Sample Question Paper – 2 (TERM - I)

Class XII (Session - 2021-22)

Subject- Physics

Time Allowed: 90 minutes **Maximum Marks: 45**

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 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 number of questions are attempted, ONLY first 20 will be considered for evaluation.

1. A body is positively charged, it implies that **[1]**

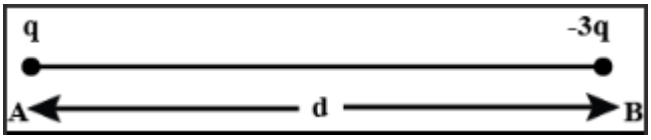
(a) there is only positive charge in the body

(b) there is positive as well as negative charge in the body but the positive charge is more than negative charge

(c) there is equal positive and negative charge in the body but the positive charge lies in the outer regions

(d) negative charge is displaced from its position

2. Two charge q and $-3q$ are placed fixed on x-axis separated by distance d. Where should a third charge 2q be placed such that it will not experience any force? **[1]**



(a) $d + \sqrt{3}d$

(b) $\frac{d+\sqrt{3}d}{2}$

(c) $\frac{d+3d}{2}$

(d) $d + 3d$

3. The electric potential inside a conducting sphere **[1]**

(a) increases from centre to surface

(b) decreases from centre to surface

(c) remains constant from centre to surface

(d) is zero at every point inside

4. The electric potential at a point (x, y) in the $x - y$ plane is given by $V = -kxy$. The field intensity at a distance r from the origin varies as **[1]**

(a) r^2

(b) r

(c) $\frac{1}{r}$

(d) $\frac{1}{r^2}$

5. Magnetic field at the centre of a circular coil of radius r through which a current I flows is **[1]**

(a) directly proportional to r

(b) inversely proportional to I

(c) directly proportional to I

(d) directly proportional to I^2

6. A square of side L metres lies in the xy-plane in a region, where the magnetic field is given by $B = B_0(2\hat{i} + 3\hat{j} + 4\hat{k})$ T, where B_0 is constant. The magnitude of flux passing through the square is **[1]**

(a) $2\ B_0\ L^2$ Wb

(b) $3\ B_0\ L^2$ Wb

(c) $4\ B_0\ L^2$ Wb

(d) $\sqrt{29}\ B_0\ L^2$ Wb

7. A varying magnetic flux linking a coil is given by $\phi = xt^2$. If at a time $t = 3$ s, the emf induced is 9 V, then value of x is **[1]**

(a) $0.66\ \text{Wb/s}^2$

(b) $1.5\ \text{Wb/s}^2$

(c) $-0.66\ \text{Wb/s}^2$

(d) $-1.5\ \text{Wb/s}^2$

8. An electric dipole with dipole moment 4×10^{-9} Cm is aligned at 30° with the direction of a uniform electric field of magnitude $5 \times 10^4 \text{NC}^{-1}$. The torque acting on the dipole is **[1]**

(a) 1×10^{-4}Nm

(b) 5×10^{-8}Nm

(c) 11×10^{-12}Nm

(d) 25×10^{-19}Nm

9. The electrostatic potential energy of a system of two charges is negative when **[1]**

(a) both the charges are positive

(b) both the charges are negative

(c) one charge is positive and other is negative

(d) both the charges are separated by infinite distance

10. Consider the following statements and select the true/ false. **[1]**

I. Force on the charged particle will be zero in magnetic field if it is at rest.

II. Direction of force on moving charge particle is given by Fleming's Left-Hand Rule.

III. A charged particle enters a region of uniform magnetic field at an angle of 45° to the magnetic lines of force, the path of the particle is a circle.

IV. There is no change in the kinetic energy of a charged particle moving in a magnetic field although a magnetic force is acting on it.

