[Important MCQ's for Term-1]

(1) A uniform electric field pointing in positive X-direction exists in a region. Let A be the origin, B be the point on the X-axis at $x = +1$ cm and C be the point on the Y-axis at $y = +1$ cm. Then the potential at points A, B and C satisfy:

(a) $V_A < V_B$ (b) $V_A > V_B$ (c) $V_A < V_C$

(d) $V_A > V_C$

(2) Which of the following statement is/are correct?

(a) if the electric field due to a point charge varies at $r^{2/5}$ instead of r^2, then the Gauss law will still be valid.

(b) the Gauss law can be used to calculate the field distribution around an electric dipole.

(c) if the electric field between two point charges is zero somewhere, then the sign of the two charges is the same.

(d) the work done by the external force in moving a unit positive charge from point A at a potential V_A to point B at the potential V_B is $(V_B - V_A)$.

(3) What is angle between electric field and equipotential surface?

(a) 90° always (b) 0° always
(c) 0° to 90° (d) 0° to 180°

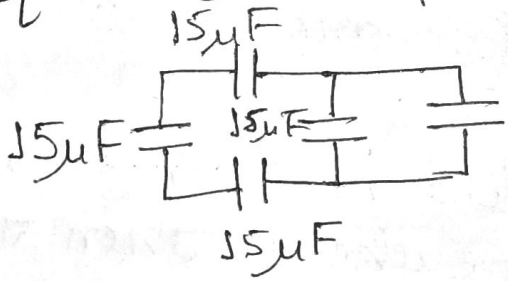
(4) A dipole is placed in a uniform electric field, its potential energy will be minimum when the angle between its axis and field is –

(a) zero (b) π (c) $\frac{\pi}{2}$ (d) 2π

(5) A dipole is placed parallel to the electric field. If W is the work done in rotating the dipole by 60°, then work done in rotating it by 180° is

(a) 2W (b) 3W (c) 4W (d) $\frac{W}{2}$

(6) The equivalent capacitance is



(a) 15μF (b) 20μF (c) 25μF (d) 30μF

(7) The dielectric between the conductors reduces the electric intensity

(a) to zero (b) between them
(c) with no change (d) none of the above

(8) Energy per unit volume for a capacitor having area A and seperation d kept at potential difference V is given by -

(a) $\frac{1}{2}\varepsilon_0 \frac{V^2}{d^2}$ (b) $\frac{1}{2\varepsilon_0}\frac{V^2}{d^2}$

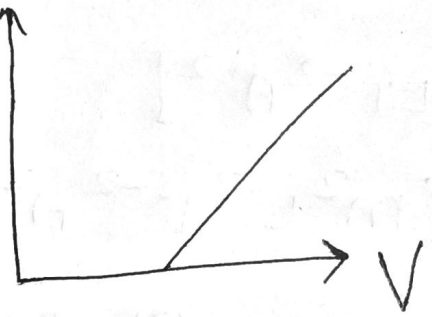
(c) $\frac{1}{2}CV^2$ (d) $\frac{Q^2}{2C}$

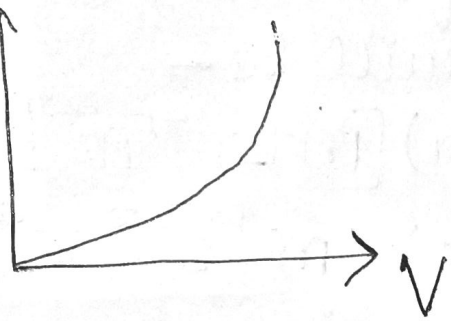
(9) The dimension of $\frac{1}{2}\varepsilon_0 E^2$, where ε_0 is permittivity of free space and E is electric field, is

