

Directorate Of Education,G.N.C.T Of Delhi

Class: XII (Session: 2022-2023)

subject: Physics

Practice Paper(Mid term)

Maximum Marks: 70 Marks

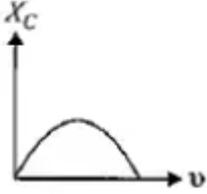
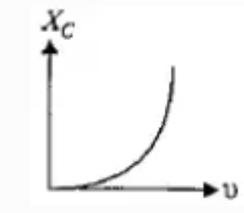
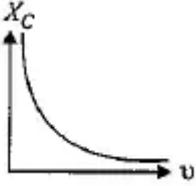
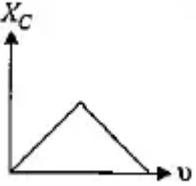
Time Allowed: 3 hours

General Instructions:

- (1) All questions are compulsory. There are 33 questions in all.
- (2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
- (3) Section A contains 15 MCQ and 3 assertion reasoning MCQs of 1 mark each. Section B contains 7 short answer questions of 2 marks each. Section C has five short answer questions of 3 marks each. Section D contains three long answer questions of 5 marks each. Section E has two case based questions of 4 marks each.
- (4) There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.

S.N		Marks
	Section – A All questions are compulsory.	
1	The physical quantity whose SI unit is volt-meter - a. Electric flux b. Electric field Intensity c. Electric potential d. Electric potential energy	1
2	Equipotential surfaces a. are closer in regions of large electric fields compared to regions of lower electric fields. b. will be more crowded near sharp edges of a conductor. c. will never be equally spaced. d. both (a) and (b) are correct.	1

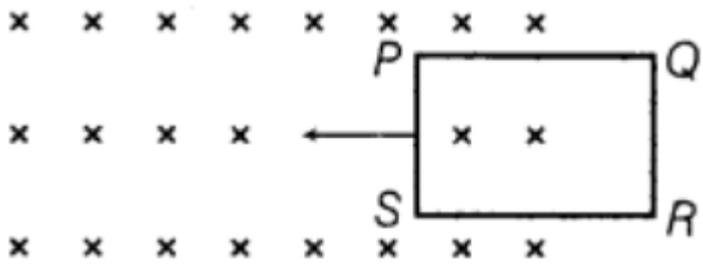
3	<p>The specific resistance of a rod of copper as compared to that of thin wire of copper is -</p> <p>(a) less (b) more (c) same (d) depends upon the length and area of cross-section of the wire</p>	1
4	<p>To convert galvanometer into voltmeter one should connect :</p> <p>a. low resistance in series with galvanometer b. high resistance in series with galvanometer c. low resistance in parallel with galvanometer d. high resistance in parallel with galvanometer</p>	1
5	<p>A magnetic dipole moment of a bar magnet is a vector quantity directed</p> <p>a. Upward at perpendicular bisector to the line joining to north pole and south pole b. From North pole to South pole c. Downward at perpendicular bisector to the line joining to north pole and south pole d. From South pole to North pole</p>	1
6	<p>The susceptibility of a magnetic material is - 4.2×10^{-6}. The material is-</p> <p>a. Ferromagnetic b. Paramagnetic c. Diamagnetic d. None of the above</p>	1
7	<p>The magnetic flux (ϕ) linked with a coil is related to its area (s) as-</p> <p>a. $\phi \propto s$ b. $\phi \propto s^3$ c. $\phi \propto s^{2/3}$ d. $\phi \propto s^{-3/2}$</p>	1

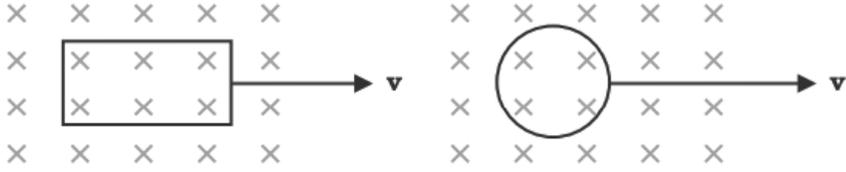
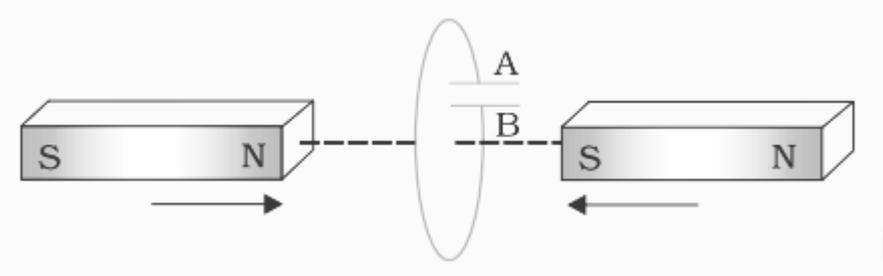
8	<p>Which of the following graphs represents the correct variation of capacitive reactance X_C with frequency ν ?</p> <p>a. </p> <p>b. </p> <p>c. </p> <p>d. </p>	1
9	<p>The rms value of current in an ac circuit is 10A. The value of peak current will be-</p> <p>a. 14.14 A b. 7.09 A c. 21.6 A d. 1.67A</p>	1