(a) F, F, F, T

(b) F, T, F, F

(c) T, T, F, T

(d) F, F, T, T

11. A cell of internal resistance r is connected across an external resistance nr. Then the ratio of the terminal voltage to the emf of the cell is **[1]**

(a) $\frac{1}{n}$

(b) $\frac{1}{n+1}$

(c) $\frac{n}{n+1}$

(d) $\frac{n-1}{n}$

12. On moving a charge of 20 coulomb by 2 cm, 2 J of work is done, then the potential difference between the points, is **[1]**

(a) 0.1 V

(b) 8 V

(c) 2 V

(d) 0.5 V

13. At a certain place, horizontal component of earth's magnetic field is $\sqrt{3}$ times the vertical component. The angle of dip at this place is **[1]**

(a) 0

(b) $\pi/3$

(c) $\pi/6$

(d) $\pi/8$

14. The magnetic compass is not useful for navigation near the magnetic poles, since **[1]**

(a) $R = 0$(Resultant field)

(b) $V = 0$ (Vertical field)

(c) $H = 0$ (Horizontal field)

(d) $\theta = 0°$ (Angle of declination)

15. A parallel plate capacitor is charged to a certain voltage. Now, if the dielectric material (with dielectric constant k) is removed then the **[1]**

(a) capacitance increases by a factor of k

(b) electric field reduces by a factor k

(c) voltage across the capacitor decreases by a factor k

(d) None of these.

16. Two resistors R_1 and R_2 of 4Ω and 6Ω are connected in parallel across a battery. The ratio of power dissipated in them, $P_1 : P_2$ will be **[1]**

(a) 4: 9

(b) 3: 2

(c) 9: 4

(d) 2: 3

17. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10Ω is **[1]**

(a) 0.5Ω

(b) 0.8Ω

(c) 1.0Ω

(d) 0.2Ω

18. Kirchhoff's first and second laws for electrical circuits are consequences of **[1]**

(a) conservation of electric charge and energy respectively

(b) conservation of electric charge

(c) conservation of energy and electric charge respectively

(d) conservation of energy

19. Sensitivity of potentiometer can be increased by **[1]**

(a) increasing the e.m.f of the cell

(b) increasing the length of the potentiometer wire

(c) decreasing the length of the potentiometer wire

(d) None of these

20. According to Faraday's law of electromagnetic induction **[1]**

I. The induced emf is not in the direction opposing the change in magnetic flux.

II. The relative motion between the coil and magnet produces change in magnetic flux.

III. Only the magnet should be moved towards coil. The true/false statement (s) are

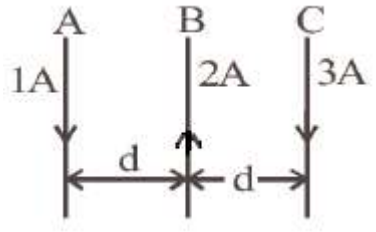
(a) T, T, F

(b) F, T, F

(c) F, F, T

(d) F, T, T

21. Three wires A, B and C are situated at the same distance. A current of 1 A, 2 A, 3 A flows through these wires in the shown direction. Then the resultant force on B is directed **[1]**



(a) Towards A

(b) Towards C

(c) Perpendicular to the plane of paper and outward

(d) Perpendicular to the plane of paper and inward

22. A galvanometer having a resistance of 8 ohms is shunted by a wire of resistance 2 ohms. If the total current is 1amp., the part of it passing through the shunt will be : **[1]**

A 0.2amp

B 0.25amp

C 0.8amp

D 0.5amp

23. The instantaneous voltage through a device of impedance 20Ω is $e = 80\sin 100\pi t$. The effective value of the current is

(a) 3 A

(b) 2.828 A

(c) 1.732 A

(d) 4 A

24. In a series LCR circuit which of the following statements is/are true/false? **[1]**

I. At resonance impedance becomes minimum and current becomes maximum.

II. At resonance current is in phase with applied voltage

III. Resonant frequency depends upon the resistance of the circuit.

(a) T, F, F

(b) F, T, F

(c) T, F, T

(d) T, T, F

25. In a transformer, number of turns in the primary coil are 140 and that in the secondary coil are 280 . If current in primary coil is 4 A, then that in the secondary coil is **[1]**

(a) 4 A

(b) 2 A

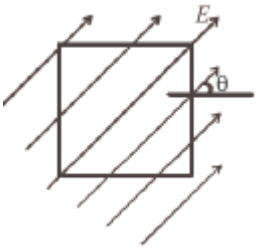
(c) 6 A

(d) 10 A.

