SET NO. 1

Exam ID. | | | | | | |

Candidates must write the Set No. on the title page of the OMR Sheet.

DAV PUBLIC SCHOOLS, ODISHA ZONE –I
PA-II EXAMINATION, 2021-22

- **Check that this question paper contains 14 printed pages.**
- **Set number given on the right hand side of the question paper should be written on the OMR SHEET by the candidate.**
- **Check that this question paper contains 55 questions.**

CLASS –XII
SUB: PHYSICS (042)

Time: 90 Minutes. **Maximum Marks: 35**

General Instruction:

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

SECTION A

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

Q1. In general, metallic ropes are suspended on the carriers taking inflammable materials. The reason is

(A) to control the speed of the carrier.

(B) to keep the centre of gravity of the carrier nearer to the earth.

(C) to keep the body of the carrier in contact with the earth.

(D) none of these.

Q2. A charge Q is divided into two parts of q and Q – q. If the coulomb repulsion between them when they are separated is to be maximum, the ratio of Q/q should be

(A) 2:1 (B) 1:2 (C) 4:1 (D) 1:4

Q3. A cylinder of radius R and length L is placed in a uniform electric field E parallel to the cylinder axis. The total flux for the surface of the cylinder is given by

(A)$2\pi R^2 E$ (B) πR^2 (C) $\frac{\pi R^2 - \pi R}{E}$ (D)$zero$

Q4. A charge Q is placed at each of the two opposite corners of a square. A charge q is placed at each of the two other opposite corners of the square. If the resultant electric force field on Q is zero, then how Q and q are related?

(A)Q= -2√2q (B) Q= 2√2q (C) Q= -2q (D)) Q= $-\frac{q}{2\sqrt{2}}$

Q5. Consider a region inside which, there are various types of charges but the total charge is zero. At points outside the region

(A) the electric field is necessarily zero.

(B) the electric field is due to the dipole moment of the charge distribution only.

(C) the dominant electric field is inversely proportional to r^3, for large r (distance from origin).

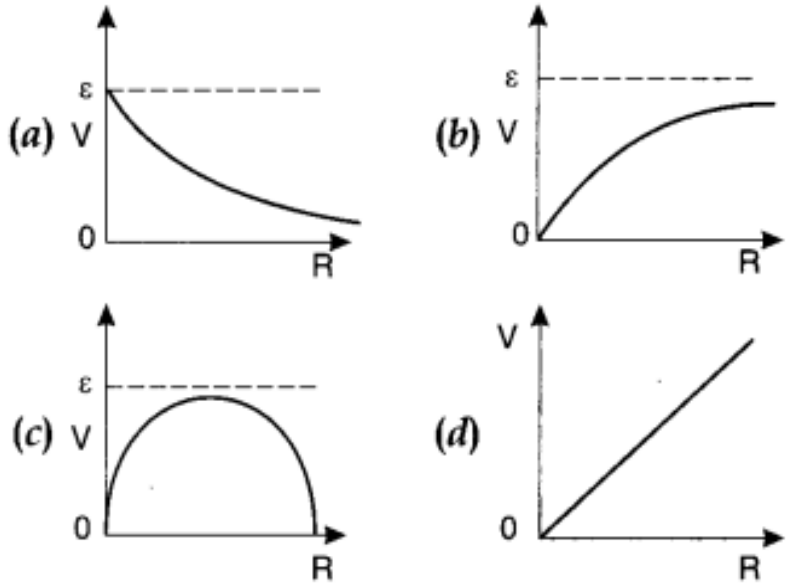
(D) the work done to move a charged particle along a closed path, away from the region will not be zero.

Q6. A positively charged particle is released from rest in an uniform electric field. The electric potential energy of the charge

(A) remains constant because the electric field is uniform.

(B) increases because the charge moves along the electric field.
(C) decreases because the charge moves opposite to the electric field.
(D) decreases because the charge moves along the electric field.

