JEE Main April 2025

Question Paper With Text Solution

02 April | Shift-2

PHYSICS

MATRIX

JEE Main & Advanced | XI-XII Foundation| VI-X Pre-Foundation

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JEE MAIN APRIL 2025 | 02 APRIL SHIFT-2

SECTION – A

Question ID : 603421258

26. An electron with mass 'm' with an initial velocity $(t = 0)\vec{v} = v_0\hat{i}\,(v_0 > 0)$ enters a magnetic field $\vec{B} = B_0\hat{j}$. If the initial de-Broglie wavelength at $t = 0$ is λ_0 then its value after time 't' would be :

(1) $\dfrac{\lambda_0}{\sqrt{1+\dfrac{e^2B_0^2t^2}{m^2}}}$ (2) λ_0 (3) $\lambda_0\sqrt{1+\dfrac{e^2B_0^2t^2}{m^2}}$ (4) $\dfrac{\lambda_0}{\sqrt{1-\dfrac{e^2B_0^2t^2}{m^2}}}$

Ans. Official answer NTA (2)

Sol.

Question ID : 603421265

27. Assuming the validity of Bohr's atomic model for hydrogen like ions the radius of Li^{++} ion in its ground state is given by $\frac{1}{X}a_0$, where X = _____.

(Where a_0 is the first Bohr's radius.)

(1) 2 (2) 9 (3) 1 (4) 3

Ans. Official answer NTA (4)

Sol.

Question ID : 603421261

28. Two identical objects are placed in front of convex mirror and concave mirror having same radii of curvature of 12 cm , at same distance of 18 cm from the respective mirrors. The ratio of sizes of the images formed by convex mirror and by concave mirror is :

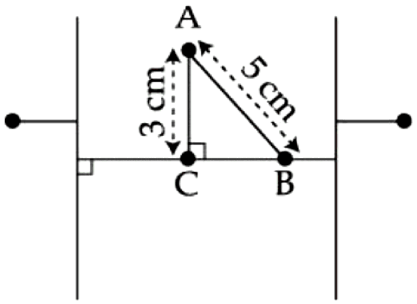
(1) 1/2 (2) 2 (3) 1/3 (4) 3

Ans. Official answer NTA (1)

Sol.

Question ID : 603421267

29. Two large plane parallel conducting plates are kept 10 cm apart as shown in figure. The potential difference between them is V. The potential difference between the points A and (shown in the figure) is :



(1) $\frac{1}{4}$V (2) $\frac{3}{4}$V (3) $\frac{2}{5}$V (4) 1 V

Ans. Official answer NTA (3)

Sol.

Question ID : 603421253

30. The moment of inertia of a circular ring of mass M and diameter r about a tangential axis lying in the plane of the ring is :

(1) $\frac{1}{2}Mr^2$ (2) $\frac{3}{2}Mr^2$ (3) $\frac{3}{8}Mr^2$ (4) $2Mr^2$

Ans. Official answer NTA (3)

Sol.

Question ID : 603421269

31. Consider a circular loop that is uniformly charged and has a radius $a\sqrt{2}$. Find the position along the positive z-axis of the cartesian coordinate system where the electric field is maximum if the ring was assumed to be placed in xy plane at the origin :

(1) 0 (2) a/2 (3) $a/\sqrt{2}$ (4) a

Ans. Official answer NTA (4)

Sol.

Question ID : 603421262

32. A bi-convex lens has radius of curvature of both the surfaces same as 1/6. If this lens is required to be replaced by another convex lens having different radii of curvatures on both sides $(R_1 \neq R_2)$, without any change in lens power then possible combination of R_1 and R_1 is :

(1) $\frac{1}{3}$cm and $\frac{1}{3}$cm (2) $\frac{1}{5}$cm and $\frac{1}{7}$cm (3) $\frac{1}{6}$cm and $\frac{1}{9}$cm (4) $\frac{1}{3}$cm and $\frac{1}{7}$cm

Ans. Official answer NTA (2)

Sol.

Question ID : 603421260

33. If μ_0 and ε_0 are the permeability and permittivity of free space, respectively, then the dimension of $\left(\frac{1}{\mu_0\varepsilon_0}\right)$ is:

(1) L/T^2 (2) T^2/L^2 (3) L^2/T^2 (4) T^2/L

Ans. Official answer NTA (3)

Sol.