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. A square surface of side L meter in the plane of the paper is placed in a uniform electric field E(volt /m) acting along the same plane at an angle θ with the horizontal side of the square as shown in Figure. The electric flux linked to the surface, in units of volt. m, is **[1]**



(a) EL^2

(b) $EL^2 \cos\theta$

(c) $EL^2 \sin\theta$

(d) zero

27. At the centre of a cubical box +Q charge is placed. The value of total flux that is coming out a wall is **[1]**

(a) Q/ε_o

(b) $Q/3\varepsilon_o$

(c) $Q/4\varepsilon_o$

(d) $Q/6\varepsilon_o$

28. In a medium of dielectric constant K, the electric field is $\vec{E}$. If $\in_0$ is permittivity of the free space, the electric displacement vector is **[1]**

(a) $\frac{KE}{\in_0}$

(b) $\frac{\vec{E}}{K\in_0}$

(c) $\frac{\in_0 \vec{E}}{K}$

(d) $K \in_0 \vec{E}$

29. A 5.0μF capacitor is charged to a potential difference of 800 V and discharged through a conductor. The energy given to the conductor during the discharge is **[1]**

(a) 1.6×10^{-2} joule

(b) 3.2 joule

(c) 1.6 joule

(d) 4.2 joule

30. Which of the following about potential difference between any two points, are true/false. **[1]**

I. It depends only on the initial and final position.

II. It is the work done per unit charge in moving from one point to other.

III. It is more for a positive charge of two units as compared to a positive charge of one unit.

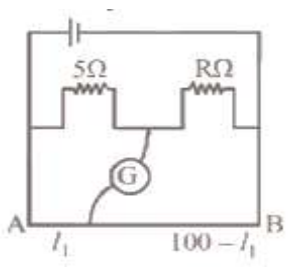
(a) T, F, F

(b) F, T, F

(c) T, T, F

(d) T, T, T

31. The resistances in the two arms of the meter bridge are 5Ω and RΩ, respectively. When the resistance R is shunted with an equal resistance, the new balance point is at $1.6l_1$. The resistance ' R ' is : **[1]**



(a) 10Ω

(b) 15Ω

(c) 20Ω

(d) 25Ω

32. A resistance R is to be measured using a meter bridge, student chooses the standard resistance S to be 100Ω. He finds the null point at $l_1 = 2.9$ cm. He is told to attempt to improve the accuracy. **[1]**

Which of the following is a useful way?

(a) He should measure I_1 more accurately

(b) He should change S to 1000Ω and repeat the experiment

(c) He should change S to 3Ω and repeat the experiment

(d) He should given up hope of a more accurate measurement with a meter bridge

33. The magnetic dipole moment of a current carrying coil does not depend upon **[1]**

(a) number of turns of the coil.

(b) cross-sectional area of the coil.

(c) current flowing in the coil.

(d) material of the turns of the coil.

34. A square current carrying loop is suspended in a uniform magnetic field acting in the plane of the loop. If the force on one arm of the loop is $\vec{F}$, the net force on the remaining three arms of the loop is **[1]**

(a) $3\vec{F}$

(b) $-\vec{F}$

(c) $-3\vec{F}$

(d) $\vec{F}$

35. Find the self-inductance of a coil in which an e.m.f. of 10 V is induced when the current in the circuit changes uniformly from 1 A to 0.5 A in 0.2sec. **[1]**

(a) 4H

(b) 2H

(c) 3H

(d) 5H

36. Eddy currents are produced when **[1]**

(a) a metal is kept in varying magnetic field

(b) a metal is kept in steady magnetic field

(c) a circular coil is placed in a magnetic field

(d) through a circular coil, current is passed

DIRECTIONS: Each of these questions contains an assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are correct and the Reason is the correct explanation of the Assertion.

(b) If both Assertion and Reason are correct but Reason is not the correct explanation of the Assertion.

(c) If the Assertion is correct but Reason is incorrect.

(d) If the Assertion is incorrect but the Reason is correct.

37. **Assertion:** When bodies are charged through friction, there is a transfer of electric charge from one body to another, but no creation or destruction of charge. **[1]**
Reason: This follows from conservation of electric charges.

38. **Assertion :** Coulomb force and gravitational force follow the same inverse-square law. **[1]**
Reason : Both laws are same in all aspects.

39. **Assertion :** Rate of change of potential is maximum at right angles to an equipotential surface. **[1]**
Reason : There is no net force is acting on the dipole in a uniform electric field.

40. **Assertion :** A dielectric is inserted between the plates of a battery connected capacitor. The potential difference between the plates remains constant. **[1]**
Reason : As the battery remains connected maintaining the same potential difference.

41. **Assertion :** The electric bulbs glows immediately when switch is on. **[1]**
Reason : The drift velocity of electrons in a metallic wire is very high.