Q7. A cell having an emf E and internal resistance r is connected across a variable external resistance R. As the resistance R is increased, the plot of potential difference V across R is given by



Q8. The masses of three wires of copper are in the ratio of 1:3:5 and their lengths are in the ratio 5:3:1. The ratio of their electrical resistance is:
(A) 1:3:5 (B) 5:3:1 (C) 1:15:125 (D) 125:15:1

Q9. The drift velocity of free electrons in a conductor is *v* when a current i is flowing in it. If both the radius and current are doubled ,then drift velocity will be:
(A) v (B) v/2 (C) v/4 (D) v/8

Q10. The balancing length of a potentiometer is at 120 cm. On shunting the cell with a resistance of 4 ohms, the balancing point shifts to a length of 60 cm. Then, find the internal resistance of the cell.
(A) 2 ohm (B) 5 ohm (C) 3 ohm (D) 4 ohm

Q11. When a metal conductor connected to the left gap of a meter bridge is heated, the balancing point

(A) shifts towards right

(B) shifts towards left

(C) remains unchanged

(D) remains at zero

Q12. In a potentiometer of 10 wires, the balance point is obtained on the 7th wire. To shift the balance point to 9th wire, we should

(A) decrease resistance in the main circuit.

(B) increase resistance in the main circuit.

(C) decrease resistance in series with the cell whose emf is to be measured.

(D) increase resistance in series with the cell whose emf is to be determined.

Q13. What happens between the two streams of electrons moving parallel to each other in the same direction:

(A) attract each other

(B) cross the electric and magnetic field of each other.

(C) repel each other.

(D) none of these.

Q14. If a charged particle moves through a magnetic field perpendicular to it

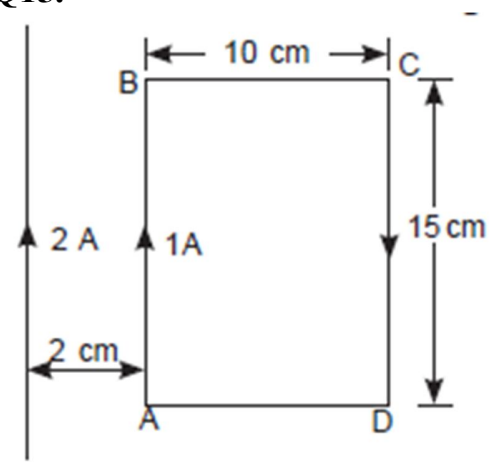
(A) both momentum and energy of particle change.

(B) momentum as well as energy are constant.

(C) kinetic energy is constant but momentum changes.

(D) momentum is constant but energy changes.

Q15.



What is the net force on the rectangular coil?

(A) 25×10^{-7} N towards wire.
(B) 25×10^{-7} N away from wire.
(C) 35×10^{-7} N towards wire.
(D) (d) 35×10^{-7} N away from wire.

Q16. A circular coil of radius R carries a current I. The magnetic field at its centre is B. At what distance from the centre on the axis of the coil, the magnetic field will be (B/8)?

(A) $\sqrt{2}R$ (B) $\sqrt{3}R$ (C) 2R (D) 3R

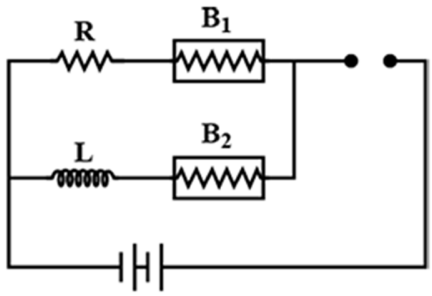
Q17. A charged particle is moving on a circular path with velocity v in a uniform magnetic field B, if the velocity of the charged particle is doubled and strength of magnetic field is halved, then radius becomes

(A) 8 times (B) 4 times (C) 2 times (D) 16 times

Q18. A galvanometer may be converted into an ammeter or a voltmeter. In which of the following cases, the resistances of the device so obtained will be the largest?

