RAVI MATHS TUITION CENTER, CHENNAI-82. WHATSAPP.- 8056206308

TERM 1 MODEL PAPER 10

12th Standard CBSE

Physics

FROM 31 TO 34 ANSWER ANY 2 ONLY

Exam Time : 01:30:00 Hrs

Total Marks : 40

1) A point positive charge is brought near an isolated conducting sphere (figure). The electric field is best given by 1

(a)  (b)  (c)  (d) 

2) The number of electrons that must be removed from an electrically neutral silver dollar to give it a charge of + 2.4 C is 1

(a) 2.5×10^{19} (b) 1.5×10^{19} (c) 1.5×10^{-19} (d) 2.5×10^{-19}

3) There are two charges +1 μC and +5 μC. The ratio of the forces acting on them will be 1

(a) 1 : 5 (b) 1 : 1 (c) 5 : 1 (d) 1 : 25

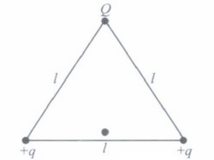
4) A condenser is charged to double its initial potential. The energy stored in the condenser becomes x times, where x= 1

(a) 2 (b) 4 (c) 1 (d) 1/2

5) A parallel-plate capacitor has circular plates of radius 8 cm and plate separation 1mm. What will be the charge on the plates if a potential difference of 100 V is applied 1

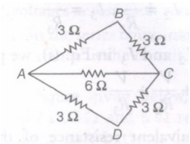
(a) 1.78×10^{-8} C (b) 1.78×10^{-5} C (c) 4.3×10^{4} C (d) 2×10^{-9} C

6) Three charges Q, +q and +q are placed at the vertices of an equilateral triangle of side l as shown in the figure. If the net electrostatic energy of the system is zero, then Q is equal to 1



(a) -q (b) +q (c) zero (d) $-\frac{q}{2}$

7) In the following diagram, equivalent resistance between A and D is 1



(a) 5 Ω (b) 4 Ω (c) 3Ω (d) 2Ω

8) Drift velocity v_d varies with the intensity of electric field as per the relation 1

(a) $v_d \propto E$ (b) $v_d \propto \frac{1}{E}$ (c) v_d = constant (d) $\boldsymbol{v_d} \propto \boldsymbol{E}^2$

9) In a cyclotron a charged particle 1

(a) undergoes acceleration all the time

(b) speeds up between the dees because of the magnetic field.

(c) speeds up in a dee

(d) slows down within a dee and speeds up between dees.

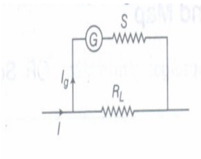
10) In an ammeter 0.5% of main current passes through galvanometer. If resistance of galvanometer is G, the resistance of ammeter will be 1

(a) G/200 (b) G/199 (c) 199 G (d) 200G.

11) There is a thin conducting wire carrying current. What is the value of magnetic field induction at any point on the conductor itself ? 1

(a) 1 (b) Zero (c) - 1 (d) Either (a) or (b

12) For the voltmeter circuit given, 1



(a) $\frac{I_g}{I} = \frac{G}{S}$ (b) $\frac{I}{I_g} = \frac{R_L+G}{S}$ (c) $(I - I_g)R_L = I_g(G+S)$ (d) $IR_L = I_gG$

13) The maximum current that can be measured by a galvanometer of resistance 40 Ω is 10 mA. It is converted into voltmeter that can read upto 50 V. The resistance to be connected in the series with the galvanometer is 1

(a) 2010 Ω (b) 4050 Ω (c) 5040 Ω (d) 4960 Ω

14) Two magnets have the same length and the same pole strength. But one of the magnets has a small hole at its centre. Then, 1

(a) both have equal magnetic moment

(b) one with hole has small magnetic moment

(c) one with hole has large magnetic moment

(d) one with hole loses magnetism through the hole

15) A toroid of n turns, mean radius R and cross-sectional radius a carries current I.It is placed on a horizontal table taken as x-y plane. Its magnetic moment m. 1

(a) is non-zero and points in the z-direction by symmetry.