42. **Assertion:** For a conductor resistivity increases with increase in temperature. **[1]**
Reason: Since $\rho = \frac{m}{ne^2\tau}$, when temperature increases the random motion of free electrons increases and vibration of ions increases which decreases τ.

43. **Assertion:** Long distance power transmission is done at high voltage. **[1]**
Reason: At high voltage supply power losses are less.

44. **Assertion :** Assertion : Kirchoff's junction rule can be applied to a junction of several lines or a point in a line. [1]

Reason : When steady current is flowing, there is no accumulation of charges at any junction or at any point in a line.

45. **Assertion :** The sensitivity of a moving coil galvanometer is increased by placing a suitable magnetic material as a core inside the coil. [1]

Reason : Soft iron has high magnetic permeability and cannot be easily magnetized or demagnetized.

46. **Assertion :** Only a change in magnetic flux will maintain an induced current in the coil. [1]

Reason : The presence of constant magnetic field through a coil maintain an induced current in the coil of the circuit.

47. The time constant of $C - R$ circuit is [1]

(a) $1/CR$

(b) C/R

(c) CR

(d) R/C

48. With increase in frequency of an A.C. supply, the inductive reactance

(a) decreases

(b) increases directly with frequency

(c) increases as square of frequency

(d) decreases inversely with frequency

49. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at $t = 0$. The time at which the energy is stored equally between the electric and the magnetic fields is: [1]

(a) $\frac{\pi}{4}\sqrt{LC}$

(b) $2\pi\sqrt{LC}$

(c) $\sqrt{LC}$

(d) $\pi\sqrt{LC}$

[1]

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. The line on the earth surface joining the point where the field is horizontal, is called

(a) magnetic equator

(b) magnetic line

(c) magnetic axis

(d) magnetic inertia

Case 1: The moving charged particle will experience electric force $\vec{\mathbf{F}}_{\mathbf{e}} = \mathbf{q}\vec{\mathbf{E}}$ and magnetic force $\vec{\mathbf{F}}_{\mathbf{m}} = \mathbf{q}(\vec{\mathbf{v}} \times \vec{\mathbf{B}})$

Net force on the charged particle $\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$ "Lorentzforce"

Depending on the direction of $\vec{v}$, $\vec{E}$ and $\vec{B}$ various situations are possible and the motion in general is quite complex.

51. An electron having a charge e moves with a velocity v in X-direction. A magnetic field acts on it in Y-direction. The force on the electron acts in

(a) positive direction of Y-axis

(b) negative direction of Y-axis

(c) positive direction of Z-axis

(d) negative direction of Z-axis

52. Lorentz force is

(a) electrostatic force acting on a charged particle.

(b) magnetic force acting on a moving charged particle.

(c) the vector sum of electrostatic and magnetic force acting on a moving charged particle.

(d) the vector sum of gravitational and magnetic force acting on a moving charged particle.

53. A certain region has an electric field $\vec{E} = (2\hat{\imath} - 3\hat{\jmath})\text{N/C}$ and a uniform magnetic field $\vec{B} = (5\hat{\imath} + 3\hat{\jmath} + 4\hat{k})\text{T}$. The force experienced by a charge 1C moving with velocity $(\hat{\mathbf{i}} + 2\hat{\mathbf{j}})\text{ms}^{-1}$ is

(a) $(10\hat{\imath} - 7\hat{\jmath} - 7\hat{k})$

(b) $(10\hat{\imath} + 7\hat{\jmath} + 7\hat{k})$

(c) $(-10\hat{\imath} + 7\hat{\jmath} + 7\hat{k})$

(d) $(10\hat{\imath} + 7\hat{\jmath} - 7\hat{k})$

54. A proton moving with a constant velocity passes through a region of space without any change in its velocity. If E and B represent the electric and magnetic fields respectively, this region of space may not have

(a) $E = 0, B = 0$

(b) $E = 0, B \neq 0$

(c) $E \neq 0, B = 0$

(d) $E \neq 0, B \neq 0$

55. A charged particle with velocity 2×10^3 m/s passes undeflected through electric and magnetic field. Magnetic field is 1.5 tesla. The electric field intensity would be

(a) 2×10^3 N/C

(b) 1.5×10^3 N/C

(c) 3×10^3 N/C

(d) $4/3 \times 10^{-3}$ N/C