JEE Main April 2026

Question Paper With Text Solution

02 April | Shift-2

PHYSICS

MATRIX

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

Office : Piprali Road, Sikar (Raj.) | Ph. 01572-241911
Website : www.matrixedu.in ; Email : smd@matrixacademy.co.in

JEE MAIN APRIL 2026 | 02 APRIL SHIFT-2

SECTION – A

Question ID : 691121176

26. Dimensions of universal gravitational constant (G) in terms of Planck's constant (h), distance (L), mass (M) and time (T) are _____ .

(1) $[hTLM^{-2}]$ (2) $[hT^{-1}LM^{-2}]$ (3) $[hTL^{2}M^{-2}]$ (4) $[h^{-1}T^{-1}LM^{-2}]$

Ans. (2)

Sol. $G = [h]^a [L]^b [M]^c [T]^d$

$\Rightarrow M^{-1}L^3T^{-2} = \left[M^1L^2T^{-1}\right]^a [L]^b [M]^c [T]^d$

$\Rightarrow M^{-1}L^3T^{-2} = M^{a+c}L^{2a+b}T^{-a+d}$

$\Rightarrow -1 = a + c$ .....(i)

$3 = 2a + b$ .....(ii)

& $-2 = -a + d$ .....(iii)

By checking the options correct answer is (2) as

4 variables using 3 equations cannot be solved

Question ID : 691121177

27. A 0.5 kg mass is in contact against the inner wall of a cylindrical drum of radius 4 m rotating about its vertical axis. The minimum rotational speed of the drum to enable the mass to remain stuck to the wall (without falling) is 5 rad/s. The coefficient of friction between the drum's inner wall surface and mass is _____ . (Take g = 10 m/s^2)

(1) 0.1 (2) 0.5 (3) 0.7 (4) 0.3

Ans. (1)

Sol. Normal reaction on block

$N = m\omega^2 r$

Weight is balanced by friction

$\therefore f_s = mg$

$\because f_s \le \mu N$

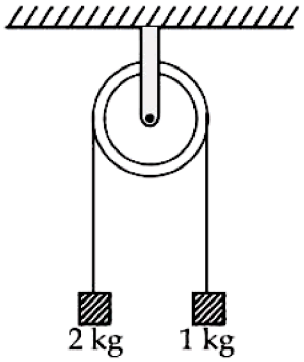
$\Rightarrow mg \le \mu m\omega^2 r$

$\Rightarrow \mu \ge \frac{g}{\omega^2 r}$

$\Rightarrow \mu \ge 0.1$

Question ID : 691121178

28. Two blocks of masses 2 kg and 1 kg respectively, are tied to the ends of a string which passes over a light frictionless pulley as shown in the figure below. The masses are held at rest at the same horizontal level and then released. The distance traversed by the centre of mass in 2 s is _____ m. (Take g = 10 m/s^2)



(1) 3.33 (2) 3.12 (3) 2.22 (4) 1.42

Ans. (3)

Sol. Acceleration of system $= \frac{(2-1)}{2+1}g = \frac{10}{3}m/s^2$

In 2 second distance $= \frac{1}{2}\left(\frac{10}{3}\right)(2)^2$

$= \frac{20}{3}m$

2 kg block moves up and 1 kg block moves down

$\therefore$ Distance covered by COM

$= \frac{\frac{20}{3}\times 2 - \frac{20}{3}\times 1}{2+1} = 2.22m$

Question ID : 691121179

29. A particle having charge 10^{-9} C moving in x-y plane in fields of $0.4\ \hat{j}$ N/C and $4 \times 10^{-3}\ \hat{k}$ T experiences a force of $(4\hat{i}+2\hat{j})\times 10^{-10}$ N. The velocity of the particle at that instant is _____ m/s.

