JEE Main April 2026

Question Paper With Text Solution

05 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 | 05 APRIL SHIFT-2

SECTION – A

Question ID : 691121476

26. Match List - I with List - II.

List - I	List - II
A. Meter (L)	I. $\sqrt{\frac{hc}{G}}$
B. Second (S)	II. $\sqrt{\frac{Gh}{c^5}}$
C. Kilogram (M)	III. $\sqrt{\frac{K^2L^2c^3}{Gh}}$
D. Kelvin (K)	IV. $\sqrt{\frac{Gh}{c^3}}$

where h (Planck's constant), G (gravitational constant) and c (speed of light in vacuum) as fundamental units.

Choose the correct answer from the options given below :

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

Ans. (2)

Sol. $[h]=\frac{[E]}{[\nu]}=ML^2T^{-1}$

$[C]=LT^{-1}$

$[G]=M^{-1}L^3T^{-2}$

Check list II $\Rightarrow \sqrt{\frac{hc}{G}}=\sqrt{\frac{(ML^2T^{-1})(LT^{-1})}{M^{-1}L^3T^{-2}}}=M$

$$\sqrt{\frac{Gh}{c^5}}=\sqrt{\frac{(M^{-1}L^3T^{-2})(ML^2T^{-1})}{(LT^{-1})^5}}=[T]$$

$$\sqrt{\frac{K^2L^2C^3}{Gh}} = \sqrt{\frac{K^2L^2L^3T^{-3}}{M^{-1}L^3T^{-2}LT^{-1}}} = [K]$$

$$\sqrt{\frac{Gh}{C^3}} = \sqrt{\frac{M^{-1}L^3T^{-2}ML^2T^{-1}}{(LT^{-1})^3}} = L$$

Question ID : 691121477

27. In an experiment to determine the resistance of a given wire using Ohm's law, the voltmeter and ammeter readings are noted as 10 V and 5 A , respectively. The least counts of voltmeter and ammeter are 500 mV and 200 mA , respectively. The estimated error in the resistance measurement is __________ Ω.

(1) 0.25 (2) 2 (3) 2.5 (4) 0.18

Ans. (4)

Sol. $V = IR \Rightarrow \frac{\Delta R}{R} = \frac{\Delta V}{V} - \frac{\Delta I}{I}$ $\quad R = \frac{10}{5} = 2\Omega$

$$\text{error} \Rightarrow \frac{\Delta R}{R} = \frac{\Delta V}{V} + \frac{\Delta I}{I}$$

$$\Delta R = 2\left[\frac{0.5}{10} + \frac{0.2}{5}\right] = \frac{2\times 9}{100} = 0.18$$

Question ID : 691121478

28. A mass of 1 kg is kept on a inclined plane with 30° inclination with respect to horizontal plane and it is at rest initially. Then the whole assembly is moved up with constant velocity of 4 m/s. The work done by the frictional force in time 2 s is _______ J. (Take $g = 10\ m/s^2$)

(1) 20 (2) 25 (3) 30 (4) 10

Ans. (1)

Sol. Upward distance in $2\sec = 4\times 2 = 8\,m$

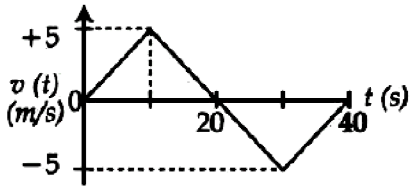
$$\text{friction} = mg\sin 30 \Rightarrow 1\times 10\times\frac{1}{2} = 5\,N$$

angle between friction & vertical displacement = 60

$$W_f = (8)(5)\cos 60 = 20\,J$$

Question ID : 691121479

29. The velocity (v) versus time (t) plot of a particle is shown in the figure, for a time interval of 40 s . The total distance travelled by the particle and the average velocity during this period are, respectively ___________.



