CUET 2024 Physics Question Paper (Set-A) with Solution

Question 1. Two charged particles, placed at a distance d apart in vacuum, exert a force F on each other. Now, each of the charges is doubled. To keep the force unchanged, the distance between the charges should be changed to _____.
Fill in the blank with the correct answer from the options given below:
(1) 4d
(2) 2d
(3) d
(4) d/2

Answer: (2) 2d

Solution: When doubled, the charge will increase the force between them by a factor of 4 if the distance is held constant. For that distance to be increased to a value such that the force remains the same, it would have to be scaled up to 2d2d2d.

Question 2. Two parallel plate capacitors of capacitances 2 μF and 3 μF are joined in series and the combination is connected to a battery of V volts. The values of potential across the two capacitors V1 and V2 and energy stored in the two capacitors U1 and U2 respectively are related as _____.
Fill in the blank with the correct answer from the options given below:

(1) $\frac{V_1}{V_2} = \frac{U_1}{U_2} = \frac{3}{2}$

(2) $\frac{V_1}{V_2} = \frac{U_1}{U_2} = \frac{2}{3}$

(3) $\frac{V_1}{V_2} = \frac{3}{2}$ and $\frac{U_1}{U_2} = \frac{2}{3}$

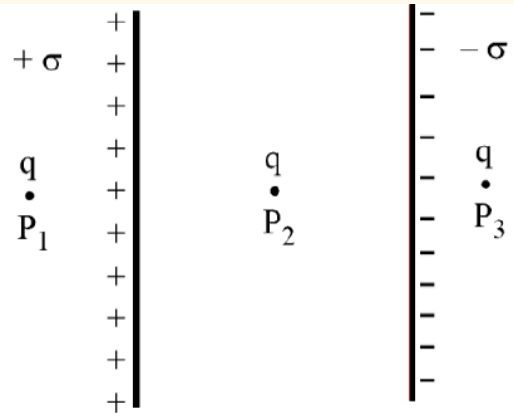
(4) $\frac{V_1}{V_2} = \frac{2}{3}$ and $\frac{U_1}{U_2} = \frac{3}{2}$

Answer: (4)

Solution: In a series combination, the charge on each capacitor is equal, but the voltage across each capacitor is inversely proportional to its capacitance.

Question 3. Two large plane parallel sheets shown in the figure have equal but opposite surface charge densities +σ+\sigma+σ and −σ-\sigma−σ. A point charge qqq placed at points P1, P2 and P3 experiences forces F1 F2 and F3 respectively.

Then
Choose the correct answer from the options given below:



Choose the correct answer from the options given below.

(1) $\vec{F}_1 = 0, \vec{F}_2 = 0, \vec{F}_3 = 0$

(2) $\vec{F}_1 = 0, \vec{F}_2 \neq 0, \vec{F}_3 = 0$

(3) $\vec{F}_1 \neq 0, \vec{F}_2 \neq 0, \vec{F}_3 \neq 0$

(4) $\vec{F}_1 = 0, \vec{F}_3 \neq 0, \vec{F}_2 = 0$

Answer: (2)

Solution: Between the sheets, the electric field is E, and outside it is zero. Thus, at points P1 and P3 (outside), it's 0. At P2 (inside), F2 not equal to zero

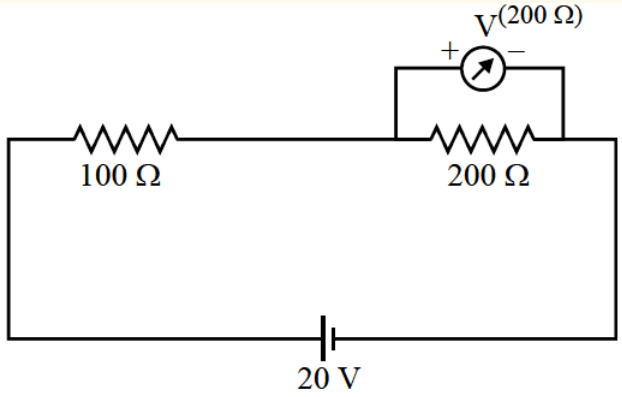
Question 4. Two charged metallic spheres with radii R1 and R2 are brought in contact and then separated. The ratio of final charges Q1 and Q2 on the two spheres respectively will be _____.
Fill in the blank with the correct answer from the options given below:

(1) $\frac{Q_1}{Q_2} = \frac{R_2}{R_1}$ (2) $\frac{Q_1}{Q_2} < \frac{R_1}{R_2}$ (3) $\frac{Q_1}{Q_2} > \frac{R_1}{R_2}$ (4) $\frac{Q_1}{Q_2} = \frac{R_1}{R_2}$

Answer: (1) Q1/Q2=R2/R1

Solution: When two spheres are brought into contact, charge distributes in proportion to their capacitances.