10	<p>If the frequency of an A.C is made 4 times of its initial value, the inductive reactance will be-</p> <ul style="list-style-type: none"> a. 2 times b. 3 times c. 4 times d. Unchanged 	1
11	<p>Choose the wave relevant to aircraft navigation</p> <ul style="list-style-type: none"> (a) ultraviolet (b) infrared (c) microwave (d) visible light 	1
12	<p>Which of the following EMW has the highest frequency?</p> <ul style="list-style-type: none"> (a) X-ray (b) ultraviolet rays (c) infrared rays (d) gamma rays 	1
13	<p>Which of the following law was modified by Maxwell by introducing the displacement current?</p> <ul style="list-style-type: none"> a. Gauss's law b. Ampere's circuital law c. Biot-Savart's law d. None of the above 	1
14	<p>An object is placed at 10 cm in front of a concave mirror of radius of curvature 15 cm. The position of the image is-</p> <ul style="list-style-type: none"> a. 15 cm b. - 30 cm c. - 25 cm d. 5 cm 	1
15	<p>The image formed by an objective of a compound microscope is</p> <ul style="list-style-type: none"> a. Virtual and enlarged b. Virtual and diminished c. Real and diminished d. Real and enlarged 	1

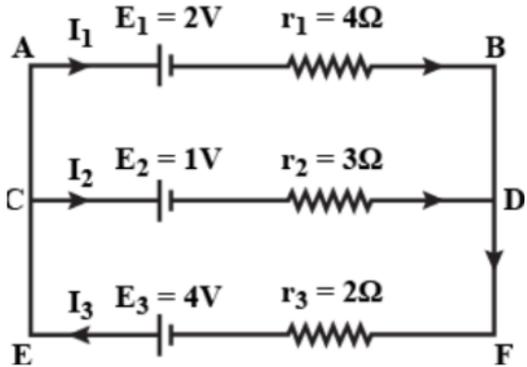
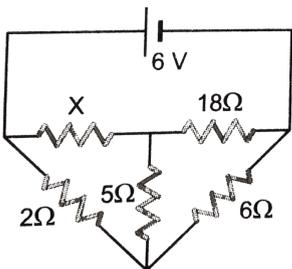
	<p>Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.</p> <p>(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.</p> <p>(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.</p> <p>(c) If the Assertion is correct but Reason is incorrect.</p> <p>(d) If both the Assertion and Reason are incorrect.</p>	
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16	<p>Assertion(A) : Kirchhoff's junction rule is based on conservation of charge.</p> <p>Reason(R): A resistor obeys Ohm's law while a diode does not.</p>	1
17	<p>Assertion(A): On the average, charge carriers in a conductor do not move with acceleration but with a steady drift velocity.</p> <p>Reason(R): This is because of the collisions with ions and atoms during transit.</p>	1
18	<p>Assertion: Some materials like Nichrome (which is an alloy of nickel, iron and chromium) exhibit a very weak dependence of resistivity with temperature.</p> <p>Reasoning: These materials are thus widely used in wire bound standard resistors since their resistance values would change very large with temperatures.</p>	1
	<p style="text-align: center;">Section – B</p> <p>All questions are compulsory. In case of internal choice, attempt any one.</p>	
19	<p>Name the electromagnetic waves referred to as heat waves. Write two applications of these waves.</p>	2