(b) points along the axis of the tortoid (m = mΦ).

(c) is zero, otherwise there would be a field falling as $\frac{1}{r^3}$ at large distances outside the toroid.

(d) is pointing radially outwards,

16) A 25 cm long solenoid has radius 2 ern and 500 total number of turns. It carries a current of 15 A. If it is equivalent to a magnet of the same size and magnetisation $\overline{\mathbf{M}}$, then $|\overline{\mathbf{M}}|$ is 1

(a) $3\pi\mathbf{Am}^{-1}$ (b) $\mathbf{30000}\pi\mathbf{Am}^{-1}$ (c) 300 Am^{-1} (d) 30000 Am^{-1}

17) The magnetic susceptibility of an ideal diamagnetic substance is 1

(a) +1 (b) 0 (c) -1 (d) ∞

18) When number of turns of a soleniod is doubled, its self inductance becomes k times, where k= 1

(a) 2 (b) 1 (c) 8 (d) 4

19) The instantaneous magnetic flux linked with a coil is given by φ = ($5t^3$ - 100t + 300) Wb. The emf induced in the coil at time t = 2 s is 1

(a) -40V (b) 40V (c) 140V (d) 300V

20) The magnitude of the induced emf in a circuit is equal to the time rate of change of magnetic flux through the circuit, is statment of 1

(a) Fleming's right hand rule (b) Fleming's left hand rule

(c) Felming's third law (d) Faraday's law of electromagnetic induction

21) **Assertion (A) :** The surface densities of two spherical conductors of different radii are equal. Then the electric field intensities near their surface are also equal. 1

Reason (R) : Surface density is ,equal to charge per unit area.

Codes:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

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22) **Assertion (A) :** If a point charge q is placed in front of an infinite grounded conducting plane surface, the point charge will experience a force. 1

Reason (R) : This force is due to the induced charge on the conducting surface which is at zero potential.

Codes:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

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23) **Assertion (A)** : The dielectric constant for metals is infinity. 1
Reason (R) : When a charged capacitor is filled completely with a metallic slab, its capacity becomes very large.
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true bttt R is false
(d) A is false and R is also false

24) **Assertion:** The current flowing through a conductor is directly proportional to the drift velocity. 1
Reason: As the drift velocity increases the current following through the conductor decreases
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

25) **Assertion**: Fuse wire must have high resistance and low melting point. 1
Reason: Fuse is used for small current flow only.
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

26) **Assertion (A) :** There is a spark in the switch when the switch is closed . 1

Reason (R) : Current flowing in the conductor produces magnetic field.

Codes:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

27) **Assertion (A) :** The kinetic energy of a charged particle moving in a uniform magnetic field does not change. 1

Reason (R) : In a uniform magnetic field no force acts on the charge particle.

Codes:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

28) **Assertion (A) :** Aclinic lines on the magnetic map represents lines of equal dip. 1

Reason (R) : When the horizontal and vertical components of the earth's magnetic field are equal, the angle of dip is 60°.

Codes:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

29) **Assertion (A) :** The core of transformer is made laminated in order to increase the eddy currents. 1

Reason (R) : The sensitivity of transformer increases with increase in the eddy currents.

Codes:

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

30) **Assertion (A)** : A bulb connected in series with a solenoid is connected to A.c. source. If a soft iron core is introduced in the solenoid, the bulb will glow brighter. 1

Reason (R) : On introducing soft iron core in the solenoid, the inductance decreases.

Codes:

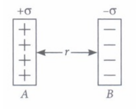
(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true but R is NOT the correct explanation of A

(c) A is true but R is false

(d) A is false and R is also false

31) Surface charge density is defined as charge per unit surface area of surface charge distribution. i.e., $\sigma = \frac{dq}{dS}$ Two large. thin metal plates are parallel and close to each other. On their inner faces, the plates have surface charge densities of opposite signs having magnitude of 17.0 x 10^{-22} C m^{-2} as shown. The intensity of electric field at a point is $E = \frac{\sigma}{\varepsilon_0}$ where ε_0 = permittivity of free space.