(1) $50\hat{i}+100\hat{j}$ (2) $100\hat{i}+50\hat{j}$ (3) $-50\hat{i}+100\hat{j}$ (4) $50\hat{i}-100\hat{j}$

Ans. (1)

Sol. Let $\vec{v} = v_1\hat{i} + v_2\hat{j} + v_3\hat{k}$

$\therefore \vec{F} = q\vec{E} + q\left(\vec{v} \times \vec{B}\right)$

$\Rightarrow \vec{F} = 0.4 \times 10^{-9}\hat{j} + 4 \times 10^{-12}\left(\vec{v}_2\hat{i} - \vec{v}_1\hat{j}\right)$

$\Rightarrow \vec{F} = (4v_2 \times 10^{-12})\hat{i} + (4 - 0.04v_1)10^{-10}\ \hat{j}$

Compare with

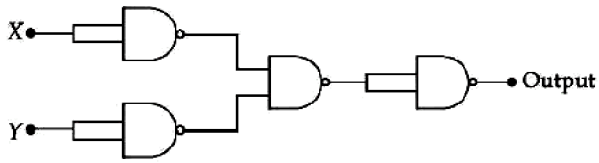
$\vec{F} = \left(4\hat{i} + 2\hat{j}\right) \times 10^{-10}$

$\Rightarrow v_2 = 100$ and $v_1 = 50$

Only x and y components can be found from the given information

Question ID : 691121180

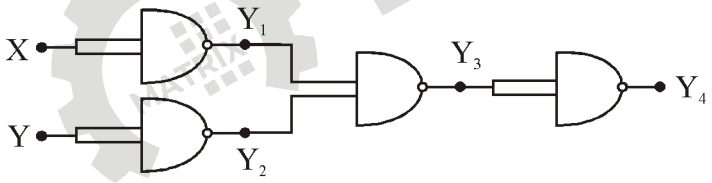
30. If X and Y are the inputs, the given circuit works as _____.



(1) OR gate (2) AND gate (3) NAND gate (4) NOR gate

Ans. (4)

Sol.



Truth table

X	Y	Y_1	Y_2	Y_3	Y_4
0	0	1	1	0	1
0	1	1	0	1	0
1	0	0	1	1	0
1	1	0	0	1	0

NOR gate

Question ID : 691121181

31. If a body of mass 1 kg falls on the earth from infinity, it attains velocity (v) and kinetic energy (k) on reaching the surface of earth. The values of v and k respectively are _____.

(Take radius of earth to be 6400 km and g = 9.8 m/s^2)

(1) 11.2 km/s; 6.27×10^7 J (2) 11.2 km/s; 12.54×10^7J

(3) 8.8 km/s; 6.27×10^7 J (4) 8.8 km/s; 12.54×10^7 J

Ans. (1)

Sol. Using cons. of M.E

$$\frac{-GMm}{R} + K = 0 \quad \Rightarrow K = mgR$$

$$\Rightarrow K = 6.27 \times 10^7 J$$

$$\Rightarrow v = 11.2 \text{ km/s}$$

Question ID : 691121182

32. In a screw gauge the zero of main scale reference line coincides with the fifth division of the circular scale when two studs are in contact. There are 100 divisions in circular scale and pitch of screw gauge is 0.1 mm . When diameter of a sphere is measured, the reading of main scale is 5 mm and 50^{th} division of circular scale coincides with the reference line of main scale. The diameter of sphere is _____ mm.

(1) 5.045 (2) 5.055 (3) 5.450 (4) 5.550

Ans. (1)

Sol. Least count = $\frac{0.1}{100}$ mm

Zero reading = 5 × L.C = .005 mm

Reading = 5 mm + 50 × L.C = 5.050 mm

$\therefore$ Corrected reading = 5.050 – 0.005

= 5.045 mm

Question ID : 691121183

33. The surface tension of a soap bubble is 0.03 N/m. The work done in increasing the diameter of bubble from 2 cm to 6 cm is $\alpha\pi \times 10^{-4}$ J. The value of α is _____ . (Take $\pi = 3.14$)

