مـــدرسـة دلهـــي الخـاصـة ذ.م.م.
DELHI PRIVATE SCHOOL L.L.C.
Affiliated to C.B.S.E., DELHI
(Approved & Recognized By Ministry of Education - United Arab Emirates)
DPS SHARJAH

PB-T1/PHQP/1221/B **14-NOV-2021**

PREBOARD EXAMINATION (2021-22)

Subject: PHYSICS **Max. Marks:35**

Grade: XII **Time: 90 Minutes**

Name: **Section:** **Roll No:**

- **General Instructions:**
  1. The Question Paper contains three sections.
  2. Section A has 25 questions. Attempt any 20 questions.
  3. Section B has 24 questions. Attempt any20 questions.
  4. Section C has 6 questions. Attempt any 5 questions.
  5. All questions carry equal marks.
  6. There is no negative marking.

I. SECTION A

This section consists of 25 multiple choice questions with overall choice to attempt any 20 questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.

1. Shape of equipotential surface due to point charge will be:

a. Spherical normal to electric field **b.** Random

c. circular normal to electric field **d.** Equidistant Planes normal to electric field

2. Consider a neutral conducting sphere. A positive point charge is placed outside the sphere. Then the net charge on the sphere is -

a. Negative and distributed uniformly over the surface of the sphere **b.** Negative and distributed non– uniformly over the entire surface of the sphere

c. Negative and appears only at the point on the sphere closest to the point charge **d.** Zero

3. A spherical conductor of radius 5cm is charged to the potential 10V. Then the electric field at the Centre of the sphere is

a. 5N/C **b.** 50N/C

c. 15N/C **d.** zero

4. Two conducting spheres of radii r_1 and r_2 are equally charged. The ratio of their potential is

a. r_1 / r_2 **b.** r_2^2 / r_1^2

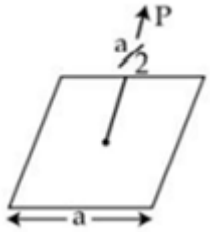
c. r_2 / r_1 **d.** r_1^2 / r_2^2

5. Each of the two-point charges are doubled and their distance is halved. Force of interaction becomes n times, where n is

a. 1 **b.** 18

c. 16 **d.** 4

6. A charge Q is placed at a distance a/2 above the centre of the square surface of edge a as shown in the figure



The electric flux through the square surface is :

a. Q/ϵ_0 **b.** $Q/2\epsilon_0$

c. $Q/3\epsilon_0$ **d.** $Q/6\epsilon_0$

7. A parallel plate capacitor is charged, and the charging battery is then disconnected. If the plates of the capacitor are moved farther apart by means of insulating handles _____ .

a. the electrostatic energy stored in the capacitor increases **b.** the capacitance increases

c. the voltage across the plates decreases **d.** the charge on the capacitor increases

8. The resistance of each arm of a Wheatstone bridge is 10Ω. A resistance of 10Ω is connected in series with the galvanometer. Then, the equivalent resistance of the bridge across the battery will be:

a. 20Ω **b.** 10Ω

c. 15Ω **d.** 40Ω

9. A wire has a resistance of 3.1Ω at 30° C and a resistance 4.5Ω at 100 °C. The temperature coefficient of resistance of the wire is:

a. $0.0034\ °C^{-1}$ **b.** $0.0025\ °C^{-1}$

c. $0.0064\ °C^{-1}$ **d.** $0.12\ °C^{-1}$

10. Kirchhoff's first law at a junction, deals with the conservation of

a. Energy **b.** Momentum

c. Angular momentum **d.** Charge

11. Mobility is defined as

a. the number of charges in motion per unit electric field **b.** the magnitude of the drift velocity per unit voltage

c. the magnitude of the drift velocity per unit charge **d.** the magnitude of the drift velocity per unit electric field

12. A 10 m long wire of resistance 20Ω is connected in series with a battery of emf 3 V and a resistance of 10Ω. The potential gradient along the wire in V/m is:

a. 0.2 **b.** 0.02

c. 1.2 **d.** 0.1

13.` If two identical heaters each rated as (1000 W, 220 V) are connected in parallel to 220 V, then the total power consumed is:

a. 250 W **b.** 2000 W

c. 2500 W **d.** 200W

14. If the length of the conductor is doubled keeping potential and cross section constant, then the drift velocity will be

a. Remains same
b. Reduced to half
c. Doubled
d. Tripled

15. Bohr magneton of hydrogen atom is:

a. Magnetic moment of revolving electron in 1st orbit
b. Magnetic moment of revolving electron in 2nd orbit
c. Magnetic moment of revolving electron in odd number orbits
d. Magnetic moment of revolving electron in any orbit