(A) Ammeter of range 1 A
(B) Ammeter of range 10 A
(C) Voltmeter of range 1 V
(D) Voltmeter of range 10 V

Q19. The figure shows two bulbs B_1 and B_2, resistor R and inductor L. When the switch S is turned off



(A) Both B_1 and B_2 die out promptly
(B) Both B_1 and B_2 die out with some delay
(C) B_2 dies out promptly, but B_1 with some delay
(D) B_1 dies out promptly, but B_2 with some delay

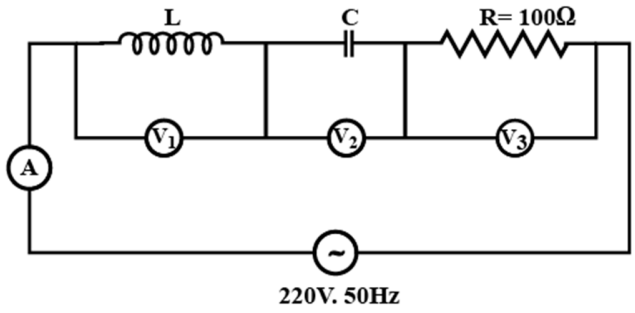
Q20. The magnetic flux linked with a coil at any instant t is given by $\phi = 5t^3 - 100t + 300$ Wb. The emf induced in coil at t=2s is

(A) 40V (B) -40V (C) 140V (D)300V

Q21. A circular loop of radius R carrying current I lies in x-y plane with its centre at origin. The total magnetic flux through x-y plane is :

(A)directly proportional to R (B) zero
(C) inversely proportional to R (D) directly proportional to I

Q22. In the given circuit the reading of voltmeter V_1 and V_2 is 300 volts each. The reading of the voltmeter V_3 and ammeter A are respectively



(A) 100V, 2.0A (B) 150V, 2.2A (C) 220, 2.2A (D) 200V, 2.0A

Q23. In an AC generator, a coil with N turns, all of the same area A and total resistance R, rotates with frequency ω in a magnetic field B. The maximum value of e.m.f. generated in the coil is :

(A) $NABR\omega$ (B) NAB (C) $NABR$ (D) $NAB\omega$

Q24. When a voltage measuring device is connected to AC mains, the meter shows the steady input voltage of 220V. This means

(A) input voltage cannot be AC voltage, but a DC voltage.
(B) maximum input voltage is 220V.
(C) the meter reads not v but and is calibrated to read $\sqrt{< v2 >}$.
(D) the pointer of the meter is stuck by some mechanical defect.

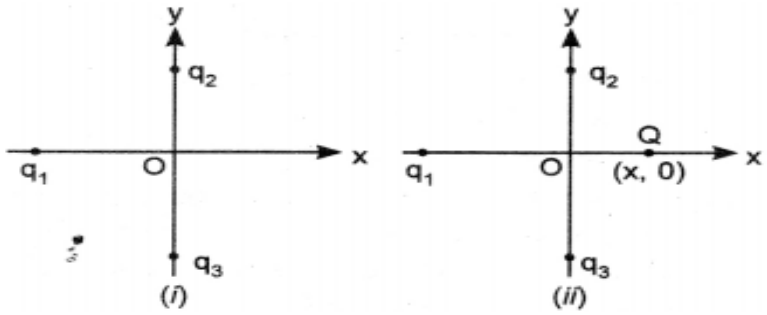
Q25. The electric current in a circuit is given by $i = i_0 t/\tau$ for some time. The rms current for the period t = 0 to $t = \tau$ will be-

(A) $i_0/\sqrt{2}$ (B) $i_0/\sqrt{3}$ (C) $i_0/2$ (D) $i_0/3$

SECTION B

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

Q26. In Fig. (i) two positive charges q_2 and q_3 fixed along the y-axis, exert a net electric force in the +x direction on a charge q_1 fixed along the x-axis. If a positive charge Q is added at (x, 0) in figure (ii), the force on q_1 is



(A) shall decrease along the positive x-axis.
(B) shall increase along the positive x-axis.
(C) shall point along the negative x-axis.
(D) shall increase but the direction changes because of the intersection of Q with q_2 and q_3

Q27. Eight mercury droplets having a radius of 1mm and a charge of 0.066pC each merge to form one droplet. Its potential is:

(A) 1.2V (B) 2.4V (C) 3.6V (D) 4.8V

Q28. Two concentric spheres of radii R and r have similar charges with equal surface densities σ. What is the electric potential at their common centre?