(1) 0.86 (2) 0.64 (3) 1.92 (4) 7.68

Ans. (3)

Sol. Work done = $S\Delta A$

$S\pi\left(d_2^2 - d_1^2\right) \times 2$

$= 2 \times .03\ \pi\ (36 - 4)10^{-4}$

$= 1.92\ \pi \times 10^{-4}$ J

Question ID : 691121184

34. A mixture of carbon dioxide and oxygen has volume 8310 cm^3, temperature 300 K , pressure 100 kPa and mass 13.2 g . The number of moles of carbon dioxide and oxygen gases in the mixture respectively are _____ .

(Assume both carbon dioxide and oxygen gases behave like ideal gases) [R = 8.31 J/mol.K]

(1) 0.15 and 0.18 (2) 0.25 and 0.08 (3) 0.21 and 0.12 (4) 0.13 and 0.20

Ans. (3)

Sol. $\because n = \dfrac{PV}{RT} = \dfrac{10^5 \times 8310 \times 10^{-6}}{8.31 \times 300}$

$\Rightarrow n = \dfrac{1}{3}$

Let n_1 = no of moles of CO_2

$\therefore n_1 \times 44 + \left(\dfrac{1}{3} - n_1\right)32 = 13.2$

$\Rightarrow n_1 = 0.21$ and $n_2 = 0.12$

Question ID : 691121185

35. If an air bubble of diameter 2 mm rises steadily through a liquid of density 2000 kg/m^3 at a rate of 0.5 cm/s, then the coefficient of viscosity of liquid is _____ Poise. (Take g = 10 m/s^2)

(1) 0.88 (2) 8.8 (3) 88.8 (4) 0.088

Ans. (2)

Sol. Assuming density of air negligible balancing upward buoyant and downward viscous forces

$$6\pi\eta rv = \frac{4}{3}\pi r^3 \rho g$$

$$\Rightarrow \eta = .88 \text{ SI unit}$$

$$\Rightarrow \eta = 8.8 \text{ poise}$$

Question ID : 691121186

36. A spherical ball of mass 2 kg falls from a height of 10 m and is brought to rest after penetrating 10 cm into sand. The average force exerted by sand on the ball is _____ N.

(Take g = 10 m/s^2)

(1) 1980 (2) 2020 (3) 2000 (4) 1000

Ans. (3)

Sol. Applying work energy theorem

mgh – Fs = 0

$$\Rightarrow F = \frac{2\times10\times10}{0.1} = 2000N$$

Question ID : 691121187

37. An electromagnetic wave travels in free space along the x–direction. At a particular point in space and time, $\vec{B} = 2\times10^{-7}\hat{j}T$ is associated with this wave. The value of corresponding electric field $\vec{E}$ at this point is _____ V/m.

(1) $60\hat{k}$ (2) $-60\hat{k}$ (3) $30\hat{k}$ (4) $-600\hat{k}$

Ans. (2)

Sol. E = CB = 60

As wave travels along $\vec{E}\times\vec{B}$

So direction of $\vec{E}$ is $-\hat{k}$

$\therefore \vec{E} = -60\hat{k}$

Question ID : 691121188

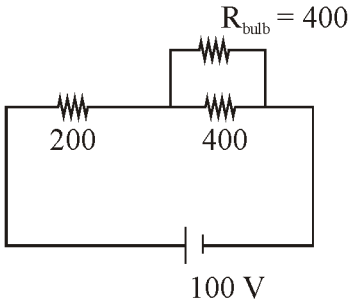
38. Two resistors of 200 Ω and 400 Ω are connected in series with a battery of 100 V . A bulb rated at 200

V, 100 W is connected across the 400 Ω resistance. The potential drop across the bulb is _____ V.

(1) 25 (2) 50 (3) 66.6 (4) 100

Ans. (2)

Sol.