(1) 25 m and zero (2) 50 m and zero (3) 100 m and zero (4) 100 m and 2.5 m/s

Ans. (3)

Sol. area of graph is displacement.

$$\text{area}\,(t = 0 \text{ to } t = 20) = A_1 = \frac{1}{2} \times 20 \times 5 = 50$$

$$\text{area}\,(t = 20 \text{ to } t = 40) = A_2 = -\frac{1}{2} \times 20 \times 5 = -50$$

total displacement $= A_1 + A_2 = 0$

total distance $= |A_1| + |A_2| = 100\,\text{m}$

$$V_{av} = \frac{\text{displacement}}{\text{time}} = 0$$

Question ID : 691121480

30. A wheel initially at rest is subjected to a uniform angular acceleration about its axis. In the first 2 s it rotates through an angle θ_1 and in the next 2 s it rotates through an angle θ_2. The ratio $\frac{\theta_2}{\theta_1}$ is _______.

(1) 6 (2) 3 (3) 4 (4) $\frac{1}{3}$

Ans. (2)

Sol. $\omega_i = 0$ $\alpha = \text{const.}$

$$\theta(\text{ in 2sec}) = 0 + \frac{1}{2}\alpha(2)^2 = 2\alpha = \theta_1$$

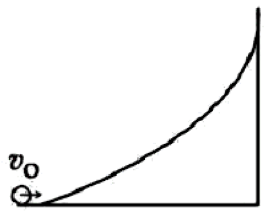
angle in next 2sec $= \theta_2 = \theta(t = 4) - \theta(t = 2)$

$= \frac{1}{2}\alpha(4)^2 - \frac{1}{2}\alpha(2)^2 = 6\alpha$

$\frac{\theta_2}{\theta_1} = 3$

Question ID : 691121481

31. An object of uniform density rolls up the curved path with the initial velocity v_o as shown in the figure. If the maximum height attained by an object is $\frac{7v_o^2}{10g}$ (g = acceleration due to gravity), the object is a___.



(1) Solid cylinder (2) Ring (3) Disc (4) Solid sphere

Ans. (4)

Sol. at maximum velocity and angular velocity becomes zero.

$\omega_i = \frac{v_0}{R}$

apply WET $\Rightarrow mgh = \frac{1}{2}mv_0^2 + \frac{1}{2}I\left(\frac{v_0}{R}\right)^2$ (1)

$h = \frac{7v_0^2}{10g}$ (2)

from (1) & (2) $I = \frac{2}{5}MR^2$

So body will be solid sphere

Question ID : 691121482

32. A body of mass m is taken from the surface of earth to a height equal to twice the radius of earth (R_e). The increase in potential energy will be _________ .

(g is acceleration due to gravity at the surface of earth)

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

Ans. (4)

Sol. $U_i = \frac{-GMm}{R_e}$

$U_f = \frac{-GMm}{3R_e}$

$\Delta U = U_f - U_i = \frac{2GMm}{3R_e} = \frac{2mgR_e}{3}$

Question ID : 691121483

33. Eight mercury drops, each of radius r, coalesce to form a bigger drop. The surface energy released in this process is _________. (S is the surface tension of mercury).

(1) 8 $\pi r^2 S$ (2) 16 $\pi r^2 S$ (3) 64 $\pi r^2 S$ (4) 4 $\pi r^2 S$

Ans. (2)

Sol. Radius of bigger drop is R then

$V_i = V_f \Rightarrow (8)\frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3 \Rightarrow R = 2r$

$U_i = 8(S)4\pi r^2 = 32S\pi r^2$

$U_f = S4\pi R^2 = 16S\pi r^2$

$\Delta U = U_i - U_f = 16S\pi r^2$

Question ID : 691121484

34. An ideal gas at pressure P and temperature T is expanding such that PT^3 = constant. The coefficient of volume expansion of the gas is _________.

