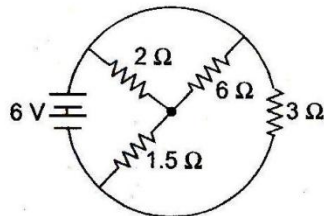


- 01 A 220 V, 50 Hz AC generator is connected to an inductor and a 50Ω resistance in series. The current in the circuit is 1.0 A. What is P.D. across inductor?
 (a) 102.2 V (b) 186.4 V
 (c) 213.6 V (d) 302 V
- 02 The impedance of a circuit consists of 3 ohm resistance and 4 ohm reactance. The power factor of the circuit is
 (a) 0.4 (b) 0.6
 (c) 0.8 (d) 1.0
- 03 A choke coil is preferred to a rheostat in AC circuit as
 (a) It consumes almost zero power
 (b) It increases current
 (c) It increases power
 (d) It increases voltage
- 04 An energy of 24.6 eV is required to remove one of the electrons from a neutral helium atom. The energy (in eV) required to remove both the electrons from a neutral helium atom is
 (a) 79.0 (b) 51.8
 (c) 49.2 (d) 38.2
- 05 A hydrogen-like atom of atomic number Z is in an excited state of quantum number $2n$. It can emit a maximum energy photon of 204 eV. If it makes a transition to quantum state n , a photon of energy 40.8 eV is emitted. The value of n will be
 (a) 1 (b) 2
 (c) 3 (d) 4
- 06 The transition from the state $n = 4$ to $n = 3$ in a hydrogen-like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition
 (a) $2 \rightarrow 1$ (b) $3 \rightarrow 2$
 (c) $4 \rightarrow 2$ (d) $5 \rightarrow 4$
- 07 In a hypothetical Bohr hydrogen, the mass of the electron is doubled. The energy E_0 and the radius r_0 of the first orbit will be (a_0 is the Bohr radius)
 (a) $E_0 = -27.2 \text{ eV}; r_0 = a_0 / 2$
 (b) $E_0 = -27.2 \text{ eV}; r_0 = a_0$
 (c) $E_0 = -13.6 \text{ eV}; r_0 = a_0 / 2$
 (d) $E_0 = -13.6 \text{ eV}; r_0 = a_0$
- 08 A strip of copper and another of germanium are cooled from room temperature to 80 K. The resistance of
 (a) Each of these increases
 (b) Each of these decreases
 (c) Copper strip increases and that of germanium decreases
 (d) Copper strip decreases and that of germanium increases

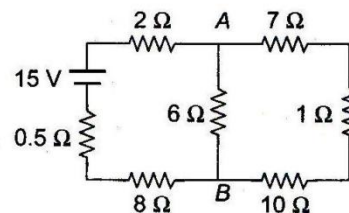
- 09 The resistance of the series combination of two resistance is S . When they are joined in parallel the total resistance is P . If $S = nP$, then the minimum possible value of n is
- (a) 4 (b) 3
(c) 2 (d) 1

- 10 The total current supplied to the circuit by the battery is



- (a) 1 A (b) 2 A
(c) 4 A (d) 6 A
- 11 In a potentiometer experiment the balancing with a cell is at length 240 cm. On shunting the cell with a resistance of $2\ \Omega$, the balancing length becomes 120 cm. The internal resistance of the cell is
- (a) $4\ \Omega$ (b) $2\ \Omega$
(c) $1\ \Omega$ (d) $0.5\ \Omega$
- 12 A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions per milliampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be
- (a) 99995 (b) 9995
(c) 10^3 (d) 10^5

- 13 The current from the battery in circuit diagram shown is



- (a) 1 A (b) 2 A
(c) 1.5 A (d) 3 A
- 14 Light of two different frequencies whose photons have energies $1\ eV$ and $2.5\ eV$ respectively, successively illuminates a metal of work function $0.5\ eV$. The ratio of maximum kinetic energy of the emitted electron will be
- (a) 1 : 5 (b) 1 : 4
(c) 1 : 2 (d) 1 : 1
- 15 Sodium and copper have work functions $2.3\ eV$ and $4.5\ eV$ respectively. Then the ratio of their threshold wavelengths is nearest to
- (a) 1 : 2 (b) 4 : 1
(c) 2 : 1 (d) 1 : 4
- 16 According to Einstein's photoelectric equation, the plot of the kinetic energy of the emitted photo electrons from a metal versus the frequency, of the incident radiation gives a straight line whose slope
- (a) Is the same for all metals and independent of the intensity of the radiation
(b) Depends on the intensity of the radiation
(c) Depends both on the intensity of the radiation and the metal used
(d) Depends on the nature of the metals used

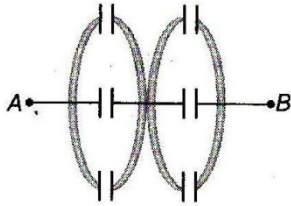
17 Two identical parallel plate capacitors are connected in series to a battery of 100 V. A dielectric slab of dielectric constant 4.0 is inserted between the plates of second capacitor. The potential difference across the capacitors will now be respectively

