JEE–MAIN EXAMINATION – JANUARY 2026

(HELD ON WEDNESDAY 28th JANUARY 2026) **TIME : 3:00 PM TO 6:00 PM**

PHYSICS — TEST PAPER WITH SOLUTION

SECTION-A

26. A nucleus has mass number α and radius R_α. Another nucleus has mass number β and radius R_β. If $\beta = 8\alpha$ then R_α/R_β is :

(1) 2 (2) 8

(3) 1 (4) 0.5

Ans. (4)

Sol. $R_\alpha = R_0\,\alpha^{1/3}$

$R_\beta = R_0\,\beta^{1/3}$

$$\frac{R_\alpha}{R_\beta} = \left(\frac{\alpha}{\beta}\right)^{1/3} = \frac{1}{2}$$

27. A plane electromagnetic wave is moving in free space with velocity $c = 3 \times 10^8$ m/s and its electric field is given as $\vec{E} = 54\sin(kz - \omega t)\hat{j}$ V/m, where $\hat{j}$ is the unit vector along y-axis. The magnetic field vector $\vec{B}$ of the wave is :

(1) $-1.8\times10^{-7}\sin(kz-\omega t)\hat{i}T$

(2) $1.4\times10^{-7}\sin(kz-\omega t)\hat{k}T$

(3) $1.4\times10^{-7}\sin(kz-\omega t)\hat{i}T$

(4) $+1.8\times10^{-7}\sin(kz-\omega t)\hat{i}T$

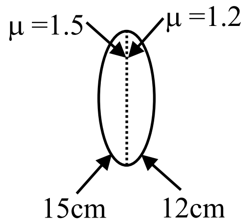
Ans. (1)

Sol. $\hat{B} = \hat{C}\times\hat{E} = \hat{k}\times\hat{j} = -\hat{i}$

$$\therefore\ \vec{B} = \frac{54}{3\times10^8}\sin(kz-\omega t)(-\hat{i})$$

$= -1.8 \times 10^{-7} \sin(kz - \omega t)\,\hat{i}$

28. A biconvex lens is formed by using two thin planoconvex lenses, as shown in the figure. The refractive index and radius of curved surfaces are also mentioned in figure. When an object is placed on the left side of lens at a distance of 30 cm from the biconvex lens, the magnification of the image will be :



(1) –2 (2) +2

(3) +2.5 (4) –2.5

Ans. (1)

Sol. $$\frac{1}{v}-\frac{1}{u}=\frac{1}{f_{net}}=\frac{1}{f_1}+\frac{1}{f_2}$$

$$\frac{1}{v}+\frac{1}{30}=(1.5-1)\left(\frac{1}{15}-\frac{1}{\infty}\right)+(1.2-1)\left(\frac{1}{\infty}+\frac{1}{12}\right)$$

$$\frac{1}{v}+\frac{1}{30}=\frac{1}{30}+\frac{1}{60}$$

$v = 60$

$$m=\frac{v}{u}=\frac{60}{-30}=-2$$

29. The mean free path of a molecule of diameter 5×10^{-10} m at the temperature 41°C and pressure 1.38×10^5 Pa, is given as ____m.

(Given $k_B = 1.38 \times 10^{-23}$ J/K).

(1) $2\sqrt{2}\times10^{-10}$

(2) $10\sqrt{2}\times10^{-8}$

(3) $2\sqrt{2}\times10^{-8}$

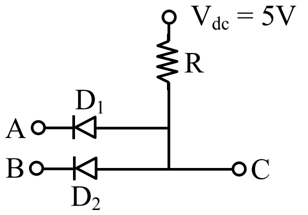
(4) 2×10^{-8}

Ans. (3)

Sol. $$\lambda=\frac{k_BT}{\sqrt{2}\pi\sigma^2P}$$

$$=\frac{1.38\times10^{-23}\times(273+41)\times100}{\sqrt{2}\times3.14\times(5\times10^{-10})^2\times1.38\times10^5}=2\sqrt{2}\times10^{-8}$$

30. Two p-n junction diodes D_1 and D_2 are connected as shown in figure. A and B are input signals and C is the output. The given circuit will function as a ____.

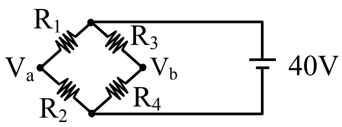


(1) OR Gate (2) NOR Gate
(3) NAND Gate (4) AND Gate

Ans. **(4)**

Sol. If either A or B is zero, in that case current flow and $v_c = 0$.
Hence the Gate will be AND Gate

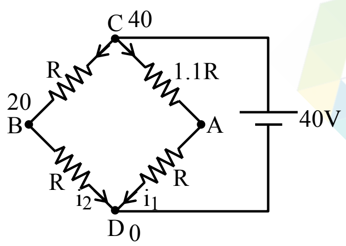
31. A wheatstone bridge is initially at room temperature and all arms of the bridge have same value of resistances ($R_1 = R_2 = R_3 = R_4$). When R_3 resistance is heated to some temperature, its resistance value has gone up by 10%. The potential difference ($V_a - V_b$) (after R_3 is heated) is _____V.