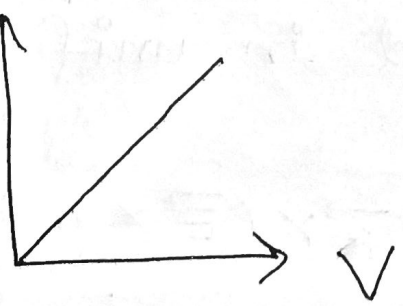
(a) ML^2T^{-2} (b) $ML^{-1}T^{-2}$

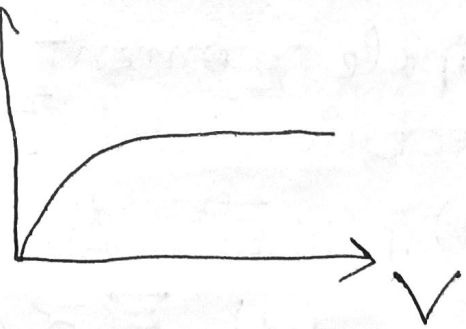
(c) ML^2T^{-1} (d) MLT^{-1}

(10) The velocity v acquired by an electron starting from rest and moving through potential difference V is shown by which of the following graphs?

(a) 

(b) 

(c) 

(d) 

(11.) If a charge q is placed at the centre of the line joining two equal charges Q such that the system is in equilibrium, then the value of q is -

(a) $\frac{Q}{2}$ (b) $-\frac{Q}{2}$ (c) $\frac{Q}{4}$ (d) $-\frac{Q}{4}$

(12) A comb run through one's dry hair attracts small bits of paper. This is due to

(a) comb is a good conductor
(b) paper is a good conductor
(c) the atoms in the paper get polarized by the charged comb
(d) the comb possesses magnetic properties.

(13) Using mass (M), length (L), time (T) and electric current (A) as fundamental quantities, the dimensions of permittivity will be -

(a) $[ML T^{-1} A^{-1}]$ (b) $[ML T^{-2} A^{-2}]$
(c) $[M^{-1} L^{-3} T^{4} A^{2}]$ (d) $[M^{2} L^{-2} T^{-2} A^{2}]$

(14) Torque acting on electric dipole of dipole moment $\vec{p}$ placed in uniform electric field $\vec{E}$ is -

(a) $\vec{p} \times \vec{E}$ (b) $\vec{p} \cdot \vec{E}$ (c) $\vec{p} \times (\vec{E} \times \vec{p})$
(d) $\vec{E} \cdot \vec{p} / p^2$

(15) A semi-circular arc of radius a is charged uniformly and the charge per unit length is λ. The electric field at the centre is -

(a) $\frac{\lambda}{4\pi^2\varepsilon_0 a}$ (b) $\frac{\lambda}{2\pi\varepsilon_0 a^2}$

(c) $\frac{\lambda}{2\pi\varepsilon_0 a}$ (d) $\frac{\lambda^2}{2\pi\varepsilon_0 a}$

(16) A point charge $+q$ is placed at the midpoint of a cube of side l. The electric flux emerging from the cube is-

(a) zero (b) $\frac{q}{\varepsilon_0}$ (c) $\frac{6ql^2}{\varepsilon_0}$ (d) $\frac{q}{6l^2\varepsilon_0}$

(17) The electric field required to keep a water drop of mass 'm' just to remain suspended, when charged with one electron is -

(a) mg (b) $\frac{mg}{e}$ (c) emg (d) $\frac{me}{g}$

(18) In a non-uniform electric field, electric dipole experiences

(a) torque only (b) torque as well as force
(c) force only (d) none of these.

(19) If E_1 be the Electric field strength of a short dipole at a point on its axial line and E_2 that on the equatorial line at the same distance, then

(a) $E_1 = E_2$ (b) $E_1 = 2E_2$

(c) $E_2 = 2E_1$ (d) none of these

(20) Out of the following is not a property of field lines-

(a) field lines are continuous curves without any breaks

(b) two field lines can not cross each other

(c) field lines starts at positive charges and end at negative charges

(d) They formed closed loops.