(A) $\frac{\sigma}{\epsilon_0}$ (B) $\frac{\sigma}{\epsilon_0}$(R+r) (C) $\frac{\sigma}{\epsilon_0}$(R-r) (D) Zero

Q29. A uniform electric field 25N/C exists along the x-axis in space. The potential difference ($V_B - V_A$) for the points A (4m,2m) and (6m,5m)is:

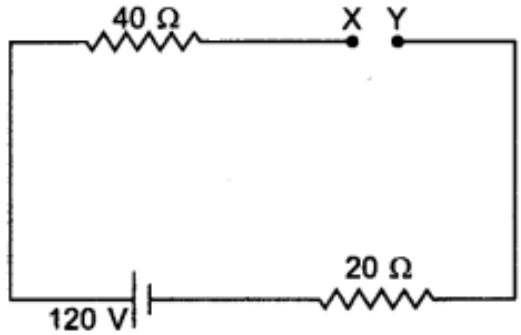
(A) $25\sqrt{13}$ volt (B) - 40 volt (C)– 50 volt (D) Zero volt

Q30. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

(A) proportional to the square root of the distance between the plates.
(B) linearly proportional to the distance between the plates.

(C) independent of the distance between the plates.
(D) inversely proportional to the distance between the plates.

Q31. In the circuit shown, potential difference between X and Y is _____ and across 40 Ω is _____ .



(A) 40 V, 80 V (B) 0 V, 80 V (C) 120 V, 0 V (D) 0 V, 0 V

Q32. A wire connected to a power supply of 230 V has power dissipation P_1 .Suppose the wire is cut into two equal pieces and connected parallel to the same power supply. In this case power dissipation is P_2. The ratio P_2 / P_1 is.

(A) 1 (B) 2 (C) 3 (D) 4

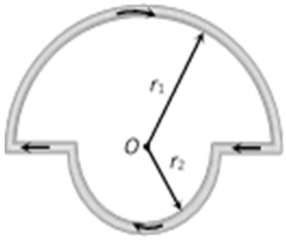
Q33. In the equation AB = C, A is the current density, C is the electric field, Then B is

(A) resistivity (B) conductivity
(C) potential difference (D) resistance

Q34. If B_1 and B_2 are the magnetic fields at a radial distance 2R and R/2 respectively from the axis of a thick current carrying conductor of radius R carries a steady current I , then B_1: B_2

(A) 1 : 1 (B) 2 : 1 (C) 1 : 4 (D) 4 : 1

Q35. In the figure shown there are two semicircles of radii r_1=2r and r_2= r in which a current i is flowing. The magnetic induction at the centre O will be



(A) $\mu_0 i/16r$ **(B) $\mu_0 i/8r$** **(C) $\mu_0 i/4r$** **(D) $3\mu_0 i/8r$**

Q36. A thin circular wire carrying a current I has a magnetic moment M. The shape of the wire is changed to a square and it carries the same current. It will have a magnetic moment

(A) M (B) M($\frac{\pi}{4}$) (C) M($\frac{4}{\pi}$) (D) 2 M

Q37. An electron is projected with uniform velocity along the axis of a current carrying long solenoid. Which of the following is true?

(A) The electron will be accelerated along the axis.
(B) The electron path will be circular about the axis.
(C) The electron will experience a force at 45° to the axis and hence execute a helical path.
(D) The electron will continue to move with uniform velocity along the axis of the solenoid

Q38. Magnetic field strength due to a short bar magnet at a distance x on the axial line is $\frac{B}{2}$ from its centre. What is its value at the same distance on the equatorial line?

(A) B (B) $\frac{B}{4}$ (C) $\frac{B}{8}$ (D) 2B

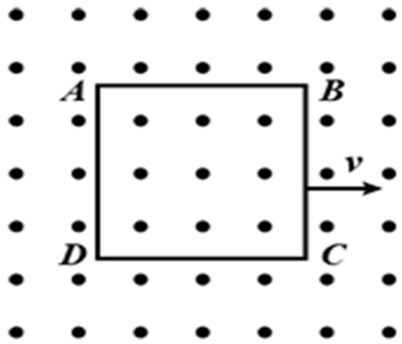
Q39. If at a certain place earth's total magnetic field is double that of the horizontal components of that place, then the angle of dip of that place is

(A) 45^0 (B) 30^0 (C) 60^0 (D) 90^0

Q40. A small square loop of wire of side l is placed inside a large square loop of wire of size L (L >> l). The loops are coplanar and their centers coincide. The mutual inductance of the system is proportional to