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

Ans. (3)

Sol. Coefficient of volume expansion $= \gamma = -\frac{dV}{VdT}$

$PT^3 = \text{constant}$

$$\left(\frac{nRT}{V}\right)T^3 = \text{constant} \Rightarrow V^{-1}T^4 = K$$

diff. wr to T.

$$\left(-\frac{1}{V^2}\frac{dV}{dT}\right)T^4 + \left(\frac{1}{V}\right)4T^3 = 0$$

$$\frac{dV}{VdT} = \frac{4}{T}$$

Question ID : 691121485

35. Match List - I with List - II.

List - I	List - II
A. $\sin^2 \omega t$	I. Periodic with time period $T = \frac{\pi}{\omega}$ but not simple harmonic motion (SHM)
B. $\sin^3(2\omega t)$	II. Periodic with time period $T = \frac{2\pi}{\omega}$ but Not SHM
C. $\sin(\omega t) + \cos(\pi\omega t)$	III. Periodic with time period $T = \frac{\pi}{\omega}$ and SHM
D. $\cos\omega t + \cos 2\omega t$	IV. Non-periodic

Choose the correct answer from the options given below :

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

Ans. (1)

Sol. (A) Option A $\Rightarrow \sin^2 \omega t \Rightarrow \frac{1}{2}[1 - \cos 2\omega t]$

$$\text{SHM } T = \frac{2\pi}{2\omega} = \frac{\pi}{\omega}$$

(B) $\sin^3 2\omega t = \frac{3\sin 2\omega t}{4} - \frac{\sin 6\omega t}{4}$

Not SHM $T_1 = \frac{2\pi}{2\omega}$ $\quad T_2 = \frac{2\pi}{6\omega}$

$= \dfrac{\pi}{\omega} \qquad\qquad = \dfrac{\pi}{3\omega}$

$T_1 = 3T_2$ so function repeat itself every T_1

So common time period $= \dfrac{\pi}{\omega}$

(C) $\sin(\omega t) + \cos(\pi\omega t)$

$T_1 = \dfrac{2\pi}{\omega} \quad T_2 = \dfrac{2\pi}{\pi\omega} = 2$

no common time period so non periodic

(D) $\cos\omega t + \cos 2\omega t$

$T_1 = \dfrac{2\pi}{\omega} \qquad\qquad T_2 = \dfrac{2\pi}{\pi\omega}$

$T_1 = 2T_2$ So common time period is T_1 any, freq. are different so not SHM.

Question ID : 691121486

36. A metal rod of length L rotates about one end at origin with a uniform angular velocity ω. The magnetic field radially falls off as $B(r) = B_o e^{-\lambda r}$; λ being a positive constant. The emf induced (neglecting the centripetal force on electrons in the rod) is :

(1) $B_o\omega\left[\dfrac{1}{\lambda^2} - e^{-\lambda L}\left(\dfrac{1}{\lambda^2} + \dfrac{L}{\lambda}\right)\right]$

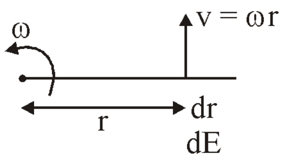
(2) $B_o\omega\left[\dfrac{1}{\lambda^2} + e^{-\lambda L}\left(\dfrac{1}{\lambda^2} + \dfrac{L}{\lambda}\right)\right]$

(3) $B_o\omega\left[\dfrac{4}{\lambda^2} - e^{-2\lambda L}\left(\dfrac{1}{\lambda^2} + \dfrac{2L}{\lambda}\right)\right]$

(4) $B_o\omega\left[\dfrac{3}{\lambda^2} - e^{-3\lambda L}\left(\dfrac{3}{\lambda^2} + \dfrac{L}{\lambda}\right)\right]$

Ans. (1)

Sol.



$$dE = \left(B_0 e^{-\lambda r}\right)\omega r dr$$

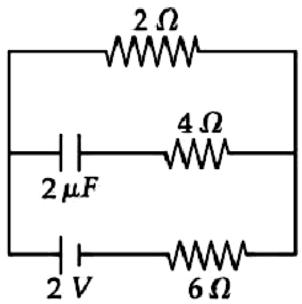
$$\text{emf} = \int dE = B_0 \omega r e^{-\lambda r} dr$$

$$= B_0\omega\left[\frac{re^{-\lambda r}}{-\lambda} - \frac{e^{-\lambda r}}{\lambda^2}\right]_0^L$$

$$= B_0\omega\left[\frac{1}{\lambda^2} - e^{-\lambda L}\left(\frac{1}{\lambda^2}+\frac{1}{\lambda}\right)\right]$$