16. Two thin, long parallel wires, separated by a distance (d) carry a current of i in the same direction. Then they will

a. Attract each other with a force per unit length of $\frac{\mu_0 i^2}{2\pi d}$
b. repel each other with a force per unit length of $\frac{\mu_0 i^2}{2\pi d}$
c. Attract each other with a force per unit length of of $\frac{\mu_0 i^2}{2\pi d^2}$
d. Attract each other with a force per unit length of $\frac{\mu_0 i^2}{2\pi d^2}$

17. A positive charge is moving upward in a magnetic field that is towards the north. The particle will be deflected towards:

a. East
b. west
c. north
d. south

18. Which of the following statements are correct in case of Magnetic field lines

a. Never intersect
b. Always closed loops
c. Are closer in a region of stronger magnetic field
d. All the above

19. If horizontal component of earth's magnetic field is √3 times the vertical component, then the angle of dip at that place is

a. 30^0
b. 45^0
c. 60^0
d. 90^0

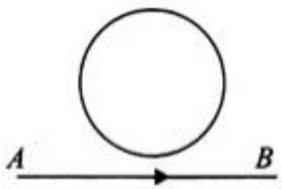
20. Two coils are placed closed to each other. The mutual inductance of the pair of coils depends upon:

a. the currents in the two coils
b. the rates at which currents are changing in the two coils
c. relative position and orientation of the two coils
d. the material of the wires of the coils

21. A long solenoid has 1000 turns. When a current of 4 A flows through it, the magnetic flux linked with each turn of the solenoid is 4 $x10^{-3}$ Wb. The self-inductance of the solenoid is:

a. 1 H
b. 4 H
c. 3 H
d. 2 H

22. In the given figure current from A to B in the straight wire is decreasing. The direction of induced current in the loop is



a. Clockwise **b.** Anticlockwise
c. Changing **d.** Nothing can be said

23. A circular loop of area 0.01 m^2 carrying a current of 10 A, its surface is held perpendicular to the magnetic field of intensity 0.1 T. The torque acting on the loop is
a. 0.01 Nm **b.** 0.8 Nm
c. zero **d.** 0.01

24. The phase difference between the current and voltage at resonance is:
a. 0 **b.** $-\pi$
c. π **d.** $\pi/2$

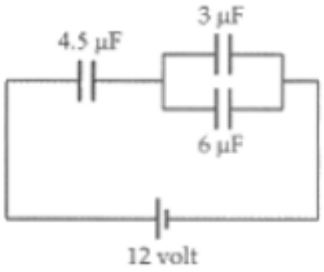
25. In the free oscillations of an LC circuit, the sum of energies stored in the capacitor and the inductor
a. varies linearly with time **b.** varies cubically with time
c. varies as square of time **d.** is constant with time

II. SECTION B

This section consists of 24 multiple choice questions with overall choice to attempt any 20 questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.

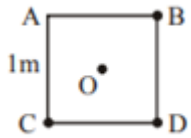
26. Electric field due to infinite plane sheet of charge
a. Increases with distance **b** Decreases with distance
c. Doesn't change with distance **d** None of the above

27. In the circuit shown in the figure, the potential difference across the 4.5μF capacitor is:



a. 8volt **b.** 8 /3 volt
c. 6volt **d.** 4volt

28. Three charges each of +4μC, are placed at the corners B, C, D of a square ABCD of side 1m. The electric field at the Centre O of the square is



a. $7.2x10^4$ towards A **b.** $7.2x10^4$ towards C
c. $3.6x10^4$ towards A **d.** $3.6x10^4$ towards C

29. When an electric dipole is kept in uniform electric field, it experiences torque. In this case which of the following quantities are perpendicular to each other?
a. Torque and electric field **b.** Torque and dipole moment
c. Both a and b **d.** Electric field and dipole moment

30. Potential energy of two equal +ve charges 1μC each held 1 m apart in air is:
a. $9x10^{-3}$eV **b.** $9x10^{-3}$ J
c. Zero **d.** 1J

31. A wire of length L is bent to form a ring of single loop and current is flown through it. The magnetic field at its Centre is B. If the same wire is bent to form two loops and same current is flowing, the new B' at its Centre will be

a. B **b.** B/2

c. 4B **d.** 2B

32. In an L-R-C series circuit, the rms voltage across the resistor is 30.0 V, across the capacitor it is 90.0 V, and across the inductor it is 50.0 V. Rms voltage of the source is

a. 55.0 V **b.** 50.0 V

c. 60.0 V **d.** 65.0 V

33. Twenty-seven drops of mercury are charged simultaneously to the same potential of 10 volts. What will be potential if all the charged drops are made to combine to form one large drop?