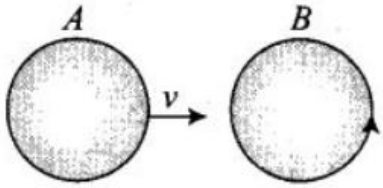
(A) $\frac{l}{L}$ (B) $\frac{l^2}{L}$ (C) $\frac{L}{l}$ (D) $\frac{L^2}{l}$

Q41. A metallic square loop ABCD is moving in its own plane with velocity v in a uniform magnetic field perpendicular to its plane as shown in the figure. An electric field is induced



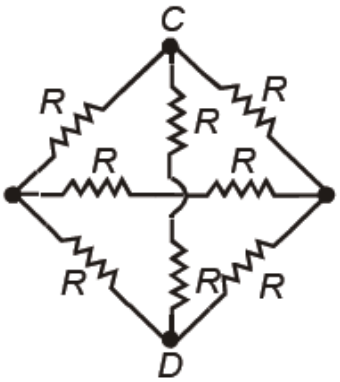
(A) in AD, but not in BC
(B) in BC, but not in AD
(C) neither in AD nor in BC
(D) in both AD and BC

Q42. There are two coils A and B as shown in Fig. A current starts flowing in B as shown, when A is moved towards B and stops when A stops moving. The current in A is counter clockwise. B is kept stationary when A moves. We can infer that



(A) there is a constant current in the clockwise direction in A.
(B) there is a varying current in A.
(C) there is no current in A.
(D) there is a constant current in the counter clockwise direction in A.

Q43. The effective resistance between C & D in the given circuit is



(A) R
(B) 3R
(C) 2R/3
(D) R/3

Q44. If a current I given by $I_0 \sin(\omega t - \pi/2)$ flows in an AC circuit across which an AC potential of $E_0 \sin\omega t$ has been applied, then the power consumption P in the circuit will be:

(A) $\boldsymbol{E_0 I_0/\sqrt{2}}$ (B) $\boldsymbol{E_0 I_0/2}$ (C) $\boldsymbol{EI/\sqrt{2}}$ (D) zero

Q45. Assertion and reason type

Assertion (A): Conductors having equal positive charge and volume must also have same potential.

Reason (R): Potential depends only on charge and volume of the conductor.

(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but the reason is not correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If the assertion and reason both are false.

Q46. Assertion and reason type

Assertion (A): The electric field due to a discrete charge distribution is not defined at the locations of the discrete charges.

Reason (R): For a surface charge distribution electric field is discontinuous across the surface.

(A) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but the reason is not correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If the assertion and reason both are false.

Q47. Assertion and reason type

Assertion (A): The conductivity of an electrolyte is very low as compared to a metal at room temperature.

Reason (R): The number density of free ions in electrolyte is much smaller as compared to number density of free electrons in metals. Further ions drift much more slowly being heavier.

(A)If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but the reason is not correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If the assertion and reason both are false.

Q48. Assertion and reason type

Assertion (A): If we use a battery across the primary of a step up transformer then voltage is also obtained across secondary.
Reason (R): Battery gives a time varying current, so there is a change in magnetic flux through the secondary of transformer and hence, emf is induced across secondary.

(A)If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but the reason is not correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If the assertion and reason both are false.

Q49. Assertion and reason type

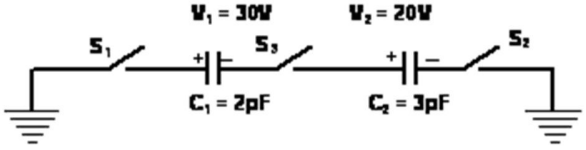
Assertion (A): In series LCR circuit, the resonance occurs at one frequency only.
Reason (R): At resonance, the inductive reactance is equal and opposite to the capacitive reactance.

(A)If both assertion and reason are true and the reason is the correct explanation of the assertion.
(B) If both assertion and reason are true but the reason is not correct explanation of the assertion.
(C) If assertion is true but reason is false.
(D) If the assertion and reason both are false.