Question 5. Two resistances of 100 Ω and 200 Ω are connected in series across a 20 V battery as shown in figure below. The reading in a 200 Ω voltmeter connected across the 200 Ω resistance is _____.



Fill in the blank with the correct answer from the options given below.

(1) 4 V (2) $\frac{20}{3}$ V (3) 10 V (4) 16 V

Answer: (3) 10 V

Solution: By using Ohm's law, V=IR Total resistance Rtotal=100+200=300Ω
so The voltage across the 200 Ω resistor in series can be found using voltage division. The total resistance is 300 Ω. Therefore, the voltage across the 200 Ω resistor is 10 V.

Question 6. The current through a 4/3 Ω external resistance connected to a parallel combination of two cells of 2 V and 1 V emf and internal resistances of 1 Ω and 2 Ω respectively is _____.
Fill in the blank with the correct answer from the options given below:
(1) 1 A
(2) 2/3 A
(3) 3/4 A
(4) 5/6 A

Answer: (4) 5/6 A

Solution: Using parallel cell formula

Question 7. A metallic wire of uniform area of cross section has a resistance RRR, resistivity ρ and power rating P at V volts. The wire is uniformly stretched to reduce the radius to half the original radius. The values of resistance, resistivity and power rating at V volts are now denoted by R′, ρ′ and P′ respectively. The corresponding values are correctly related as _____.
Fill in the blank with the correct answer from the options given below:

(1) $\rho' = 2\rho, R' = 2R, P' = 2P$

(2) $\rho' = (1/2)\,\rho, R' = (1/2)\,R, P' = (1/2)\,P$

(3) $\rho' = \rho, R' = 16R, P' = (1/16)\,P$

(4) $\rho' = \rho, R' = (1/16)\,R, P' = 16P$

Answer: (3) $\rho'=\rho$, $R'=16R$, $P'=(1/16)P$

Solution: Given $\rho'=\rho$, stretching the wire to twice the length with half the radius leads to $R'=16R$ Therefore, $P'=(1/16)P$

Question 8. Three magnetic materials are listed below:

(A) paramagnetics

(B) diamagnetics

(C) ferromagnetism

Choose the correct order of the materials in increasing order of magnetic susceptibility.

(1) (A), (B), (C)

(2) (C), (A), (B)

(3) (B), (A), (C)

(4) (B), (C), (A)

Answer: (3) (B), (A), (C)

Solution: Diamagnetic materials have the smallest susceptibility, followed by paramagnetic materials with moderate susceptibility, and ferromagnetic materials have the highest susceptibility. So, the order is (B), (A), (C).

Question 9. Two infinitely long straight parallel conductors carrying currents I1 and I2 are held at a distance d apart in vacuum. The force F on a length L of one of the conductors due to the other is _____.

Fill in the blank with the correct answer from the options given below:

(1) proportional to L but independent of $I1 \times I2$

(2) proportional to $I1 \times I2$ but independent of length L

(3) proportional to $I1 \times I2 \times L$

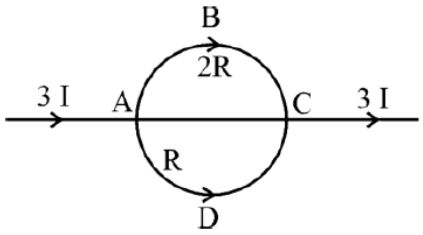
(4) proportional to $L/ I1 \times I2$

Answer: (3) proportional to $I1 \times I2 \times L$

Solution: The force per unit length between two parallel currents is given by F. Thus, the force on length L is $F \propto I1I2L$

Question 10. In the circuit shown below, a current 3I enters at A. The semicircular parts ABC and ADC have equal radii 'r' but resistances 2R and R respectively. The magnetic field at the center of the circular loop ABCD is _____.

_____.



Fill in the blank with the correct answer from the options given below.