Question ID : 691121487

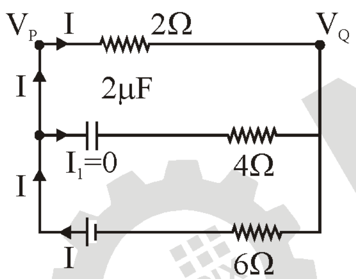
37. Under steady state condition the potential difference across the capacitor in the circuit is __________ V.



(1) 0.5 (2) 1.5 (3) 0 (4) 2

Ans. (1)

Sol. Under steady state current in capacitor is zero.



$$I = \frac{2}{2+6} = \frac{1}{4}$$

ΔV across capacitor $= V_p - V_Q = I(2)$

$$= \left(\frac{1}{4}\right)2 = \frac{1}{2}$$

Question ID : 691121488

38. A particle of charge q and mass m is projected from origin with an initial velocity $\vec{v} = \left(\frac{v_0}{\sqrt{2}}\hat{x} + \frac{v_0}{\sqrt{2}}\hat{y}\right)$.

There exists a uniform magnetic field $\vec{B} = B_0\hat{z}$ and a space varying electric field $\vec{E} = E_o e^{-\lambda x}\hat{x}$ within the region $0 \leqslant x \leqslant L$. After travelling a distance such that x-coordinate has changed from x = 0 to x = L, the change in the kinetic energy is __________.

(1) $\frac{qE_0}{\lambda}\left[1-e^{-\lambda L}\right]$ (2) $\left(\frac{v_0 qB_0}{2\lambda}\right)\left[2-e^{-2\lambda L}\right]$

(3) $\frac{qE_0}{\lambda}\left[1+e^{-\lambda L}\right]$ (4) $q\left(\frac{E_0+v_0B_0}{\lambda}\right)\left[1-e^{-\lambda L/2}\right]$

Ans. (1)

Sol. Apply $WET \Rightarrow W_e + W_m = \Delta KE$

$$\int_0^L qE_0 e^{-\lambda x}dx + 0 = \Delta KE$$

$$\frac{qE_0}{\lambda}\left(1-e^{-\lambda L}\right) = \Delta KE$$

Question ID : 691121489

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

Assertion (A): The electromagnetic wave exerts pressure on the surface on which they are allowed to fall.

Reason (R): There is no mass associated with the electromagnetic waves.

In the light of the above statements, choose the correct answer from the options given below:

(1) Bothe (A) and (R) are true and (R) is the correct explanation of (A)

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

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

Ans. (2)

Sol. for assertion $\Rightarrow$ wave exerts pressure due to change in momentum of photon.

For Reason $\Rightarrow$ no mass associated with EM wave.

Question ID : 691121490

40. A thin convex lens and a thin concave lens are kept in contact and are co-axial. Which of the following statements is correct for this combination of two lenses?

(1) behaves as concave lens if $|f_{convex}| > |f_{concave}|$

(2) behaves as concave lens if $|f_{convex}| < |f_{concave}|$

(3) behaves as concave lens if $|f_{convex}| > |f_{concave}|$

(4) Focal length of the lens system will change if the positions of two lenses are interchanged

Ans. (1)

Sol. From combination of lens $\frac{1}{f_{eq}} = \frac{1}{f_{convex}} + \frac{1}{f_{concave}}$

in general $f_{convex} = +ve$ & $f_{concave} = -ve$

$|f_{convex}| > |f_{concave}| \Rightarrow f_{eq} = -ve$ concave lens

$|f_{convex}| < |f_{concave}| \Rightarrow f_{eq} = +ve$ convex lens

Question ID : 691121491

41. An object AB is placed 15 cm on the left of a convex lens P of focal length 10 cm . Another convex lens Q is now placed 15 cm right of lens P. If the focal length of lens Q is 15 cm , the final image is __________ .