(21) A steady current flows in a metallic conductor of non-uniform cross-section The quantity/quantities constant along the length of a conductor is/are-

(a) current, electric field and drift speed

(b) drift speed only

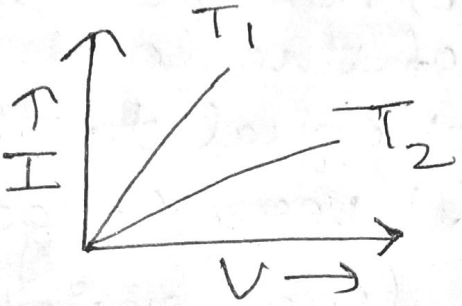
(c) current and drift speed

(d) current only.

(22) The current I and voltage V curves for a given metallic wire at two different temperatures T_1 and T_2 are shown in figure. Then.

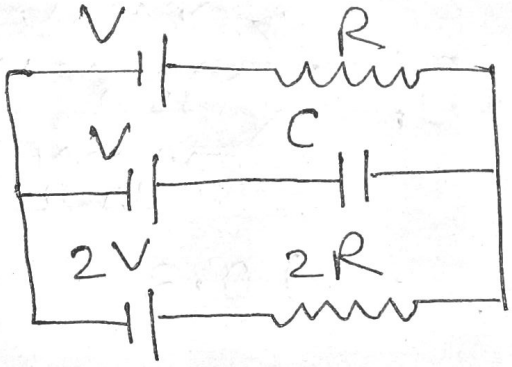
(a) $T_1 > T_2$ (b) $T_1 < T_2$

(c) $T_1 = T_2$ (d) $T_1 = 2T_2$



(23) In the given circuit, the potential drop across the capacitor must be

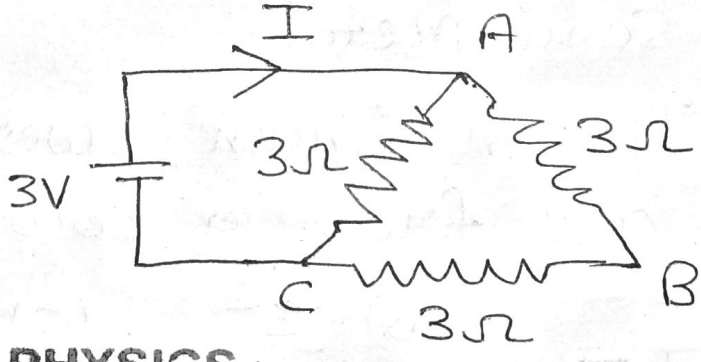
(a) V
(b) V/2
(c) V/3
(d) 2V/3



(24) A 23 V battery with negligible internal resistance is connected in a circuit as shown in the figure.

The current I in the circuit will be

(a) 1 Amp
(b) 1.5 Amp
(c) 2 Amp
(d) $\frac{1}{3}$ Amp



(25) An energy source will supply a constant current into the load, if its internal resistance is

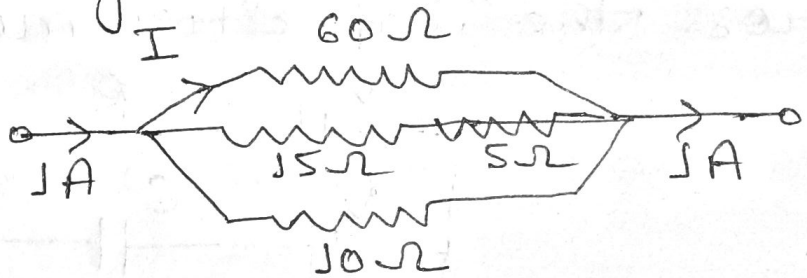
(a) zero

(b) non-zero but less than the resistance of the load

(c) equal to the resistance of the load

(d) very large as compared to the load resistance.

(26) The magnitude of I in ampere is



(a) 0.1 (b) 0.3 (c) 0.6 (d) None of these.