(1) $\frac{\mu_0 I}{4r}$ out of the plane

(2) $\frac{\mu_0 I}{4r}$ into the plane

(3) $\frac{\mu_0 3I}{4r}$ out of the plane

(4) $\frac{\mu_0 3I}{4r}$ into the plane

Answer:
(3) μ03I/4r out of the plane

Solution:
Using the Biot-Savart law, the magnetic field at the center due to a current I in a circular loop is B=μ0I2r. For semicircular loops, the net magnetic field is B=μ0I4r. Given the currents and resistances, the net current is 3I, thus B=μ03I/4r.

Question 11. A square loop with each side 1 cm, carrying a current of 10 A, is placed in a magnetic field of 0.2 T. The direction of the magnetic field is parallel to the plane of the loop. The torque experienced by the loop is _____.
Fill in the blank with the correct answer from the options given below:

(1) zero (2) 2×10^{-4} Nm (3) 2×10^{-2} Nm (4) 2 Nm

Answer: (1) zero

Solution: Since the magnetic field is parallel to the plane of the loop, the angle between the field and the normal to the plane is θ=0.

Question 12. In an ac circuit, the current leads the voltage by π/2\pi/2π/2. The circuit is _____.
Fill in the blank with the correct answer from the options given below:
(1) purely resistive
(2) should have circuit elements with resistance equal to reactance
(3) purely inductive
(4) purely capacitive

Answer: (4) purely capacitive

Solution: In a purely capacitive circuit, the current leads the voltage by 90◦ or π/2 radians.

Question 13. In a pair of adjacent coils, for a change of current in one of the coils from 0 A to 10 A in 0.25 s, the magnetic flux in the adjacent coil changes by 15 Wb. The mutual inductance of the coils is _____.
Fill in the blank with the correct answer from the options given below:
(1) 120 H
(2) 12 H
(3) 1.5 H
(4) 0.75 H

Answer: (2) 12 H

Solution: Mutual inductance M =Δ/Δϕ=15/10=1.5 H.

Question 14. A wire of irregular shape in figure (a) and a circular loop of wire in figure (b) are placed in different uniform magnetic fields as shown in the figures below. In figure (a), the magnetic field is perpendicular into the plane. In figure (b) , the magnetic field is perpendicular out of the plane. The wire in figure (a) is turning into a circular loop and that in figure (b) into a narrow straight wire. The direction of induced current will be _____.
Fill in the blank with the correct answer from the options given below:
(1) clockwise in both (a) and (b)
(2) anticlockwise in both (a) and (b)
(3) clockwise in (a) and anticlockwise in (b)
(4) anticlockwise in (a) and clockwise in (b)

Answer: (4) anticlockwise in (a) and clockwise in (b)

Solution: According to Lenz's law, the induced current will flow in a direction to oppose the change in magnetic flux. so the current will be clockwise to oppose the decrease.

Question 15. Match List-I has four graphs showing variation of opposition to flow of ac versus frequency with circuit characteristic in List-II.
List-I
(A) Graph A
(B) Graph B
(C) Graph C
(D) Graph D

List-II
(I) Impedance
(II) Capacitive reactance
(III) Inductive reactance
(IV) Resistance

Choose the correct answer from the options given below:
(1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(2) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)
(3) (A) - (I), (B) - (II), (C) - (IV), (D) - (III)
(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Answer: (1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)

Solution: Impedance varies with frequency based on circuit elements, capacitive reactance decreases with increasing frequency, inductive reactance increases with increasing frequency, and resistance is independent of frequency.

Question 16. In an electromagnetic wave, the ratio of energy densities of electric and magnetic fields is _____.
Fill in the blank with the correct answer from the options given below:
(1) 1:1
(2) 1
(3) c:1
(4) 1:c^2

Answer: (1) 1:1

Solution:
In an electromagnetic wave, the energy densities of the electric and magnetic fields are equal. Hence, the ratio is 1:1.

Question 17. Of the following, the correct arrangement of the electromagnetic spectrum in decreasing order of wavelength is _____.
Fill in the blank with the correct answer from the options given below:
(1) Radio waves, X-rays, Infrared waves, microwaves, visible waves
(2) Infrared waves, microwaves, Radio waves, X-rays, visible waves
(3) Radio waves, microwaves, Infrared waves, visible waves, X-rays
(4) X-rays, visible waves, Infrared waves, microwaves, Radio waves

Answer: (3) Radio waves, microwaves, Infrared waves, visible waves, X-rays

Solution: The correct order from the longest to the shortest wavelengths is: Radio waves, microwaves, Infrared waves, visible waves, X-rays.