- (a) 50 V, 50 V (b) 80 V, 20 V
(c) 20 V, 80 V (d) 75 V, 25 V

18 An electric field is given by $E_x = -2x^3$ kN/C. The potential of the point (1, -2), if potential of the point (2, 4) is taken as zero, is

- (a) -7.5×10^3 V (b) 7.5×10^3 V
(c) -15×10^3 V (d) 15×10^3 V

19 All six capacitors shown are identical. Each can withstand maximum 200 volts between its terminals. The maximum voltage that can be safely applied between A and B is

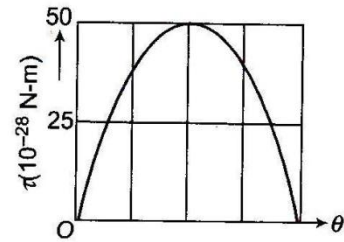


- (a) 1200 V (b) 400 V
(c) 800 V (d) 200 V

20 The magnitude of electric field intensity at point B (2, 0, 0) due to a dipole of dipole moment, $\vec{p} = \hat{i} + \sqrt{3}\hat{j}$ kept at origin is (assume that the point B is at large distance from the dipole and $k = \frac{1}{4\pi\epsilon_0}$)

- (a) $\frac{\sqrt{13}k}{8}$ (b) $\frac{\sqrt{13}k}{4}$
(c) $\frac{\sqrt{7}k}{8}$ (d) $\frac{\sqrt{7}k}{4}$

21 An electric dipole is placed in a uniform electric field \vec{E} of magnitude 40 N/C. Graph shows the magnitude of the torque on the dipole versus the angle θ between the field \vec{E} and the dipole moment \vec{p} . The magnitude of dipole moment \vec{p} is equal to :



- (a) 1.25×10^{-28} C-m (b) 2.0×10^{-25} C-m
(c) 2.5×10^{-28} C-m (d) 5.0×10^{-28} C-m

22 There are three concentric thin spheres of radius a, b, c ($a > b > c$). The total surface charge densities on their surfaces are $\sigma, -\sigma, \sigma$ respectively. The magnitude of electric field at r (distance from centre) such that $a > r > b$ is:

- (a) 0 (b) $\frac{\sigma}{\epsilon_0 r^2}(b^2 - c^2)$
(c) $\frac{\sigma}{\epsilon_0 r^2}(a^2 + b^2)$ (d) none of these

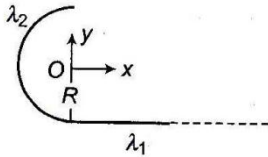
23 A α particle is released from rest 10 cm from a large sheet carrying a surface charge density of -2.21×10^{-9} C/m². It will strike the sheet after the time. ($\epsilon_0 = 8.84 \times 10^{-22}$ C²/Nm²)

- (a) 4 μ s (b) 2 μ s
(c) $2\sqrt{2}$ μ s (d) $4\sqrt{2}$ μ s

24 A ring of radius R , has charge $-Q$ distributed uniformly over it. A charge q is placed at the centre of the ring such that the electric field becomes zero at a point on the axis of the ring distant ' R ' from the centre of the ring. The value of charge q is

- (a) $\frac{Q}{2}\sqrt{3}$ (b) $\frac{Q}{4}\sqrt{2}$
 (c) $\frac{Q}{3}\sqrt{2}$ (d) $\frac{Q}{4}\sqrt{3}$

25 In the figure shown, find the ratio of the linear charge densities λ_1 (on semi-infinite straight wire) and λ_2 (on semi-circular part) that is, λ_1/λ_2 so that the field at O is along y direction.



- (a) 2 (b) 1.5
 (c) 3 (d) 2.5

26 A coil of inductance 300 mH and resistance 2Ω is connected to a source of voltage $2V$. The current reaches half of its steady state value in

- (a) 0.15 s (b) 0.3 s
 (c) 0.05 s (d) 0.1 s

27 If in a coil rate of change of area is $\frac{5 \text{ metre}^2}{\text{millisecond}}$ and

current become 1 amp form 2 amp in $2 \times 10^{-3} \text{ sec}$. If magnetic field is 1 Tesla then self-inductance of the coil is

- (a) 2 H (b) 5 H
 (c) 20 H (d) 10 H

28 A metal conductor of length 1m rotates vertically about one of its ends at angular velocity $5 \text{ radians per second}$. If the horizontal component of earth's magnetic field is $0.2 \times 10^{-4} \text{ T}$, then the e.m.f. developed between the two ends of the conductor is