(27) Which of the following substances which is heated, its conductivity increases?

(a) Metal (b) Insulator (c) Semiconductor (d) Semi-Metal.

(28) The maximum power drawn out of the cell from a source is given by

(a) $\frac{\varepsilon^2}{2r}$ (b) $\frac{\varepsilon^2}{4r}$ (c) $\frac{\varepsilon^2}{r}$ (d) $\frac{\varepsilon^2}{3r}$

(29) Which of the following relations is called as current density?

(a) $\frac{I}{A}$ (b) $\frac{A}{I}$ (c) $\frac{I^2}{A}$ (d) $\frac{I^3}{A^2}$

(30) When a balance point is obtained in a potentiometer for finding the internal resistance of a cell, the current through the potentiometer wire is due to

(a) the cell, whose internal resistence is to be found

(b) the auxiliary battery

(c) both cell and auxiliary battery

(d) neither the cell nor the battery

(31) Kirchhoff's first and second laws of electrical circuits are consequences of

(a) Conservation of energy and electric charge respectively

(b) Conservation of energy

(c) conservation of electric charge and energy respectively.

(d) conservation of electric charge

(32) Potentiometer measures the potential difference more accurately than a voltmeter, because

(a) it does not draw current from external circuit

(b) It draws a heavy current from external circuit

(c) It has a wire of high resistance

(d) It has a wire of low resistance

(33) If percentage change in current through a resistor is 1%, then the change in power through it would be

(a) 1% (b) 2% (c) 1.7% (d) 0.5%

(34) A circular loop of radius R, carrying current I, lies in x-y plane with its centre at origin. Total magnetic flux through x-y plane is

(a) directly proportional to I

(b) directly proportional to R

(c) inversely proportional to R

(d) Zero

(35) Two thin long parallel wires are seperated by a distance r and carry a current I each. The magnitude of the force per unit length experienced by one wire due to other is -

(a) $\frac{\mu_0 I^2}{r^2}$ (b) $\frac{\mu_0 I^2}{2\pi r}$ (c) $\frac{\mu_0 I}{2\pi r}$ (d) $\frac{\mu_0 I}{2\pi r^2}$

(36) A rectangular loop carrying a current I is situated near a long straight wire such that wire is parallel to one of the sides of the loop and is in the plane of the loop. If steady current I is established in the wire as shown in figure, the loop will

(a) rotate about an axis parallel to wire
(b) move away from the wire
(c) move towards the wire
(d) remain stationary

(37) A long straight wire of radius 'a' carries a steady current I. The current is uniformly distributed across its cross-section. The ratio of the magnetic field at $\frac{a}{2}$ and 2a is-

(a) $\frac{1}{2}$ (b) 1 (c) 2 (d) $\frac{1}{4}$

(38) If an electron and a proton having same momenta enter perpendicularly to a magnetic field, then

(a) curved path of electron and proton will be same
(b) they will move undeflected
(c) curved path of electron is more curved than that of proton.
(d) path of proton is more curved.

(39) The time-period of a charged particle undergoing a circular motion in a uniform magnetic field is independent of its-

(a) speed (b) mass (c) charge
(d) magnetic induction

(40) The magnetic field near a current carrying conductor is given by

(a) Coulomb's law (b) Lenz's Law
(c) Biot-savart law (d) Kirchoff's Law

(41) A current of 10 A is passing through a long wire which has semicircular loop of the radius 20 cm as shown in figure.

