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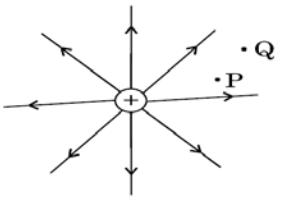
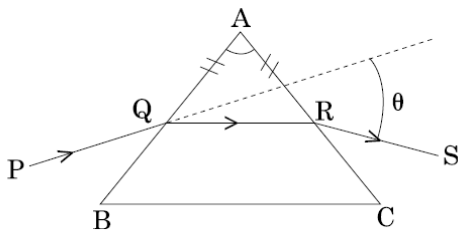
HALF YEARLY EXAMINATION – 2018-19

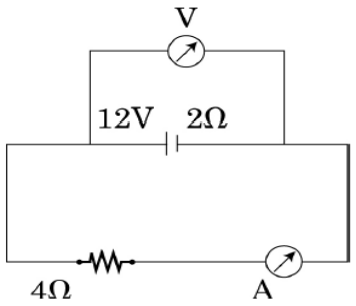
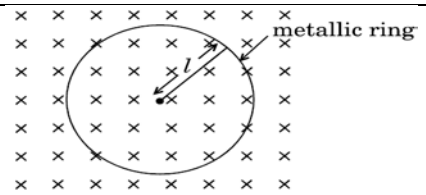
Subject:	Physics	Class:	XII
Time:	3 Hours	Maximum Marks:	70

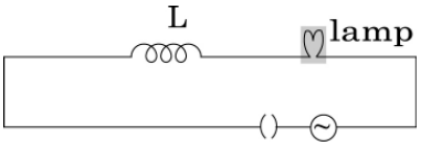
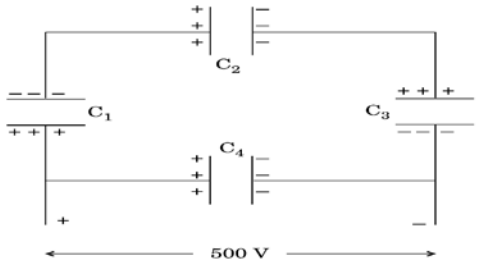
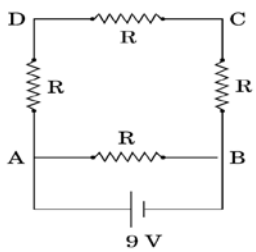
General Instructions:

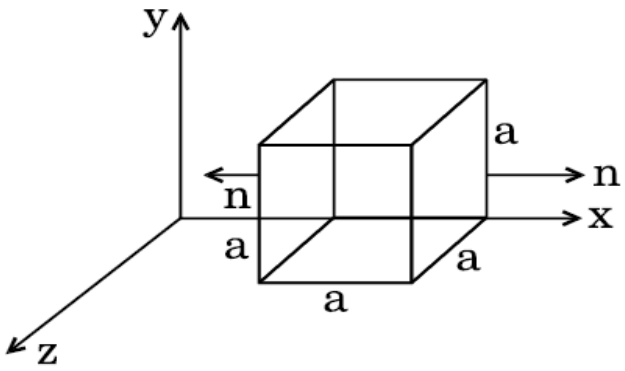
1. **All questions are compulsory.**
2. **There are 27 questions in total. Questions 1 to 5 carry one mark each, questions 6 to 12 carry two marks each, and questions 13 to 24 carry three marks each. Questions 25 to 27 carry five marks each.**
3. **There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choices in such questions.**
4. **Use of calculator is not permitted. Demand log table from invigilator, if required.**

QUESTIONS

1.	Two wires, one of copper and the other of manganin, have same resistance and equal thickness. Which wire is longer? Justify your answer.	1
2.	The figure shows the field lines of a positive point charge. What will be the sign of the potential energy difference of a small negative charge between the points Q and P ? Justify your answer. 	1
3.	The radii of curvature of both the surfaces of a lens are equal. If one of the surfaces is made plane by grinding, how will the focal length and power of the lens change?	1
4.	In an a.c. circuit, the instantaneous voltage and current are V = 200 sin 300 t volt and I = 8 cos 300 t ampere respectively. Is the nature of the circuit capacitive or inductive? Give reason.	1
5.	Why does sun appears red at sunrise and sunset?	1
6.	When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is 2.5 X 10^{-4} m/s. If the electron density in the wire is 8 X 10^{28} m^{-3}, calculate the resistivity of the material of wire.	2
7.	A ray PQ incident on the refracting face BA is refracted in the prism BAC as shown in the figure and emerges from the other refracting face AC as RS such that AQ = AR. If the angle of prism A = 60° and refractive index of material of prism is $\sqrt{3}$, calculate angle θ. 	2
8.	Define the term 'power loss' in a conductor of resistance R carrying a current I. In what form does this power loss appear? Show that to minimize the power loss in the transmission cables connecting the power stations to homes, it is necessary to have the connecting wires carrying current at enormous high values of voltage.	2