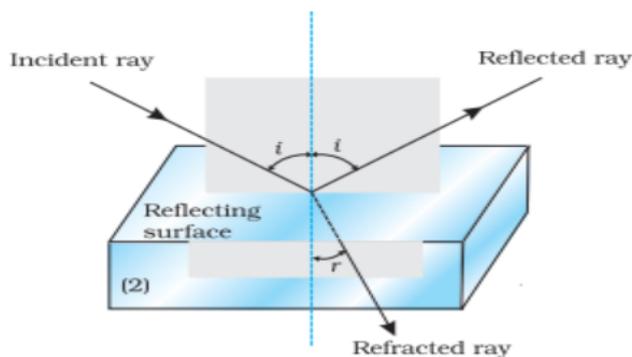
20	<p>Draw a graph for the electric field E versus r for $r \gg a$, when the electric field is E due to a dipole of length $2a$ at a point distant r from the center of the dipole on the axial line.</p> <p>Or</p> <p>Draw a graph for the electric field E versus r for $r \gg a$, when the electric field is E due to a dipole of length $2a$ at a point distant r from the center of the dipole on the equatorial line.</p>	2
21	<p>Explain with the help of a diagram how a moving coil galvanometer can be converted into an ammeter?</p> <p>Or</p> <p>State Biot Savart law and express this law in Vector form.</p>	2
22	<p>A closely wound solenoid of 2000 turns and area of cross-section $1.6 \times 10^{-4} \text{ m}^2$, carrying a current of 4.0 A, is suspended through its center allowing it to turn in a horizontal plane. What is the magnetic moment associated with the solenoid?</p>	2
23	<p>The closed loop PQRS of wire is moved into a uniform magnetic field at right angles to the plane of the paper as shown in the figure. Predict the direction of the induced current in the loop.</p> 	2
24	<p>Calculate the radius of curvature of an equi-concave lens of refractive index 1.5, when it is kept in a medium of refractive index 1.33, to have a power of -5D?</p>	2
25	<p>Derive an expression for the potential at a point along an axial line outside of a short dipole .</p>	2
26	<p>Define resistivity of a conductor, Plot a graph showing the variation of resistivity with temperature for a metallic conductor.</p>	3

27	<p>(a) A rectangular loop and a circular loop are moving out of a uniform magnetic field region as shown in the figure below, 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. Justify.</p>  <p>(b) Predict the polarity of the capacitor in the situation described by Figure below.</p>  <p>OR A pair of adjacent coils has a mutual inductance of 1.5H. If the current in one coil changes from 0 to 20 A in 0.5 s, what is the change of flux linkage with the other coil?</p>	3
28	<p>Two charges $5 \times 10^{-8} \text{ C}$ and $-3 \times 10^{-8} \text{ C}$ are located 16 cm apart. At what point p (p lies somewhere in between the charges) on the line joining the two charges is the electric potential zero? Take the potential at infinity to be zero.</p> <p>OR Three capacitors of capacitances 2 pF, 3 pF and 4 pF are connected in parallel.</p> <p>(a) What is the total capacitance of the combination? (b) Determine the charge on each capacitor if the combination is connected to a 100 V supply.</p>	3
29	Explain three energy losses in the transformer.	3
30	Draw a schematic diagram of a refracting telescope. Write its two important limitations.	3

31	<p>Consider an infinitely long straight uniformly charged wire with linear charge density λ.</p> <p>a) To find the electric field at P (located at a distance 'r' from the line of charge), describe an appropriate Gaussian surface.</p> <p>b) Define electric flux. Write a mathematical expression for the electric flux.</p> <p>c) Find the total electric flux through the Gaussian surface for the above mentioned charged wire.</p> <p>d) What is the net charge enclosed by the Gaussian surface?</p> <p>e) Apply Gauss's theorem to find the electric field at P for the above mentioned charged wire. Write the direction of the field.</p> <p>OR</p> <p>a) Derive an expression for the electric field intensity at any point on the equatorial line of an electric dipole.</p> <p>b) Diagrammatically represent the position of a dipole in (i) stable (ii) unstable equilibrium when placed in a uniform electric field.</p> <p>c) Two point charges having equal charges separated by 1 m distance in air experience a force of 8 N. What will be the force experienced by them if they are held in water at the same distance?</p> <p>(Given, $K_{\text{water}} = 80$)</p>	5
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<p>32</p>	<p>a) The emf of a cell is always greater than its terminal voltage. Why? Give reason.</p> <p>b) Two electric bulbs P and Q have their resistances in the ratio of 1: 2. They are connected in series across a battery. Find the ratio of the power dissipation in these bulbs.</p> <p>c) Use Kirchhoff's rules to write the expressions for the currents I_1, I_2 and I_3 in the circuit diagram shown below.</p>  <p>OR</p> <p>a) What is a Wheatstone bridge?</p> <p>b) When is the bridge said to be balanced?</p> <p>c) Apply Kirchhoff's laws to derive the balanced condition of the Wheatstone bridge.</p> <p>d) Find out the magnitude of resistance X in the circuit shown in figure, When no current flows through the 5Ω resistance.</p> 	<p>5</p>
<p>33</p>	<p>a) Derive an expression for the force per unit length between two infinitely long straight parallel current carrying wires hence define one ampere.</p> <p>b) Two parallel very long straight wires carrying a current of 5A each are kept at a separation of 1m. If the currents are in the same direction, What will be the force per unit length (in N/m) between them?</p>	<p>5</p>