SECTION C

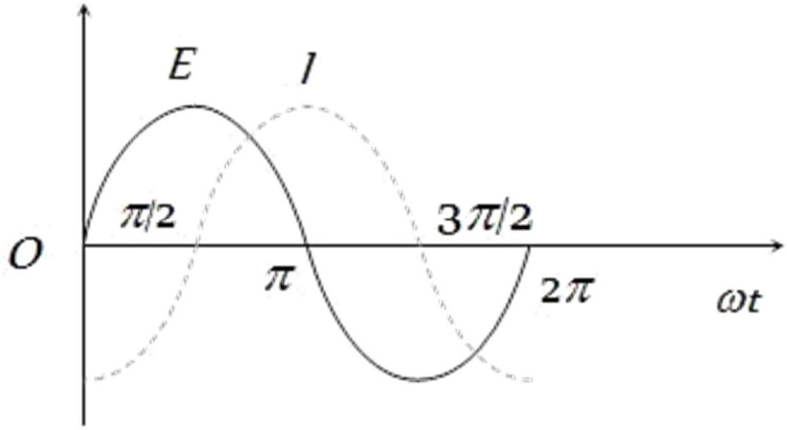
This section consists of 6 multiple choice questions with an overall choice to attempt any 5. In case more than desirable numbers of questions are attempted, ONLY first 5 will be considered for evaluation.

Q50. For the circuit shown which of the following statements is true ?



(A) With S_1 closed, V_1 = 1 5 V, V_2 = 20 V (B) With S_3 closed $V_1 = V_2$ = 25 V
(C) With S_1 & S_2 closed, $V_1 = V_2 = 0$ (D) With S_1 & S_3 closed, V_1 = 30 V, V_2 = 20 V

Q51. The variation of the instantaneous current (*I*) and the instantaneous emf (*E*) in a circuit is as shown in fig. Which of the following statements is correct?

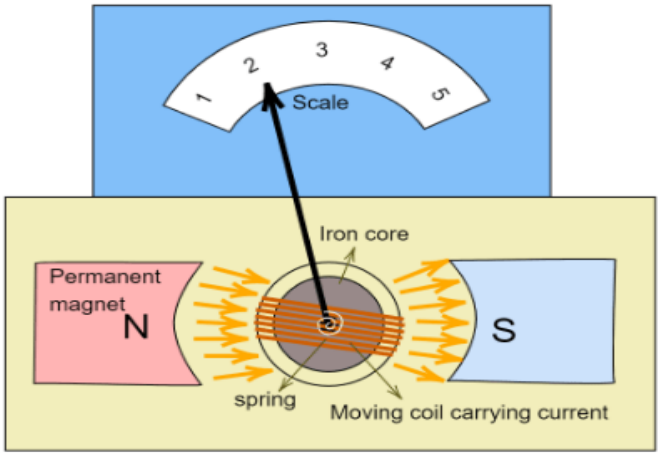


(A) The voltage lags behind the current by Π/2 (B) The voltage leads the current by Π/2
(C)The voltage and the current are in phase (D) The voltage leads the current by Π

Case study:
Read the following paragraph and answer the questions.

MOVING COIL GALVANOMETER.

Its working is based on the fact that when a current carrying coil is placed in a magnetic field, it experiences a torque. This torque tends to rotate the coil about its axis of suspension in such a way that the magnetic flux passing through the coil is maximum.



Front view of a Moving Coil Galvanometer

Q52. To make the field radial in a moving coil galvanometer.

(A) number of turns of coil is kept small
(B) magnet is taken in the form of bar
(C) poles are of very strong magnets
(D) poles are made concave in shape.

Q53. The deflection in a moving coil galvanometer is

(A) directly proportional to torsional constant of spring
(B) directly proportional to the number of turns in the coil
(C) inversely proportional to the area of the coil
(D) inversely proportional to the current in the coil

Q54. To increase the current sensitivity of a moving coil galvanometer, we should decrease

(A) strength of magnet
(B) torsional constant of spring
(C) number of turns in coil
(D) area of coil

Q55. How will you convert 1 mA full scale deflection galvanometer of resistance 100Ω into an ammeter to read 1 A?

(A) By connecting 900 Ω in series
(B) By connecting 0.1 Ω in series
(C) By connecting 900 Ω in parallel
(D) By connecting 0.1Ω in parallel

********** ALL THE BEST **********