9.	A battery of emf 12 V and internal resistance 2Ω is connected to a 4Ω resistor as shown in the figure: a) Show that a voltmeter when placed across the cell and across the resistor, in turns, gives the same reading. b) To record the voltage and the current in the circuit, why is voltmeter placed in parallel and ammeter in series in the circuit?		2
10.	A screen is placed 90 cm away from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by 20 cm. Determine the focal length of the lens.		2
11.	a) If the earth did not have atmosphere, would its average surface temperature be higher or lower than it is now? Explain. b) An EM wave exerts pressure on the surface on which it is incident. Justify.		2
12.	Arrange the following em radiations in ascending order to their frequencies: Microwave, radio waves, X-rays, Gamma-Rays. Write two uses of any one of these.		2
13.	A metallic rod of length '*l*' is rotated with a frequency '*v*', with one end hinged at the centre and the other end at the circumference of a circular metallic ring, about an axis passing through the centre and perpendicular to the plane of the ring. A constant and uniform magnetic field B parallel to the axis is present everywhere. (a) Obtain the expression for the emf induced between the centre and the ring. (b) Given that the rod has resistance 'R', then how much power will be generated?		3
	OR i) Write three characteristics of a material used for making permanent magnets. ii) Why is core of an electromagnet made of Ferro magnetic material?		
14.	Write the expression for the generalized Ampere's circuital law. Through a suitable example, explain the significance of time-dependent term.		3
15.	Define an equipotential surface. Draw equipotential surfaces: i) In the case of a single point charge and ii) In a constant electric field in Z-direction Why the equipotential surfaces about a single charge are not equidistant? iii) Can electric field exist tangential to an equipotential surface? Give reason		3
16.	i) State law of Malus ii) Draw a graph showing the variation of intensity I of polarized light transmitted by an analyzer with angle Θ between polarizer and analyzer. iii) What is the value of refractive index of a medium of polarizing angle 60^o?		3

17.	(i) When an AC source is connected to an ideal inductor show that the average power supplied by the source over a complete cycle is zero. (ii) A lamp is connected in series with an inductor and an AC source. What happens to the brightness of the lamp when the key is plugged in and an iron rod is inserted inside the inductor ? Explain. 	3
18.	A network of four 10μF capacitors is connected to a 500 V supply as shown in the figure. Determine the (a) equivalent capacitance of the network and (b) Charge on each capacitor. 	3
19.	A uniform magnetic field of $6{\cdot}5 \times 10^{-4}$ T is maintained in a chamber. An electron enters into the field with a speed of $4{\cdot}8 \times 10^{6}$ m/s normal to the field. Explain why the path of the electron is a circle. Determine its frequency of revolution in the circular orbit. Does the frequency depend on the speed of the electron? Explain.	3
20.	Use Biot-Savart law to derive the expression for the magnetic field on the axis of a current carrying loop of radius R. Draw the magnetic field lines due to a circular wire carrying current I.	3
21.	A 16 Ω resistance wire is bent to form a square. A source of emf 9 V is connected across one of its sides as shown. Calculate the current drawn from the source. Find the potential difference between the ends C and D. If now the wire is stretched uniformly to double the length and once again the same cell is connected in the same way, across one side of the square formed, what will now be the potential difference across one of its diagonals? 	3
22.	(a) Assume that the light of wavelength 6000 Å is coming from a star. Find the limit of resolution of a telescope whose objective has a diameter of 250 cm. (b) Two slits are made 1 mm apart and the screen is placed 1 m away. What should be the width of each slit to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern?	3
23.	Compare and explain three distinguishing features observed in Young's double slit interference pattern with those seen for a coherently illuminated single slit producing diffraction pattern.	3
24.	i) Derive an expression for drift velocity of free electron. ii) How does drift velocity of electron in a metallic conductor vary with increase in temperature? Explain.	3
25.	(a) Define the term 'electric flux'. Write its S.I. unit. (b) Given the components of an electric field as $E_x = \alpha x$, $E_y = 0$ and $E_z = 0$, where α is a dimensional constant. Calculate the flux through each face of the cube of side 'a', as shown in the figure, and the effective charge inside the cube.	5

	 **OR** (a) Define equipotential surface. Why the electric field at any point on the equipotential surface is directed normal to the surface? (b) Draw the equipotential surfaces for an electric dipole. Why does the separation between successive equipotential surfaces get wider as the distance from the charges increases? (c) For this dipole, draw a plot showing the variation of potential V versus x, where x (x >> 2a), is the distance from the point charge – q along the line joining the two charges.	
26.	(a) Write the principle of working of a transformer. Show, with the help of suitable diagrams, how the windings of a step-up transformer are done. (b) Assuming the transformer to be an ideal one, deduce the expression for the ratio of (i) output voltage to input voltage and (ii) output current to input current in terms of the number of turns in the primary and secondary coils. (c) What are the main sources of energy loss in actual transformers and how are these reduced? **OR** (a) Draw a labelled diagram of a moving coil galvanometer. State its working principle. What is the function of a cylindrical soft iron core used in it? (b) Define the terms (i) current sensitivity and (ii) voltage sensitivity. (c) Explain the underlying principle used in converting a galvanometer into a (i) voltmeter and (ii) ammeter.	5
27	(a) State the essential conditions for the phenomenon of total internal reflection to take place. (b) Draw a ray diagram to show how a right isosceles prism made of crown glass can be used to obtain the inverted image. (c) Explain briefly with the help of a necessary diagram, how the phenomenon of total internal reflection is used in optical fibres. Illustrate giving an example how optical fibres can be employed for transmission of optical signals. OR (a) Draw a suitable diagram to demonstrate that given the shape of a wave front at t = 0, its shape at a later time t1 can be obtained using Huygens' geometrical construction. (b) Consider the propagation of a plane wave front from a rarer to a denser medium and verify Snell's law of refraction. Show that when a wave gets refracted into a denser medium, the wavelength and speed of propagation decreases but the frequency remains the same.	5

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