Question 18. Match Electromagnetic waves listed in column I with Production method/device in column II.
Column-I
(A) Microwaves
(B) Infrared
(C) X-rays
(D) Radio waves

Column-II
(I) LC oscillator
(II) Magnetron
(III) Vibration of atoms/molecules
(IV) Bombarding large atomic number metal target with fast moving electrons

The correctly matched combination is as in option:
(1) (A) - (I), (B) - (II), (C) - (III), (D) - (IV)
(2) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)
(3) (A) - (II), (B) - (I), (C) - (IV), (D) - (III)
(4) (A) - (III), (B) - (IV), (C) - (I), (D) - (II)

Answer:
(2) (A) - (II), (B) - (III), (C) - (IV), (D) - (I)

Solution: Microwaves are produce by magnetrons, infrared by vibration of atoms/molecules, X-rays by bombarding a target with fast electrons, and radio waves by LC oscillators.

Question 19. In the figure given below, APB is a curved surface of radius of curvature 10 cm separating air and a transparent material (μ=4/3\mu = 4/3μ=4/3). A point object OOO is placed in air on the principal axis of the surface 20 cm from P. The distance of the image of OOO from P will be _____.
Fill in the blank with the correct answer from the options given below:
(1) 16 cm left of P in air
(2) 16 cm right of P in water
(3) 20 cm right of P in water
(4) 20 cm left of P in air

Answer:
(1) 16 cm left of P in air

Solution:
Using the lens-maker's formula for refraction at a spherical surface,

Question 20. For fixed values of radii of curvature of lens, power of the lens will be _____.

(1) $P \propto (\mu - 1)$ (2) $P \propto \mu^2$ (3) $P \propto 1/\mu$ (4) $P \propto \mu^{-2}$

Answer:
(1) P∝(μ−1)

Solution:
The power P of a lens is given by P=(μ−1)

Question 21. The graph correctly representing the variation of image distance 'v' for a convex lens of focal length 'f' versus object distance 'u' is _____.

Fill in the blank with the correct answer from the options given below:
(1) Graph 1
(2) Graph 2
(3) Graph 3
(4) Graph 4
Answer:
(1) Graph 1

Solution: For a convex lens, 1f=1v+1u. As u approaches f, v approaches ∞\infty∞, and for u<f, v is negative. The correct graph is hyperbolic.

Question 22. Using light from a monochromatic source to study diffraction in a single slit of width 0.1 mm, the linear width of central maxima is measured to be 5 mm on a screen held 50 cm away. The wavelength of light used is _____.

Fill in the blank with the correct answer from the options given below.

(1) 2.5×10^{-7} m (2) 4×10^{-7} m
(3) 5×10^{-7} m (4) 7.5×10^{-7} m

Answer:
(3) 5×10^−7

Solution:
For single slit diffraction, Width of central maxima=2λ

Question 23. Radiation of frequency 2v02v_02v0 is incident on a metal with threshold frequency v0v_0v0. The correct statement of the following is _____.
Fill in the blank with the correct answer from the options given below:
(1) No photoelectrons will be emitted
(2) All photoelectrons emitted will have kinetic energy equal to hv0
(3) Maximum kinetic energy of photoelectrons emitted can be hv0
(4) Maximum kinetic energy of photoelectrons emitted will be 2hv0

Answer:
(3) Maximum kinetic energy of photoelectrons emitted can be hv0

Solution:
According to the photoelectric equation**.** maximum kinetic energy is hv0.

Question 24. A point source causing photoelectric emission from a metallic plate is moved away from the plate. The variation of photoelectric current with distance from the source is correctly represented by the graph _____.
Fill in the blank with the correct answer from the options given below:
(1) Graph 1
(2) Graph 2
(3) Graph 3
(4) Graph 4

Answer:
(3) Graph 3

Solution:
Photoelectric current is directly proportional to the intensity of light, which decreases with the square of the distance. Hence, the right graph shows an inverse square relationship.

Question 25. A proton accelerated through a potential difference VVV has a de Broglie wavelength λ\lambdaλ. On doubling the accelerating potential, de Broglie wavelengths of the proton _____.
Fill in the blank with the correct answer from the options given below:
(1) remains unchanged
(2) becomes double
(3) becomes four times
(4) decreases

Answer: (4) decreases

Solution: The de Broglie wavelength, indicating it decreases.