(1) virtual, formed at 7.5 cm right of lens Q, with a size bigger than that of AB

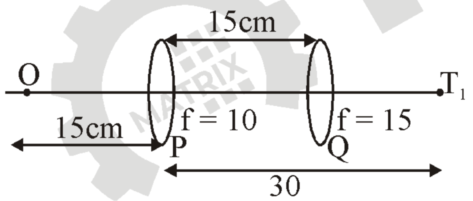
(2) real, formed at 7.5 cm right of lens Q, with a size same as that of AB

(3) formed at infinity.

(4) real, formed at 7 cm right of lens Q, with a size smaller than that of AB

Ans. (2)

Sol.



$$\text{from p} \Rightarrow \frac{1}{v_1} - \frac{1}{-15} = \frac{1}{10} \Rightarrow v_1 = 30$$

$$\text{from Q} \Rightarrow \frac{1}{v_2} - \frac{1}{15} = \frac{1}{15} \Rightarrow v_2 = 7.5 \text{ (real)}$$

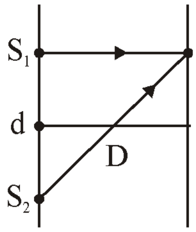
Question ID : 691121492

42. The maximum intensity in a Young's double slit experiment is I_0. Distance between the slits (d) is 5λ, where λ is the wavelength of light used. The intensity of the fringe, exactly opposite to one of the slits on the screen, placed at D = 10d is ________.

(1) $\frac{I_0}{4}$ (2) $\frac{I_0}{2}$ (3) I_0 (4) $\frac{3I_0}{4}$

Ans. (2)

Sol.



$$\Delta x_p = \sqrt{D^2 + d^2} - D$$

$$= D\left(1 + \frac{d^2}{D^2}\right)^{1/2} - D$$

$$= D\left[1 + \frac{d^2}{2D^2}\right] - D = \frac{d^2}{2D}$$

$$\Delta x_p = \frac{d^2}{2 \times 10d} = \frac{d}{20} = \frac{5\lambda}{20} = \frac{\lambda}{4}$$

$$\Delta \phi_p = \frac{2\pi}{\lambda}(\Delta x) = \frac{2\pi}{\lambda}\left(\frac{\lambda}{4}\right) = \frac{\pi}{2}$$

assume $I_1 = I_2 = I$

$$4I = I_0 \Rightarrow I = \frac{I_0}{4}$$

$$(I_{net})_p = I + I + 2\sqrt{I}\sqrt{I}\cos\frac{\pi}{2} = 2I$$

$$= 2\left(\frac{I_0}{4}\right) = \frac{I_0}{2}$$

Question ID : 691121493

43. An electron is travelling with a velocity v in free space and when it enters a medium, its velocity is reduced by 20%. The de Broglie wavelength of electron in the medium is $\alpha\lambda_0$, where λ_0 is its de Broglie wavelength in free space. The value of α is _________.

(1) 1.20 (2) 1.0 (3) 1.25 (4) 0.75

Ans. (3)

Sol. $V_{freespace} = V$ $\qquad$ $\lambda_{free\ space} = \lambda_0 = \frac{h}{mV}$ ....(1)

$V_{medium} = 0.8\,V \qquad \lambda_{mediam} = \frac{h}{m(0.8\,V)} = \lambda_m$ ....(2)

$\frac{(2)}{(1)} \Rightarrow \frac{\lambda m}{\lambda_0} = \frac{1}{0.8} \Rightarrow \lambda_m = \frac{5}{4}\lambda_0$

$\alpha = 1.25$

Question ID : 691121494

44. Assuming the experimental mass of ${}^{12}_{6}C$ as $12u$, the mass defect of ${}^{12}_{6}C$ atom is __________ MeV/ c^2.

(Mass of proton = 1.00727 u. mass of neutron = 1.00866 u, 1 u = 931.5 MeV/c^2 and c is the speed of the light in vacuum).