	<p>OR</p> <p>a) Derive an expression for torque acting on a rectangular current carrying loop kept in a uniform magnetic field B. Indicate the direction of torque acting on the loop.</p> <p>b) A square coil of side 10 cm consists of 20 turns and carries a current of 12 A. The coil is suspended vertically and the normal to the plane of the coil makes an angle of 30 degree with the direction of a uniform horizontal magnetic field of magnitude 0.80 T. What is the magnitude of torque experienced by the coil?</p>	
	<p style="text-align: center;">Section – E</p> <p>Questions 34 and 35 are Case Study based questions .In case of internal choice attempt only one of them.</p>	



34

When a beam of light encounters another transparent medium, a part of light gets reflected back into the first medium while the rest enters the other. A ray of light represents a beam. The direction of propagation of an obliquely incident ray of light that enters the other medium, changes at the interface of the two media. This phenomenon is called refraction of light. Snell experimentally obtained the following laws of refraction:

(i) The incident ray, the refracted ray and the normal to the interface at the point of incidence, all lie in the same plane.

(ii) The ratio of the sine of the angle of incidence to the sine of angle of refraction is constant.

Remember that the angles of incidence (i) and refraction (r) are the angles that the incident and its refracted ray make with the normal, respectively. We have

$$\sin i / \sin r = \mu_{21}$$

1) μ_{21} is characteristic of the pair of media which is

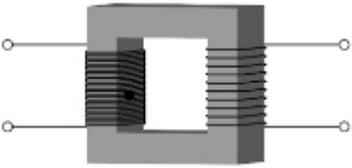
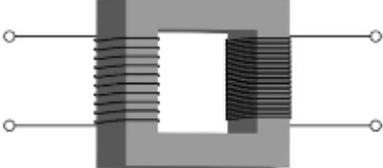
- Independent of the angle of incidence.
- dependent on the angle of incidence.
- does not depend on the wavelength of light.
- None of the above

2) If the refractive index of water is $4/3$ and that of glass is $3/2$. What will be the refractive index of glass with respect to water?

- $9/8$
- $8/9$
- $7/5$
- 1

3) Optical density is the ratio of the speed of light in two media. For example, turpentine and water-

- Mass density of turpentine is more than that of water but its optical density is lesser.
- Mass density of turpentine is less than that of water but its

	<p>optical density is higher.</p> <p>c. Both have equal mass density and optical density.</p> <p>d. None of the above.</p> <p>OR</p> <p>The refractive index of diamond is 2.42. What is the speed of light in a diamond?</p> <p>a. 0.62×10^8 m/s</p> <p>a. 7.23×10^8 m/s</p> <p>b. 0.80×10^8 m/s</p> <p>c. 1.24×10^8 m/s</p>	
35	<p>Transformer</p> <p>For many purposes, it is necessary to change (or transform) an alternating voltage from one to another of greater or smaller value. This is done with a device called a transformer.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>fig (1)</p> </div> <div style="text-align: center;">  <p>fig(2)</p> </div> </div> <p>When an alternating voltage is applied to the primary, the resulting current produces an alternating magnetic flux which links the secondary and induces an emf in it. The value of this emf depends on the number of turns in the secondary. We consider an ideal transformer in which the primary has negligible resistance and all the flux in the core links both primary and secondary windings.</p>	4

1) A step-down transformer increases.....

- a Voltage
- b Current
- c Power
- d Frequency

2) A step-up transformer has _____ number of turns on primary winding and _____ number of turns on secondary winding.

- a less,more
- b more,less
- c less,less
- d more,more

3) If the primary coil of a transformer has 100 turns and the secondary has 200 turns, $N_s / N_p = 2$. Thus, a 220V input at 10A will step-up-

- a. to 220 V output at 20 A
- b. to 440 V output at 10 A
- c. to 440 V output at 5 A
- d. to 110 V output at 10A

OR

A transformer is used to reduce the mains supply of 220V to 22V.If the currents in the primary and secondary are 2A and 15A respectively, then the efficiency of the transformer is

- a 65%
- b 75%
- c 80%
- d 90%

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