$R_{eq} = 400\Omega \Rightarrow I = \frac{1}{4}A$

$\therefore$ Potential drop = 50 V

Question ID : 691121189

39. Two metal plates (A, B) are kept horizontally with separation of $\left(\frac{12}{\pi}\right)$ cm, with plate A on the top. An atomizer jet sprays oil (density 1.5 g/cm^3) droplets of radius 1 mm horizontally. All oil droplets carry a charge 5 nC . The potentials V_A and V_B are required on plates A and B respectively in order to ensure the droplets do not descend. The values of V_A and V_B are _____ .

(Neglect the air resistance to the droplets and take g = 10 m/s^2)

(1) 100 V and 580 V (2) 580 V and 100 V

(3) 60 V and 400 V (4) 0 V and –200 V

Ans. (1)

Sol. For equilibrium

$F_e = mg$

$\Rightarrow q\left(\frac{\Delta V}{l}\right) = \frac{4}{3}\pi r^3 \rho g$

$\Rightarrow \Delta V = 480V$

Upper plate should be at low potential.

Question ID : 691121190

40. Two point charges 8 μC and –2 μC are located at x = 2 cm and x = 4 cm, respectively on the x-axis. The ratio of electric flux due to these charges through two spheres of radii 3 cm and 5 cm with their centers at the origin is _____ .

(1) 4 : 1 (2) 3 : 4 (3) 4 : 3 (4) 4 : 5

Ans. (3)

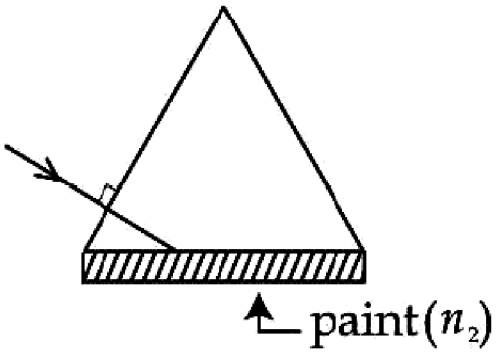
Sol. $\phi_1(r = 3cm) = \frac{8\mu C}{\varepsilon_0}$

$\phi_2(r = 5cm) = \frac{(8-2)\mu C}{\varepsilon_0}$

$\therefore \frac{\phi_1}{\phi_2} = \frac{4}{3}$

Question ID : 691121191

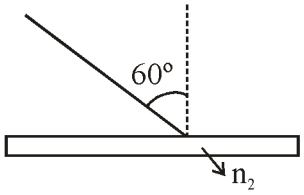
41. One side of an equilateral prism is painted by a transparent material of refractive index n_2. The refractive index of prism is 1.6 . The minimum value of n_2 required for total internal reflection from painted face is _____ .



(1) $3\sqrt{3}/1.6$ (2) $\sqrt{3}$ (3) $3.2/\sqrt{3}$ (4) $4\sqrt{3}/5$

Ans. (Bonus)

Sol.



For TIR

$\sin 60° > \left(\frac{n_2}{1.6}\right)$

$\frac{\sqrt{3}}{2} > \frac{n_2}{1.6}$

$\Rightarrow n_2 < \frac{4\sqrt{3}}{5}$

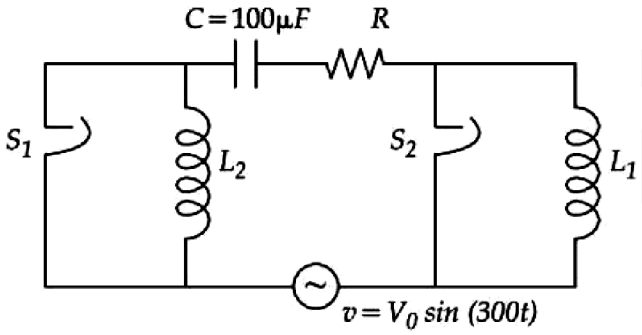
$\therefore n_{2(max.)} = \frac{4\sqrt{3}}{5}$

As minimum value of R.I. for TIR will be 1.