Question ID : 603421259

34. A sinusoidal wave of wavelength 7.5 cm travels a distance of 1.2 cm along the x-direction in 0.3 sec . The crest P is at $x = 0$ at $t = 0$ and maximum displacement of the wave is 2 cm . Which equation correctly represents this wave ?

(1) $y = 2\cos(0.83x - 3.35t)$cm (2) $y = 2\cos(0.13x - 0.5t)$cm

(3) $y = 2\cos(3.35x - 0.83t)$cm (4) $y = 2\sin(0.83x - 3.5t)$cm

Ans. Official answer NTA (1)

Sol.

Question ID : 603421256

35. Two water drops each of radius 'r' coalesce to form a bigger drop. If 'T' is the surface tension, the surface energy released in this process is :

(1) $4\pi r^2 T[\sqrt{2}-1]$ (2) $4\pi r^2 T\left[2-2^{2/3}\right]$ (3) $4\pi r^2 T[1+\sqrt{2}]$ (4) $4\pi r^2 T\left[2-2^{1/3}\right]$

Ans. Official answer NTA (2)

36. Identify the characteristics of an adiabatic process in a monoatomic gas.

(A) Internal energy is constant.

(B) Work done in the process is equal to the change in internal energy.

(C) The product of temperature and volume is a constant.

(D) The product of pressure and volume is a constant.

(E) The work done to change the temperature from T_1 to T_2 is proportional to $(T_2 - T_1)$

Choose the correct answer from the options given below :

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

Ans. Official answer NTA (3)

Sol.

Question ID : 603421268

37. A solenoid having area A and length '*l*' is filled with a material having relative permeability 2. The magnetic energy stored in the solenoid is :

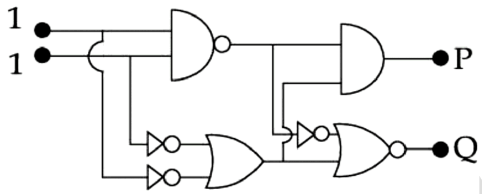
(1) B^2Al (2) $\frac{B^2Al}{4\mu_0}$ (3) $\frac{B^2Al}{2\mu_0}$ (4) $\frac{B^2Al}{\mu_0}$

Ans. Official answer NTA (2)

Sol.

Question ID : 603421264

38. In the digital circuit shown in the figure, for the given inputs the P and Q values are :



(1) P = 0, Q = 0 (2) P = 1, Q = 0 (3) P = 1, Q = 1 (4) P = 0, Q = 1

Ans. Official answer NTA (1)

Sol.

Question ID : 603421251

39. Match List - I with List - II.

List - I	List - II
(A) Heat capacity of body	(I) $J\ kg^{-1}$
(B) Specific heat capacity of body	(II) $J\ K^{-1}$
(C) Latent heat	(III) $J\ kg^{-1}\ K^{-1}$
(D) Thermal conductivity	(IV) $J\ m^{-1}\ K^{-1}\ s^{-1}$

Choose the correct answer from the options given below :

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

(3) (A)-(III), (B)-(IV), (C)-(I), (D)-(II) (4) (A)-(II), (B)-(III), (C)-(I), (D)-(IV)

Ans. Official answer NTA (4)

Sol.

Question ID : 603421266

40. Given below are two statements : one is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A) : Net dipole moment of a polar linear isotropic dielectric substance is not zero even in the absence of an external electric field.

Reason (R) : In absence of an external electric field, the different permanent dipoles of a polar dielectric substance are oriented in random directions.

In the light of the above statements, choose the **most appropriate answer** from the options given below :

(1) (A) is not correct but (R) is correct

(2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

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

(4) (A) is correct but (R) is not correct

Ans. Official answer NTA (1)

Sol.