Question 26. The kinetic energy of an electron in ground level in hydrogen atom is KKK units. The values of its potential energy and total energy respectively are _____.
Fill in the blank with the correct answer from the options given below:
(1) −2K;−K
(2) +2K;−K
(3) −K,+2K
(4) +K,+2K

Answer:
(1) −2K;−K

Solution:
For an electron in a hydrogen atom,for ground state, total energy E=−KE and potential energy U=−2KU hence −2K;−K

Question 27. Two nuclei have mass numbers AAA and BBB respectively. The density ratio of the nuclei is _____.
Fill in the blank with the correct answer from the options given below:
(1) A:B
(2) Square root A: Square root B
(3) A^2 : B^2
(4) 1:1

Answer:
(4) 1:1

Solution:
Nuclear density is approximately constant for all nuclei and is not dependent of the mass number. Therefore, the density ratio is 1:1

Question 28. The shortest wavelengths emitted in hydrogen spectrum corresponding to different spectral series are as under:
(A) Pfund series
(B) Balmer series
(C) Brackett series
(D) Lyman series

The wavelengths arranged correctly in decreasing order are _____
Fill in the blank with the correct answer from the options given below:

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

Answer:
(2) (A), (C), (B), (D)

Solution:
The wavelength of emitted light decreases as the energy level difference increases.
The correct order in decreasing wavelength is: Pfund > Brackett > Balmer > Lyman.

Question 29. Silicon can be doped using one of the following elements as dopant:
(A) Arsenic
(B) Indium
(C) Phosphorus
(D) Boron

To get n-type semiconductor, the dopants that can be used are _____.
Fill in the blank with the correct answer from the options given below:
(1) (A) and (C) only
(2) (B) and (C) only
(3) (A), (B), (C) and (D)
(4) (C) and (D) only

Answer: (1) (A) and (C) only

Solution: Arsenic and Phosphorus are pentavalent impurities that donate electrons and create n-type semiconductors when doped into silicon.

Question 30. Given below are V versus I graphs for different types of p-n junction diodes marked A, B, C and D.
(A) Graph A
(B) Graph
(C) Graph C
(D) Graph D

The correct sequence of graphs corresponding to forward biased p-n junction; Zener diode; Photo diode and Solar cell in order is _____
Fill in the blank with the correct answer from the options given below:
(1) (D), (C), (A), (B)

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

Answer:
(2) (A), (C), (B), (D)

Solution:
Forward biased p-n junction diode shows an exponential increase, the Zener diode shows a reverse breakdown, the Photodiode shows current due to light, and the Solar cell shows current generation under illumination.

Question 31. A wire carrying current II, bent as shown in the figure, is placed in a uniform field B that emerges normally out from the plane of the figure. The force on this wire is _____.
Fill in the blank with the correct answer from the options given below:
(1) 4BIR, directed vertically downward
(2) 3BIR, directed vertically upward
(3) BI(2R+πR), vertically downward
(4) 2π BIR, from P to Q

Answer: (4) 2π BIR, from P to Q

Solution:
The force on a current-carrying wire in a magnetic field is F. For a circular segment, the net force is along the line joining the ends of the wire.

Question 32. The refractive index of the material of an equilateral prism is 222. The angle of minimum deviation of that prism is _____.
Fill in the blank with the correct answer from the options given below:
(1) 60◦
(2) 75◦
(3) 30◦
(4) 90◦

Answer:
(2) 75◦

Solution: The angle of minimum deviation of that prism is 75◦

Question 33. The transfer of the integral number of _____ is one of the pieces of evidence for quantization of electric charge.
Fill in the blank with the correct answer from the options given below:

(1) photons
(2) nuclei
(3) electrons
(4) neutrons

Answer:
(3) electrons

Solution: The quantization of an electric charge is evidenced by the transfer of integral numbers of electrons.