(i) E in the outer region of the first plate is

$(a)\ 17 \times 10^{-22}\ \mathrm{N/C}$ $(b)\ 1.5 \times 10^{-25}\ \mathrm{N/C}$ $(c)\ 1.9 \times 10^{-10}\ \mathrm{N/C}$ **(d) zero**

(ii) E in the outer region of the second plate is

$(a)\ 17 \times 10^{-22}\ \mathrm{N/C}$ $(b)\ 1.5 \times 10^{-15}\ \mathrm{N/C}$ $(c)\ 1.9 \times 10^{-10}\ \mathrm{N/C}$ **(d) zero**

(iii) E between the plates is

$(a)\ 17 \times 10^{-22}\ \mathrm{N/C}$ $(b)\ 1.5 \times 10^{-15}\ \mathrm{N/C}$ $(c)\ 1.9 \times 10^{-10}\ \mathrm{N/C}$ **(d) zero**

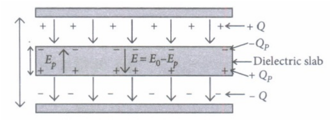
(iv) The ratio of E from right side of B at distances 2 cm and 4 ern, respectively is

(a) 1: 2 **(b) 2: 1** **(c) 1: 1** $(d)\ 1 : \sqrt{2}$

(v) In order to estimate the electric field due to a thin finite plane metal plate, the Gaussian surface considered is

(a) spherical **(b) cylindrical** **(c) straight line** **(d) none of these**

32) A dielectric slab is a substance which does not allow the flow of charges through it but permits them to exert electrostatic forces on one another. When a dielectric slab is placed between the plates, the field E_o polarises the dielectric. This induces charge $-Q_p$ on the upper surface and $+ Q_p$ on the lower surface of the dielectric. These induced charges set up a field E_p inside the dielectric in the opposite direction of $\vec{E}_0$ as shown. 5



(I) In a parallel plate capacitor, the capacitance increases from $4\mu\text{F}$ to 80 μF on introducing a dielectric medium between the plates. What is the dielectric constant of the medium?

(a) 10 (b) 20 (c) 50 (d) 100

(ii) A parallel plate capacitor with air between the plates has a capacitance of 8 pF. The separation between the plates is now reduced half and the space between them is filled with a medium of dielectric constant 5. Calculate the value of capacitance of the capacitor in second case.

(a)	(b)	(c)	(d)
8pF	**10pF**	**80pF**	**100pF**

(iii) A dielectric introduced between the plates of a parallel plate condenser

(a) decreases the electric field between the plates **(b) increases the capacity of the condenser**

(c) increases the charge stored in the condenser **(d) increases the capacity of the condenser**

(iv) A parallel plate capacitor of capacitance 1 pF has separation between the plates is d. When the distance of separation becomes 2d and wax of dielectric constant x is inserted in it the capacitance becomes 2 pF. What is the value of x?

(a) 2 (b) 4 (c) 6 (d) 8

(v) A parallel plate capacitor having area A and separated by distance d is filled by copper plate of thickness b. The new capacity is

(a) $\frac{\varepsilon_0 A}{d+\frac{b}{2}}$ (b) $\frac{\varepsilon_0 A}{2d}$ (c) $\frac{\varepsilon_0 A}{d-b}$ (d) $\frac{2\varepsilon_0 A}{d+\frac{b}{2}}$

33) Metals have a large number of free electrons nearly 10^{28} per cubic metre. In the absence of electric field, average terminal speed of the electrons in random motion atroom temperature is of the order of 10^5 m s^{-1}When a potential difference V is applied across the two ends of a given conductor, the free electrons in the conductor experiences a force and are accelerated towards the positive end of the conductor. On their way, they suffer frequent collisions with the ions/atoms of the conductor and lose their gained kinetic energy. After each collision, the free electrons are again accelerated due to electric field, towards the positive end of the conductor and lose their gained kinetic energy in the next collision with the ions/atoms of the conductor. The average speed of the free electrons with which they drift towards the positive end of the conductor under the effect of applied electric field is called drift speed of the electrons. 5