So this question should be Bonus

Question ID : 69112119

42. The figure given below shows an LCR series circuit with two switches S_1 and S_2. When switch S_1 is closed keeping S_2 open, the phase difference (ϕ) between the current and source voltage is 30° and phase difference is 60° when S_2 is closed keeping S_1 open. The value of $(3L_1 - L_2)$ is _____ H.



(1) $\frac{9}{2}$ (2) $\frac{2}{9}$ (3) $\frac{1}{3}$ (4) 3

Ans. (2)

Sol. When S_1 is closed

$\tan 30° = \frac{X_C - X_{L_1}}{R}$ .....(1)

When S_2 is closed

$\tan 60° = \frac{X_C - X_{L_2}}{R}$ .....(2)

(1) ÷ (2)

$\frac{1}{3} = \frac{X_C - X_{L_1}}{X_C - X_{L_2}}$

$\Rightarrow 3X_{L_1} - X_{L_2} = 2X_C$

$$\Rightarrow 300(3L_1 - L_2) = 2 \times \frac{100}{3}$$

$$\Rightarrow 3L_1 - L_2 = \frac{2}{9}$$

Question ID : 691121193

43. A circular current loop of radius R is placed inside square loop of side length L(L >> R) such that they are co-planar and their centers coincide. The permeability of free space is μ_0. The mutual inductance between circular loop and square loop is _____ .

(1) $2\sqrt{2}\frac{\mu_0 L^2}{R}$ (2) $\sqrt{2}\frac{\mu_0 L^2}{R}$ (3) $\sqrt{2}\frac{\mu_0 R^2}{L}$ (4) $2\sqrt{2}\frac{\mu_0 R^2}{L}$

Ans. (4)

Sol. Let I current flowing in square loop

$$B(\text{centre}) = \frac{\frac{\mu_0 I}{4\pi\left(\frac{L}{2}\right)}\left(2\sin 45°\right) \times 4}$$

and flux $\phi = \pi R^2 B$

$\therefore$ Mutual inductance

$$M = 2\sqrt{2}\frac{\mu_0 R^2}{L}$$

Question ID : 691121194

44. The binding energy per nucleon of $^{209}_{83}Bi$ is ____ MeV .

[Take $m\left(^{209}_{83}Bi\right) = 208.980388u, m_p = 1.007825u, m_n = 1.008665u, 1u = 931MeV/c^2$]

(1) 7.48 (2) 7.84 (3) 8.79 (4) 6.94

Ans. Official answer NTA (2)

Sol. Mass defect = (83 × 1.007825 + 126 × 1.008665) – 208.980388

= 1.760877 u

$\therefore$ B.E = 1.760877 × 931 MeV

$\therefore$ B.E/nucleon = 7.84 MeV

Question ID : 691121195

45. The equation of motion of a particle is given by $x = a\sin(50t + \pi/3)$cm . The particle will come to rest at time t_1 and it will have zero acceleration at time t_2. The t_1 and t_2 respectively are _____ .

(1) $\frac{\pi}{300}$s, $\frac{\pi}{75}$s (2) $\frac{\pi}{75}$s, $\frac{\pi}{300}$s (3) $\frac{\pi}{300}$s, $\frac{\pi}{25}$s (4) $\frac{\pi}{50}$s, $\frac{\pi}{100}$s

Ans. (1)

Sol. $x = a\sin(50t + \pi/3)$

Particle will come to rest at extreme positions

$\Rightarrow 50t_1 + \pi/3 = (2n+1)\pi/2$

Particle will have zero acceleration at mean postion

$$\Rightarrow 50t_2 + \frac{\pi}{3} = n\pi$$

$$\therefore t_1 = \frac{\pi}{300} \text{ and } t_2 = \frac{\pi}{75}$$

There will be infinite values. We have reported minimum values.