Question 34. When a slab of insulating material 4 mm thick is introduced between the plates of a parallel plate capacitor of separation 4 mm, it is found that the distance between the plates has to be increased by 3.2 mm to restore the capacity to its original value. The dielectric constant of the material is _____.
Fill in the blank with the correct answer from the options given below:
(1) 2
(2) 5
(3) 3
(4) 7

Answer:
(2) 5

Solution: The dielectric constant of the material is 5

Question 35. A copper ball of density 8.0 g/cc and 1 cm in diameter is immersed in oil of density 0.8 g/cc. The charge on the ball if it remains just suspended in oil in an electric field of intensity 600π\piπ V/m acting in the upward direction is _____.
Fill in the blank with the correct answer from the options given below: (Take g=10 m/s2g = 10 \text{ m/s}^2g=10 m/s2)
(1) 2×10^−6
(2) 2×10^−5
(3) 1×10^−5
(4) 1×10^−6

Answer:
(1) 2×10^−6

Solution:
The buoyant force(Considering equilibrium of forces), The charge on the ball if it remains just suspended in oil in an electric field of intensity 600π\piπ V/m acting in the upward direction is 2×10^−6

Question 36. A metal wire is subjected to a constant potential difference. When the temperature of the metal wire increases, the drift velocity of the electron in it _____.
Fill in the blank with the correct answer from the options given below:
(1) increases, thermal velocity of the electrons decreases
(2) decreases, thermal velocity of the electrons decreases
(3) increases, thermal velocity of the electrons increases
(4) decreases, thermal velocity of the electrons increases

Answer:
(4) decreases, thermal velocity of the electrons increases

Solution: With a constant potential difference, increasing temperature increases the resistance, thereby decreasing the drift velocity and the thermal velocity of electrons increases with temperature.

Question 37. For the given mixed combination of resistors calculate the total resistance between points A and B.
Choose the correct answer from the options given below:
(1) 9 Ω
(2) 18 Ω
(3) 4 Ω
(4) 14 Ω

Answer: (1) 9 Ω

Solution: using series and parallel combinations: combine resistors step by step to find total resistance, resulting in 9 Ω.

Question 38. A cell of emf 1.1 V and internal resistance 0.5 Ω is connected to a wire of resistance 0.5 Ω. Another cell of the same emf is now connected in series with the intention of increasing the current but the current in the wire remains the same. The internal resistance of the second cell is _____.
Fill in the blank with the correct answer from the options given below:
(1) 1 Ω
(2) 2.5 Ω

(3) 1.5 Ω
(4) 2 Ω

Answer:
(2) 2.5 Ω

Solution:
Using Ohm's law, I=ER+r. For the current to remain unchanged, total resistance R+rR + rR+r must be the same.by solving, internal resistance of the second cell r2=2.5Ω.

Question 39. P, Q, R and S are four wires of resistances 3, 3, 3 and 4 Ω\OmegaΩ respectively. They are connected to form the four arms of a Wheatstone bridge circuit. The resistance with which S must be shunted in order that the bridge may be balanced is _____.
Fill in the blank with the correct answer from the options given below:
(1) 14 Ω
(2) 12 Ω
(3) 15 Ω
(4) 7 Ω

Answer:
(4) 7 Ω

Solution: For a balanced Wheatstone bridge, PQ=RS we get S′=7Ω

Question 40. Magnetic moment of a thin bar magnet is 'M'. If it is bent into a semicircular form, its new magnetic moment will be _____.
Fill in the blank with the correct answer from the options given below:
(1) M/π
(2) M/2
(3) M
(4) 2M/π

Answer:
(1) M/π

Solution:
When bent into a semicircle, the effective length becomes 2/π. Magnetic moment M=m×lM, new moment M′=m×2lπ=M/π

Question 41. Ferromagnetic material used in Transformers must have _____.
Fill in the blank with the correct answer from the options given below:

(1) Low permeability and High Hysteresis loss
(2) High permeability and Low Hysteresis loss
(3) High permeability and High Hysteresis loss
(4) Low permeability and Low Hysteresis loss

Answer:
(2) High permeability and Low Hysteresis loss

Solution:
Materials with the high permeability and the low hysteresis loss are very efficient for transformers, reducing energy loss and improving performance.

Question 42. A conducting ring of radius rrr is placed in a varying magnetic field perpendicular to the plane of the ring. If the rate at which the magnetic field varies is xxx, the electric field intensity at any point of the ring is _____.
Fill in the blank with the correct answer from the options given below:
(1) rx
(2) rx/2
(3) 2rx
(4) 4r/x

Answer:
(1) rx

Solution: Applying Faraday's law for a varying magnetic field, the induced electric field at any point on the ring is E=rx

Question 43. A 50 Hz ac current of crest value 1 A flows through the primary of a transformer. If the mutual inductance between the primary and secondary be 0.5 H, the crest voltage induced in the secondary is _____.
Fill in the blank with the correct answer from the options given below:
(1) 75 V
(2) 150 V
(3) 100 V
(4) 200 V

Answer:
(2) 150 V

Solution:
Using Vpeak=ω/M, Vpeak=100π×0.5×1=50π, approximated to 150 V.