a. 180 V **b.** 90 V

c. 120 V **d.** 45

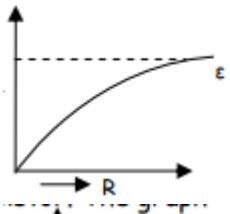
34. In a meter bridge experiment a balance point is obtained at a distance of 60cm from the left end when unknown resistance R is in a left gap and 8ohms resistor is connected in the right gap. When the position of R and 8ohm resistor is interchanged the balance point will be at distance of _____

a. 40 cm **b.** 30 cm

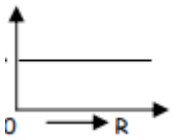
c. 60 cm **d.** 5m

35. A cell of emf (ε) and internal resistance (r) is connected across a variable external resistance (R) which of the graphs shows the model graph for variation of ε with R

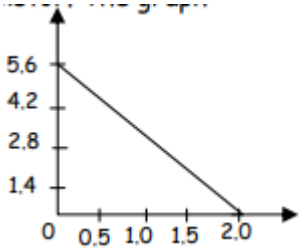
a.



b.



c.



d. None of these

36. Sensitivity of potentiometer can be increased by

a. Increasing length of wire **b.** Decreasing the current drawn from driver cell

c. Reducing potential gradient **d.** All the above

37. An ammeter together with an unknown resistance in series is connected across two identical batteries each of emf 1.5 V. When the batteries are connected in series, the galvanometer records a current of 1A and when the batteries are in parallel, the current is 0.6A. What is the internal resistance of each battery?

a. 1/5 Ω **b.** 1/3 Ω

c. ¼ Ω **d.** ½ Ω

38. If the number of turns of coil increases, then the current sensitivity of moving coil galvanometer will

a. increases **b.** decreases

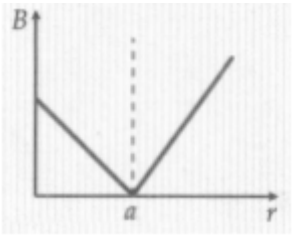
c. Remains same **d.** First decreases then increases

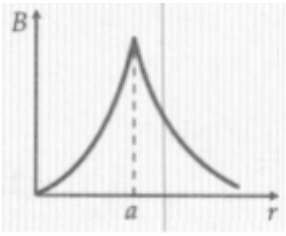
39. A galvanometer has a coil of resistance 100 ohm and gives a full-scale deflection for 30 mA current. If it is to work as a voltmeter of 30volt range, the resistance required to be added will be:

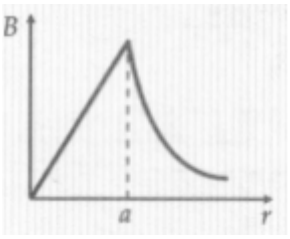
a. 1800Ω **b.** 500Ω

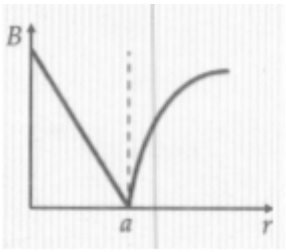
c. 1000Ω **d.** 900Ω

40. A long straight wire of circular cross-section (radius a) carries a steady current I and the current I is uniformly distributed across this cross-section. Which of the following plots represents the variation of the magnitude of magnetic field B with distance centre of the wire?

a. 

b. 

c. 

d. 

41. Kamla peddles a stationary bicycle the pedals of the bicycles are attached to a 100turn coil of area $0.10m^2$. The coil rotates at half a revolution per second and it is placed in a uniform magnetic field of 0.02T perpendicular to the coil. What is the maximum voltage generated in the coil?

a. 0.554V **b.** 0.314V

c. 0.714V **d.** 0.628V

42. In a transformer, the no. of turns of primary and secondary coil are 500 and 400 respectively. If 220V is supplied to the primary coil, then ratio of currents in primary and secondary coils is

a. 4:5 **b.** 5:4

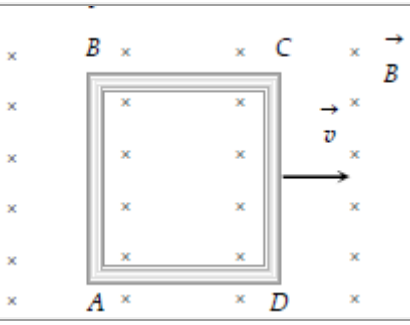
c. 5:9 **d.** 9:5

43. Eddy currents are produced in

a. Induction furnace **b.** Speedometer

c. Electromagnetic brakes **d.** All of these

44. A conducting square loop of side *L* and resistance *R* moves in its plane with a uniform velocity *v* perpendicular to one of its sides. A magnetic induction *B* constant in time and space, pointing perpendicular and into the plane of the loop exists everywhere. The current induced in the loop is



a. BLv/R clockwise **b.** BLv/R anticlockwise

c. 2BLv/R antoclockwise **d.** Zero

For question numbers 45-49 two statements are given- one labeled Assertion (A) and the other labeled Reason (R).

Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

a) Both A and R are true, and R is correct explanation of the assertion.

b) Both A and R are true, but R is not the correct explanation of the assertion.

c) A is true, but R is false.

d) A is false, but R is true.

45. Assertion (A): Magnetic field is not associated with a stationary charge.
Reason (R): A magnetic field can be detected by means of its effect on a current-carrying conductor.

46. Assertion (A): Two protons placed at different distances, between the plates of a parallel plate capacitor experience the same force.
Reason (R): The electric field between the plates of the capacitor is constant

47. Assertion (A): Current carrying solenoid behaves like a bar magnet.
Reason (R): Magnetic moment is a scalar quantity

48. Assertion (A): As the drift velocity increases, the current flowing through the conductor decreases.
Reason (R): The current flowing through a conductor is directly proportional to drift velocity

49. Assertion (A): Induced emf will occur whenever there is change in magnetic flux linked with a conductor
Reason(R): Current always induces whenever there is change in magnetic field.

III SECTION C

This section consists of 6 multiple choice questions with an overall choice to attempt any 5. In case more than desirable number of questions are attempted, ONLY first 5 will be considered for evaluation.

50. Two infinite line charges of linear charge densities $+\lambda$ and $+\lambda$ are kept parallel to each other. Let r is the perpendicular distance between them

a. Electric field between them at the distance r/2 is $\lambda/2r$
b. Electric field between them at the distance r/2 is zero
c. Electric field between them at the distance r/2 is $-(\lambda/2r)$
d. Electric field between them is independent of distance.

51. Two charges -10C and +10C are placed 10 cm apart. Potential at the Centre of the line joining the two charges is

a. 4 V
b. zero
c. -2 V
d. 2 V

CASE STUDY:

Read the following paragraph and answers the questions:

Alternating current is defined as the current that varies like a sine function with time. The value of current will oscillate between a maximum value and a minimum value. In case of AC the current is changing its magnitude at every instant of time according to $I=I_0Sinwt$.

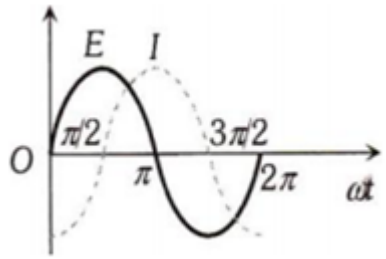
Phasor diagrams are the representations of voltage-current relationship in AC circuits. A phasor is a vector capable of rotating about the origin with (angular velocity) 'ω'. The vertical component of phasor will represent the sinusoidally varying quantity.

When the frequency of ac supply is such that the inductive reactance and capacitive reactance become equal, the impedance of the series LCR circuit is equal to the ohmic resistance in the circuit. Such a series LCR circuit is known as resonant series LCR circuit and the frequency of the ac supply is known as resonant frequency. Resonance phenomenon is exhibited by a circuit only if both L and C are present in the circuit. We cannot have resonance in a RL or RC circuit.

52. For LCR circuit, Q-factor is the ratio of

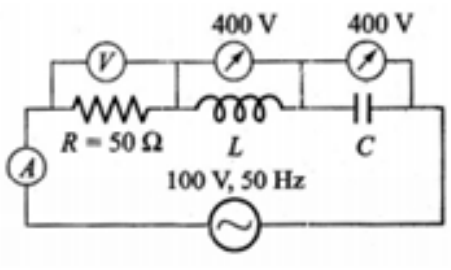
a. Resonant frequency to band width
b. Reactance to resonance frequency
c. Reactance to bandwidth
d. Bandwidth to resonance frequency

53. The variation of instantaneous current I(t) and instantaneous voltage E(t) in a circuit is as shown in figure which of the following statement is correct?



a. Voltage lags behind the current by π/2
b. Voltage leads the current by π/2
c. Voltage and current are in same phase
d. Voltage leads the current by π

54. In the series LCR circuit shown, the voltmeter and ammeter readings are



a. V=100V, I= 2A
b. V=100V, I=5A
c. V=1000V, I=2A
d. V=300V, I= 1A

55. At resonance the LCR circuit acts as

a. Pure inductive
b. Pure resistive
c. Pure capacitive
d. Semi conductive

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