Magnetic field produced at the centre of the loop is-

(a) $10\pi\mu T$ (b) $5\pi\mu T$
(c) $4\pi\mu T$ (d) $2\pi\mu T$

(42) The radius of motion of a charged particle orbiting in a magnetic field is

(a) $\frac{mB}{qv}$ (b) $\frac{mv}{qB}$ (c) $\frac{mq}{vB}$ (d) $\frac{qv}{mB}$

(43) To convert a galvanometer into an ammeter we connected
(a) low resistance in series
(b) low resistance in parallel
(c) high resistance in series
(d) high resistance in parallel

(44) To convert a galvanometer into a voltmeter we connected
(a) a high resistance in parallel
(b) a low resistance in series
(c) a low resistance in parallel
(d) a high resistance in series

(45) The force on a charge due to a magnetic field can act
(a) on a charge which is at rest
(b) which is moving in the direction of the magnetic field
(c) moving in the opposite direction of the magnetic field
(d) moving in the perpendicular direction

(46) An electron, moving in a uniform magnetic field of induction of intensity $\vec{B}$, has its radius directly proportional to
(a) its charge (b) magnetic field
(c) speed (d) none of these

(47) If M is magnetic moment and B is magnetic field, then the torque is given by

(a) $\vec{m} \cdot \vec{B}$ (b) $\frac{|\vec{m}|}{|\vec{B}|}$ (c) $\vec{m} \times \vec{B}$ (d) mB

(48) Two wires of same length are shaped into a square and a circle. If they carry same current, ratio of the magnetic moments is -

(a) $2:\pi$ (b) $\pi:2$ (c) $\pi:4$ (d) $4:\pi$

(49) Magnetic meridian is a

(a) point (b) horizontal plane

(c) vertical (d) line along N-S

(50) When a magnetic substance is heated, then it

(a) remains the same

(b) loses its magnetism

(c) becomes a strong magnet

(d) either (a) or (c).

(51.) A bar magnet of magnetic moment M is cut into two parts of equal lengths. The magnetic moment and pole strength of either part is

(a) $\frac{M}{2}, \frac{m}{2}$ (b) $M, \frac{m}{2}$ (c) $\frac{M}{2}, m$ (d) M, m

(52.) Intensity of magnetic field is H and moment of magnet is M. Maximum Potential energy is –

(a) MH (b) 3MH (c) 2MH (d) 4MH

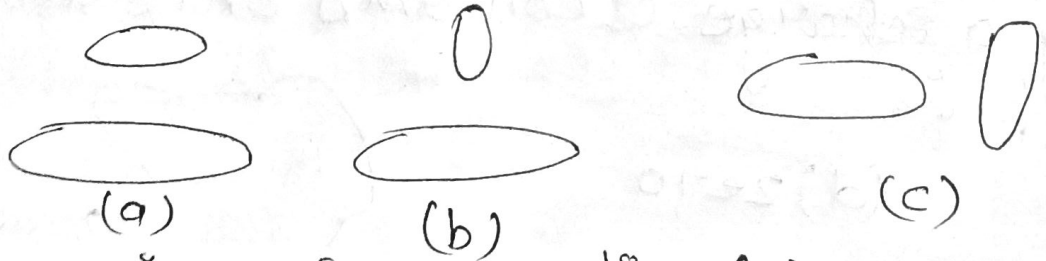
(53) At a certain place on earth, $B_H = \frac{1}{\sqrt{3}} B_V$, dip angle is

(a) 60° (b) 30° (c) 45° (d) 90°

(54.) Two identical circular loops of metal wire are lying on a table without touching each other. Loop-A carries a current, which increases with time. In response, loop B.

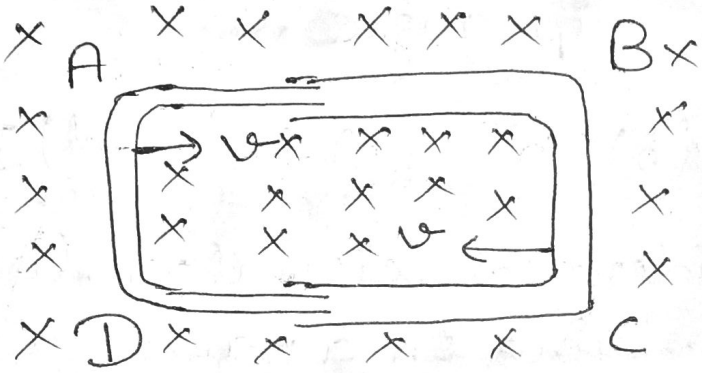
(a) remains stationary
(b) is attracted by the loop A
(c) is repelled by the loop A
(d) rotates about its CM, with CM fixed.