Question 44. A long solenoid of diameter 0.1 m has 2×1042 \times 10^42×104 turns per meter. At the center of the solenoid a coil of 100 turns and radius 0.01 m is placed with its axis coinciding with the solenoid axis. The current in the solenoid reduces at a constant rate to 0 A from 4 A in 0.05 s. If the resistance of the coil is 10π2Ω, then the total charge flowing through the coil during this time is _____.
Fill in the blank with the correct answer from the options given below:
(1) 16 μC
(2) 32 μC
(3) 16πμC
(4) 32πμC

Answer: (4) 32πμC

Solution: The total charge flowing through the coil during this time is=32πμC.

Question 45. Lower half of a convex lens is made opaque. Which of the following statements describes the image of the object placed in front of the lens?
(A) No change in image
(B) Image will show only half of the object
(C) Intensity of image gets reduced

Choose the correct answer from the options given below:
(1) (A) only
(2) (B) only
(3) (C) only
(4) (B) and (C) only

Answer: (3) (C) only

Solution: Making half of the lens opaque reduces the light passing through, thus decreasing the intensity but the entire image is still formed, confirming albeit dimmer.

Question 46. Two slits are made 0.1 mm apart and the screen is placed 2 m away. The fringe separation when a light of wavelength 500 nm is used is _____.
Fill in the blank with the correct answer from the options given below:
(1) 1 cm
(2) 0.15 cm
(3) 1.5 cm
(4) 0.1 cm

Answer: (4) 0.1 cm

Solution: Fringe separation calculation with given parameters: $\beta=\lambda D$, $d=0.1$ cm

Question 47. For an astronomical telescope having an objective lens of focal length 10 m and an eyepiece lens of focal length 10 cm, telescope's tube length and magnification respectively are _____.
Fill in the blank with the correct answer from the options given below:
(1) 20 cm, 1
(2) 1000 cm, 1
(3) 1010 cm, 10
(4) 990 cm, 10

Answer: (3) 1010 cm, 10

Solution: For given focal lengths, tube length L=10, and magnification M=10M.

Question 48. According to Bohr's Model

(A) The radius of the orbiting electron is directly proportional to 'n'.
(B) The speed of the orbiting electron is directly proportional to '1/n'.
(C) The magnitude of the total energy of the orbiting electron is directly proportional to '1/n2'.
(D) The radius of the orbiting electron is directly proportional to 'n2'.

Choose the correct answer from the options given below.

(1) (A), (B) and (C) only
(2) (A), (B) and (D) only
(3) (A), (B), (C) and (D)
(4) (B), (C) and (D) only

Answer: (4) (B), (C) and (D) only

Solution: According to Bohr's Model, the following relationships hold true for an electron in the nth orbit of a hydrogen-like atom:

49. For a full wave rectifier, if the input frequency is 50 Hz, the output frequency will be _____.
Fill in the blank with the correct answer from the options given below.
(1) 50 Hz (2) 100 Hz (3) 25 Hz (4) 0 Hz

(2) 100 Hz

Solution: A full wave rectifier converts both half of the AC input waveform into DC. This means that the output frequency is double the input frequency. When the input frequency is 50 Hz, the full wave rectifier inverts the negative half of the waveform, and it results in an output frequency of 100 Hz.

50. For an electric dipole in a non-uniform electric field with dipole moment parallel to direction of the field, the force F and torque on the dipole respectively are _____.
Fill in the blank with the correct answer from the options given below.
force F and torque
(1) force F = 0 and torque = 0
(2) force F is not equal to 0 and torque= 0
(3) force F = 0 and torque is not equal to 0
(4) Both force F and torque are not equal to 0

Answer:
(2) force F is not equal to 0 and torque= 0

Solution:
In a non-uniform electric field, an electric dipole experiences a force and a torque. However, if the dipole moment is parallel to the direction of the electric field, the torque on the dipole is zero. Therefore, for an electric dipole in a non-uniform electric field with the dipole moment parallel to the field direction, the force is non-zero ($F \neq 0$) and the torque is zero ($\tau = 0$).