Question ID : 691121196

46. In a Young's double slit experiment, the intensity at some point on the screen is found to be $\frac{3}{4}$ times of the maximum of the interference pattern. The path difference between the interfering waves at this point is $\frac{\lambda}{x}$ where λ is wavelength of the incident light. The value of x is _____ .

Ans. (6)

Sol. In YDSE

$$I = I_{max}\cos^2\left(\frac{\Delta\phi}{2}\right)$$

$$\Rightarrow \frac{3}{4} = \cos^2\left(\frac{\Delta\phi}{2}\right)$$

$$\Rightarrow \cos\left(\frac{\Delta\phi}{2}\right) = \pm\frac{\sqrt{3}}{2}$$

$$\Rightarrow \Delta\phi = \frac{\pi}{3}, \frac{5\pi}{3}$$

$$\therefore \Delta\phi = \frac{2\pi}{\lambda}\Delta x$$

$$\Rightarrow \Delta x = \frac{\lambda}{6}, \frac{5\lambda}{6}$$

Question ID : 691121197

47. Using Bohr's model, calculate the ratio of the magnetic fields generated due to the motion of the electrons in the 2^{nd} and 4^{th} orbits of hydrogen atom _____ .

Ans. (32)

Sol. Magnetic field due to a moving charge $\propto \frac{v}{r^2}$

From bohr model $r \propto n^2$ and $v \propto \frac{1}{n}$

$\therefore$ Magnetic field $\propto \frac{1}{n^5}$

$\therefore \text{ratio} = \left(\frac{4}{2}\right)^5 = 32$

Question ID : 691121198

48. 5 moles of unknown gas is heated at constant volume from 10 °C to 20 °C. The molar specific heat of this gas at constant pressure c_p = 8 cal/mol. °C and R = 8.36 J/mol.°C. The change in the internal energy of the gas is _____ calorie.

Ans. (300)

Sol. $C_V = C_P - R = 8 - \frac{8.36}{4.18} = 6 \text{ cal / mol} - k$

$\because \Delta U = nC_V\Delta T = 5 \times 6 \times 10 = 300$ cal.

Question ID : 691121199

49. If sunlight is focused on a paper using convex lens, it starts burning the paper in shortest time when the lens is kept at 30 cm above the paper. If the radius of curvature of the lens is 60 cm then the refractive index of the lens material is $\frac{\alpha}{10}$. The value of α is _____.

Ans. (20)

Sol. To burn fastest it should be kept at focus.

$\Rightarrow$ F = 30 cm

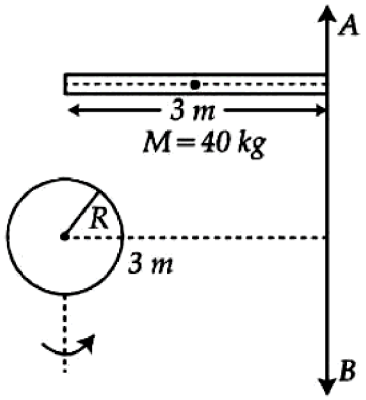
Using lens maker formula

$$\frac{1}{30}=(\mu-1)\left(\frac{1}{60}-\frac{1}{-60}\right)\Rightarrow \mu=2$$

(In this solution both surfaces are assumed spherical with R = 60 cm)

Question ID : 691121200

50. Moment of inertia about an axis AB for a rod of mass 40 kg and length 3 m is same as that of a solid sphere of mass of 10 kg and radius R about an axis parallel to AB axis with separation of 3 m as shown in figure below. The value of R is given as $\sqrt{\frac{\alpha}{2}}$. The value of α is _____.



Ans. (15)

Sol. $I_{rod}=I_{sphere}$

$$\Rightarrow \frac{(40)(3)^2}{3}=\frac{2}{5}\times 10R^2+10\times 3^2$$

$$\Rightarrow R=\sqrt{15/2}$$