters will change: - i) Charge stored in the capacitor ii) Field strength between the plates iii) Energy stored by the capacitor
32	(a) An ac source of voltage $V = V_0 \sin \omega t$ is connected to a series combination of L, C

	and R. Use the phasor diagram to obtain the expression for impedance of the circuit and phase angle between voltage and current. Find the condition when current will be in phase with the voltage. What is the circuit in this condition called? b) In a series LR circuit, X_L= R and power factor of the circuit is P_1. When capacitor with capacitance C is connected in series to LR such that $X_L = X_C$, the power factor becomes P_2. Calculate P_1/P_2. Or, (a) What is the principle of working of a Transformer? With the help of a neat and labelled diagram, explain working of a step u transformer and obtain the expression for ratio of secondary to primary voltage in terms of the number of turns in the two coils. (b)Write any four losses in a real transformer
33	(a) Draw a labelled ray diagram showing the image formation by a compoundmicroscope. Define its magnifying power. Deduce the expression for the magnifying power of the

	microscope. (b) Explain : (i) Why must both the objective and the eye piece of a compound microscope have short focal lengths? (ii) Why is the objective of a compound microscope being of short aperture? Or (a)Draw a ray diagram to show the refraction of light through a glass prism. Hence derive the relation for refractive index of material of prism. (b) Draw the graph between the angle of incidence and angle of deviation.