Question ID : 603421263

41. Energy released when two deuterons ($_1H^2$) fuse to form a helium nucleus ($_2He^4$) is :

(Given : Binding energy per nucleon of $_1H^2$ and binding energy per nucleon of $_2He^4 = 7.0$ MeV)

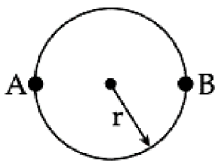
(1) 23.6 MeV (2) 8.1 MeV (3) 26.8 MeV (4) 5.9 MeV

Ans. Official answer NTA (1)

Sol.

Question ID : 603421255

42. A sportsman runs around a circular track of radius r such that he traverses the path ABAB. The distance travelled and displacement, respectively, are



(1) $3\pi r, \pi r$ (2) $2r, 3\pi r$ (3) $\pi r, 3r$ (4) $3\pi r, 2r$

Ans. Official answer NTA (4)

Sol.

Question ID : 603421270

43. In a moving coil galvanometer, two moving coils M_1 and M_1 have the following particulars :

$R_1 = 5\Omega, N_1 = 15, A_1 = 3.6\times10^{-3}\ m^2, B_1 = 0.25\,T$

$R_2 = 7\Omega, N_2 = 21, A_2 = 1.8\times10^{-3}\ m^2, B_2 = 0.50\,T$

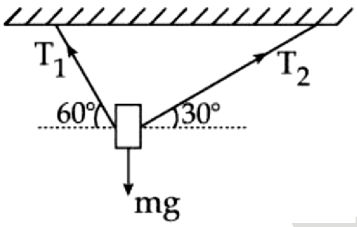
Assuming that torsional constant of the springs are same for both coils, what will be the ratio of voltage sensitivity of M_1 and M_2 ?

(1) 1 : 2 (2) 1 : 1 (3) 1 : 4 (4) 1 : 3

Ans. Official answer NTA (2)

Sol.

Question ID : 603421254

44. 

A body of mass 1 kg is suspended with the help of two strings making angles as shown in figure. Magnitudes of tensions T_1 and T_2, respectively, are (in N) : (Take acceleration due to gravity 10 m/s^2)

(1) 5, 5 (2) $5, 5\sqrt{3}$ (3) $5\sqrt{3}, 5\sqrt{3}$ (4) $5\sqrt{3}, 5$

Ans. Official answer NTA (4)

Sol.

Question ID : 603421252

45. Given a charge q, current I and permeability of vacuum μ_0. Which of the following quantity has the dimension of momentum ?

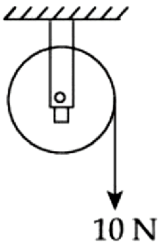
(1) $q\,\mu_0 I$ (2) $q\,\mu_0/I$ (3) $q^2\,\mu_0 I$ (4) q^I/μ_0

Ans. Official answer NTA (1)

Sol.

SECTION – B

Question ID : 603421271

46. 

A wheel of radius 0.2 m rotates freely about its center when a string that is wrapped over its rim is pulled by force of 10 N as shown in figure. The established torque produces an angular acceleration of 2rd/s^2. Moment of intertia of the wheel is _____ kg m^2.

(Acceleration due to gravity = 10 m/s^2)

Ans. Official answer NTA (1)

Sol.

Question ID : 603421275

47. The internal energy of air in sized room at 1 atmospheric pressure will be × 10^{6}J.

(Consider air as diatomic molecule)

Ans. Official answer NTA (12)

Sol.

Question ID : 603421272

48. A satellite of mass 1000 kg is launched to revolve around the earth in an orbit at a height of 270 km from the earth's surface. Kinetic energy of the satellite in this orbit is _____×10^{10}J.

(Mass of earth = 6 × 10^{24}, Radius of earth = 6.4 × 10^6 m, Gravitational constant = 6.67 × 10–^{11} Nm^2 kg^{-2})

Ans. Official answer NTA (30)

Sol.

Question ID : 603421273

49. The length of a light string is 1.4 m when the tension on it is 5 N . If the tension increases to 7 N , the length of the string is 1.56 m . The original length of the string is _____m.

Ans. Official answer NTA (1)

Sol.

Question ID : 603421274

50. A ray of light suffers minimum deviation when incident on a prism having angle of the prism equal to 60^{o}. The refractive index of the prism material is $\sqrt{2}$. The angle of incidence (in degrees) is _____.

Ans. Official answer NTA (45)

Sol.