(1) 127.5 (2) 89.03 (3) 272.0 (4) 92.0

Ans. (2)

Sol. no. of proton = no. of neutron = 6

$\Delta m = \left[6m_p + 6m_n - 12u\right]c^2$

$= [6(1.00727) + 6(1.00866) - 12]9.315$

$= 89.03\,Mev / c^2$

Question ID : 691121495

45. In a semiconductor p-n diode, the doping concentrations on p-side and n-side are 10^{15} atoms/ cm^3 and 10^{18} atoms/cm^3, respectively. Which one of the following statements is true?

(1) Widths of depletion region on either side of the interface are equal

(2) The depletion region width is more on p-side compared to that in n -side

(3) The depletion region width is more on n -side compared to that in p -side

(4) No depletion region forms because of unequal doping concentrations on p and n-side

Ans. (2)

Sol. $N_P X_P = N_n X_n$

$N_P < N_n \Rightarrow X_P > X_n$

Question ID : 691121496

46. A copper wire of length 3 m is stretched by 3 mm by applying an external force. The volume of the wire is 600×10^{-6} m^3. The elastic potential energy stored in the wire in stretched condition would be_____ J.

(Given Young modulus of copper $=1.1 \times 10^{11}$ N/m^2)

Ans. (33)

Sol. $$\text{energy density} = \frac{Y}{2}(\text{strain})^2$$

$$\text{energy stored} = \frac{Y}{2}(\text{strain})^2(\text{vol})$$

$$= \frac{1.1\times10^{11}}{2}\left(\frac{3\times10^{-3}}{3}\right)^2\left(600\times10^{-6}\right)$$

$$= 33\,\text{J}$$

Question ID : 691121497

47. The heat extracted out of x gram of water initially at 50 °C to cool it down to 0 °C is sufficient to evaporate (1000 – x) gram of water also initially at 50 °C. The value of x (closest integer) is _______ .

(Take latent heat of water 2256 kJ/kg. K, specific heat capacity of water 4200 J/kg. K)

Ans. (922)

Sol. $$X(4200)50 = (1000-X)4200(50) + (1000-X)2256\times10^3$$

$$X = 921.52$$

Question ID : 691121498

48. A series LCR circuit with R = 20 Ω, L = 1.6 H and C = 40 μF is connected to a variable frequency a.c. source. The inductive reactance at resonant frequency is ________ Ω.

Ans. (200)

Sol. at resonace resonance $\Rightarrow w_r = \frac{1}{\sqrt{LC}}$

$$X_L = \omega_r L = \left(\frac{1}{\sqrt{LC}}\right)L = \sqrt{\frac{L}{C}}$$

$$X_L = \sqrt{\frac{1.6}{40\times10^{-6}}} = 200\Omega$$

Question ID : 691121499

49. When an external resistance of 5 Ω is connected across terminals of a cell, a current of 0.25 A flows through it. When the 5 Ω resistor is replaced by a 2 Ω resistor, a current of 0.5 A flows through it. The internal resistance of the cell is ______ Ω.

Ans. (1)

Sol. $I_i = \frac{1}{4} = \frac{E}{r+5}$ (1)

$I_f = \frac{1}{2} = \frac{E_1}{r+2}$ (2)

From (1) and (2) $r = 1\Omega$

Question ID : 691121500

50. A circular loop of radius 20 cm and resistance 2 Ω is placed in a time varying magnetic field $\vec{B} = (2t^2 + 2t + 3)T$. At t = 0, for the plane of the loop being perpendicular to the magnetic field and, the induced current in the loop at t = 3 s is $\frac{\alpha}{50}A$. The value of α is _______ .

(Take π = 22/7)

Ans. (44)

Sol. $\phi = \vec{B}\cdot\vec{S} = (2t^2 + 2t + 3)(0.04\pi)$

$\varepsilon = \left|\frac{d\phi}{dt}\right| = (4t+2)(0.04\pi)$

$I = \frac{\varepsilon}{R} = \frac{(4t+2)(0.04\pi)}{2}$

$I(t=3) = \frac{(14)(0.04)}{2} \times \frac{22}{7} = \frac{44}{50}$