(55.) Two circular coils can be arranged in any of the three situations shown in the figure. Their mutual inductance will be



(a) Maximum in situation (a)
(b) Maximum in situation (b)
(c) Maximum in situation (c)
(d) same in all situations.

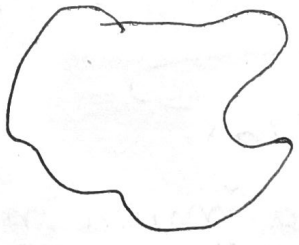
(56.) One conducting U tube can slide inside inside another as shown in figure maintaining electrical contacts between the tubes. The magnetic field B is perpendicular to the plane of the figure.



If each tube moves towards the other at a constant speed v, then the emf induced in the circuit in terms of B, l and v, where l is the width of each tube, will be

(a) Blv (b) -Blv (c) zero (d) 2Blv

(57) As a result of change in the magnetic flux linked with the closed loop shown in the figure, an emf of V volt is induced in the loop. The work done in taking a charge Q coulomb once along the loop is



(a) QV
(b) 2QV
(c) QV/2
(d) zero

(58.) If number of turns per unit length of a coil of a solenoid is doubled, its self-inductance will

(a) remain constant (b) be doubled
(c) be halved (d) be four times

(59.) Two inductors each of inductance 'L' are joined in parallel. What is their equivalent inductance?

(a) 2L (b) $\frac{L}{2}$ (c) L (d) zero

(60.) The phase difference between the alternating current and emf is $\frac{\pi}{2}$. Which of the following cannot be the constituent of the circuit?

(a) C alone (b) L alone
(c) L, C (d) R, L

(61.) The core of any transformer is laminated, so as to

(a) reduce the energy loss due to eddy currents
(b) make it light weight
(c) make it robust and strong
(d) increase the secondary voltage.

(62.) The unit of L/R (where L = inductance and R = Resistance) is –

(a) sec (b) sec^{-1} (c) volt (d) ampere

(63.) In a series LCR-circuit, resonant frequency depends on

(a) $\frac{L}{C}$ (b) $\sqrt{LC}$ (c) $\frac{1}{\sqrt{LC}}$ (d) $\sqrt{\frac{L}{C}}$

(64.) In LCR-circuit if resistance increase, quality factor

(a) increase finitely (b) decrease finitely

(c) remains constant (d) none of these

(65.) The square root of the product of inductance and capacitance has the dimensions of

(a) length (b) mass (c) time

(d) no dimension

(66.) The ratio of secondary to primary turns is 4:5. If power input is P, what will be the ratio of power output to power input?

(a) 4:9 (b) 9:4 (c) 5:4 (d) 1:1

(67.) For high frequency, capacitor offers
(a) more reactance (b) zero reactance
(c) less reactance (d) none of these

(68.) Series a.c. circuit has inductance L, resistance R and angular frequency ω, the quality factor Q is-
(a) $\left(\frac{\omega L}{R}\right)^2$ (b) $\frac{\omega L}{R}$ (c) $\frac{R}{\omega L}$ (d) $\left(\frac{R}{\omega L}\right)^2$

(69.) Transformer is a device which is used to change the magnitude of
(a) D.C. voltage (b) A.C. voltage
(c) both (a) and (b) (d) none of these

(70.) An a.c. voltage is applied to a pure inductor L, drives a current in the inductor. The current in the inductor would be
(a) ahead of the voltage by $\frac{\pi}{2}$
(b) lagging the voltage by $\frac{\pi}{2}$
(c) ahead of the voltage by $\frac{\pi}{4}$
(d) lagging the voltage by $\frac{3\pi}{4}$