- (a) 5 mV (b) $5 \times 10V$
 (c) 50 mV (d) $50 \mu V$

29 A coil having n turns and resistance $R \Omega$ is connected with a galvanometer of resistance $4R\Omega$. This combination is moved in time t seconds from a magnetic field W_1 weber to W_2 weber. The induced current in the circuit is

- (a) $-\frac{W_2 - W_1}{5 Rnt}$ (b) $-\frac{n(W_2 - W_1)}{5 Rt}$
 (c) $-\frac{(W_2 - W_1)}{Rnt}$ (d) $-\frac{n(W_2 - W_1)}{Rt}$

30 Two coils are placed close to each other. The mutual inductance of the pair of coils depends upon

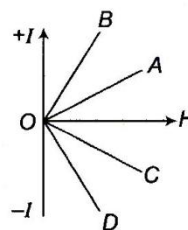
- (a) The currents in the two coils
 (b) The rates at which currents are changing in the two coils
 (c) Relative position and orientation of the two coils
 (d) The materials of the wires of the coils

31 In circular coil, when no. of turns is doubled and resistance becomes $\frac{1}{4}$ th of initial, then inductance becomes

- (a) 4 times (b) 2 times
 (c) 8 times (d) No change

- 32 If in a planoconvex lens, the radius of curvature of the convex surface is 10 cm and the focal length is 30 cm, the refractive index of the material of the lens will be
 (a) 1.5 (b) 1.66
 (c) 1.33 (d) 3
- 33 A convex lens A of focal length 20 cm and a concave lens G of focal length 5 cm are kept along the same axis with the distance d between them. If a parallel beam of light falling on A leaves B as a parallel beam, then distance d in cm will be
 (a) 25 (b) 15
 (c) 30 (d) 50
- 34 An object is placed at a distance of $\frac{f}{2}$ from a convex lens of focal length f . The image will be
 (a) at one of the foci, virtual and double its size
 (b) at $\frac{3f}{2}$ real and inverted
 (c) at $2f$, virtual and erect
 (d) none of these
- 35 The focal length of objective and eye piece of a microscope are 1 cm and 5 cm respectively. If the magnifying power for relaxed eye is 45, then length of the tube is
 (a) 6 cm (b) 9 cm
 (c) 12 cm (d) 15 cm

- 36 A wire of length L metre carrying a current of I ampere is bent in the form of a circle. Its magnitude of magnetic moment will be
 (a) $\frac{IL}{4\pi}$ (b) $\frac{IL^2}{4\pi}$
 (c) $\frac{I^2L^2}{4\pi}$ (d) $\frac{I^2L}{4\pi}$
- 37 The variation of the intensity of magnetisation (I) with respect to the magnetising field (H) in a diamagnetic substance is described by the graph



- (a) OD (b) OC
 (c) OB (d) OA
- 38 Magnetic moments of two bar magnets may be compared with the help of
 (a) Deflection magnetometer
 (b) Vibration magnetometer
 (c) Both of the above
 (d) None of the above

- 39 At a place, the magnitudes of the horizontal component and total intensity of the magnetic field of the earth are 0.3 and 0.6 Oersted respectively. The value of the angle of dip at this place will be
 (a) 60° (b) 45°
 (c) 30° (d) 0°
- 40 The angle of dip at a certain place is 30° . If the horizontal component of the earth's magnetic field is H , the intensity of the total magnetic field is
 (a) $\frac{H}{2}$ (b) $\frac{2H}{\sqrt{3}}$
 (c) $H\sqrt{2}$ (d) $H\sqrt{3}$
- 41 If N_0 is the original mass of the substance of half-life period $T_{1/2} = 5$ years, then the amount of substance left after 15 years is
 (a) $N_0/8$ (b) $N_0/16$
 (c) $N_0/2$ (d) $N_0/4$
- 42 A radioactive sample at any instant has its disintegration rate 5000 disintegration per minute. After 5 minutes, the rate is 1250 disintegrations per minute. Then, the decay constant (per minute) is
 (a) $0.8 \ln 2$ (b) $0.4 \ln 2$
 (c) $0.2 \ln 2$ (d) $0.1 \ln 2$
- 43 If radius of the ${}_{13}^{27}\text{Al}$ nucleus is estimated to be 3.6 Fermi then the radius of ${}_{52}^{125}\text{Te}$ nucleus be nearly
 (a) 4 Fermi (b) 5 Fermi
 (c) 6 Fermi (d) 8 Fermi
- 44 Starting with a sample of pure ${}^{66}\text{Cu}$, $\frac{7}{8}$ of it decays into Zn in 15 min. The corresponding half-life is
 (a) 5 min (b) $7\frac{1}{2}$ min
 (c) 10 min (d) 15 min
- 45 The binding energy per nucleon of deuterium and helium atom is 1.1 MeV and 7.0 MeV. If two deuterium nuclei fuse to form helium atom, the energy released is
 (a) 19.2 MeV (b) 23.6 MeV
 (c) 26.9 MeV (d) 13.9 MeV