(i) Magnitude of drift velocity per unit electric field is

(a) current density	**(b) current**	**(c) resistivity**	**(d) mobility**

(ii) The drift speed of the electrons depends on

(a) dimensions of the conductor

(b) number density of free electrons in the conductor

(c) both (a) and (b)

(d) neither (a) nor (b)

(iii) We are able to obtain fairly large currents in a conductor because

(a) the electron drift speed is usually very large

(b) the number density of free electrons is very high and this can compensate for the low values of the drift speed and he very small magnitude of the electron charge

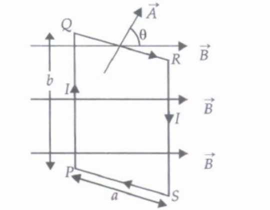
(c) the number density of free electrons as well as the electron drift speeds are very large and these co for the very small magnitude of the electron charge
(d) the very small magnitude of the electron charge has to be divided by the still smaller product of the density and drift speed to get the electric current

(iv) Drift speed of electrons in a conductor is very small i.e., i = 10^{-4} m s^{-1}.
The Electric bulb glows immediately. When the switch is closed because
(a) drift velocity of electron increases when switch is closed
(b) electrons are accelerated towards the negative end of the conductor
(c) the drifting of electrons takes place at the entire length of the conductor
(d) the electrons of conductor move towards the positive end and protons of conductor move towards negative end of the conductor

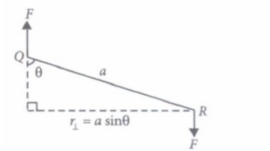
(v) The number density offree electrons in a copper conductor is 8.5 x 10^{28} m^{-3}. How long does an electron take to drift from one end of a wire 3.0 m long to its other end? The area of cross-section of the wire is 2.0 x 10^{-6}m2 and it is carrying a current of 3.0 A.

(a) 8.1 x 10^4 s	**(b) 2.7 x 10^4 s**	**(c) 9 x 10^3 s**	**(d) 3 x 10^3 S**

34) When a rectangular loop PQRS of sides 'a' and 'b' carrying current I is placed in uniform magnetic field $\vec{B}$ such that area vector $\vec{A}$ makes an angle θ with direction of magnetic field, then forces on the arms QR and SP of loop are equal, opposite and collinear, thereby perfectly cancel each other, whereas forces on the arms PQ and RS of loop are equal and opposite but not collinear, so they give rise to torque on the loop.



Force on side PQ or RS ofloop is F = IbB sin 90° = Ib B and perpendicular distance between two non-collinear forces is $r_\perp$ = a sin θ



So, torque on the loop, $\tau = IAB\sin\theta$
In vector form torque $\vec{\tau} = \vec{M} \times \vec{B}$
where $\vec{M} = NI\vec{A}$ is called magnetic dipole moment of current loop and is directed in direction of area vector $\vec{A}$ i.e., normal to the plane ofloop.
(i) A circular loop of area 1 cm^2, carrying a current of 10 A is placed in a magnetic field of 0.1 T perpendicular to the plane of the loop. The torque on the loop due to the magnetic field is

(a) zero (b) 10^{-4} N m (c) 10^{-2} N m (d) 1N m

(ii) Relation between magnetic moment and angular velocity is

(a) $M \propto \omega$ (b) $M \propto \omega^2$ (c) $M \propto \sqrt{\omega}$ **(d) none of these**

(iII) A current loop in a magnetic field

(a) can be in equilibrium in two orientations, both the equilibrium states are unstable

(b) can be in equilibrium in two orientations, one stable while the other is unstable

(c) experiences a torque whether the field is uniform or non uniform in all orientations

(d) can be in equilibrium in one orientation

(iv) The magnetic moment of a current I carrying circular coil of radius r and number of turns N varies as

(a) $\frac{1}{r^2}$ (b) $\frac{1}{r}$ **(c) r** **(d) r^2**

(v) A rectangular coil carrying current is placed in a non-uniform magnetic field. On that coil the total

(a) force is non-zero **(b) force is zero** **(c) torque is zero** **(d) none of these**

(i) (c): In mass spectrometer, the ions are sorted out by accelerating them through electric and magnetic field.

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