(1) 1.05 (2) 0 (3) 0.95 (4) 2

Ans. **(3)**

Sol.



$$V_A = \frac{V}{2}$$

$$V_B = \frac{V}{2.1R} \times R = \frac{V}{2.1}$$

$$\therefore V_A - V_B = V\left[\frac{1}{2} - \frac{1}{2.1}\right]$$

$$V_A - V_B = \frac{0.1}{2 \times 2.1} \times 40$$

$$V_A - V_B = \frac{4}{4.2} = 0.95$$

32. In an experiment, a set of reading are obtained –1.24 mm, 1.25 mm, 1.23 mm, 1.21 mm. The expected least count of the instrument used in recording these readings is _____mm.

(1) 0.01 (2) 0.001
(3) 0.1 (4) 0.05

Ans. **(1)**

Sol. Least count will be 0.01 mm.

33. A particle starts moving from time t = 0 and its coordinate is given as $x(t) = 4t^3 - 3t$.

A. The particle returns to its original position (origin) 0.866 units later

B. The particle is 1 unit away from origin at its turning point.

C. Acceleration of the particle is non-negative.

D. The particle is 0.5 units away from origin at its turning point.

E. Particle never turns back as acceleration is non-negative.

Choose the **correct** answer from the options given below :

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

Ans. **(2)**

Sol. $x = 0 \Rightarrow t = 0, \frac{\sqrt{3}}{2}$

$v = 12t^2 - 3$

At turning point, v = 0

$t = \frac{1}{2} \Rightarrow x = \frac{4}{8} - \frac{3}{2} = -1$

a = 24t (always positive)

34. The speed of a longitudinal wave in a metallic bar is 400 m/s. If the density and Young's modulus of the bar material are increased by 0.5% and 1% respectively then the speed of the wave is changed approximately to _____ m/s.

(1) 399 (2) 398 (3) 402 (4) 401

Ans. **(4)**

Sol. $V_{sound} = \sqrt{\frac{Y}{\rho}}$

$$\frac{\Delta V}{V}\times 100 = \frac{1}{2}\left(\frac{\Delta Y}{Y}\times 100\right) - \frac{1}{2}\left(\frac{\Delta \rho}{\rho}\times 100\right)$$

$$= \frac{1}{2}\times 1 - \frac{1}{2}\times 0.5$$

$$\frac{\Delta V}{V}\times 100 = \frac{1}{4}$$

$$\Delta V = \frac{1}{4}\times\frac{V}{100}$$

$\Delta V = 1 m/s$

$V_{final} = 400 + 1 = 401$ m/s

35. Identify the correct statements :

A. Effective capacitance of a series combination of capacitors is always smaller than the smallest capacitance of the capacitor in the combination.

B. When a dielectric medium is placed between the charged plates of a capacitor, displacement of charges cannot occur due to insulation property of dielectric.

C. Increasing of area of capacitor plate or decreasing of thickness of dielectric is an alternate method to increase the capacitance.

D. For a point charge, concentric spherical shells centered at the location of the charge are equipotential surfaces.

Choose the **correct** answer from the options given below.

(1) A, B and C only

(2) C and D only

(3) A, C and D only

(4) B and D only

Ans. (3)

Sol. For series combination

$$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$$

$\therefore C_{eq}$ is less than C_1 & C_2.

Note : In statement C, capacitor is assumed to be completely filled with dielectric then on decreasing thickness of dielectric capacitance will increase.

36. Number of photons of equal energy emitted per second by a 6 mW laser source operating at 663 nm is _____.

(Given : $h = 6.63 \times 10^{-34}$ J.s and $c = 3 \times 10^8$ m/s)

(1) 5×10^{16} (2) 5×10^{15}

(3) 10×10^{15} (4) 2×10^{16}

Ans. (4)

Sol. $P = \frac{nhC}{\lambda}$

$$6\times 10^{-3} = \frac{n\times 6.63\times 10^{-34}\times 3\times 10^{8}}{663\times 10^{-9}}$$

$n = 2 \times 10^{16}$ photons

37. When the position vector $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ changes sign as $-\vec{r}$, which one of the following vector will not flip under sign change ?

(1) Linear momentum

(2) Velocity

(3) Acceleration

(4) Angular momentum

Ans. (4)

Sol. $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

$$\vec{v} = \frac{d\vec{r}}{dt} = v_x\hat{i} + v_y\hat{j} + v_z\hat{k}$$

$\vec{p} = m\vec{v}$

$\vec{L} = m(\vec{r}\times\vec{v})$

$$= (x\hat{i} + y\hat{j} + z\hat{k})\times m(v_x\hat{i} + v_y\hat{j} + v_z\hat{k})$$

When sign of $\vec{r}$ changes, $\vec{L}$ remains same.

38. Which one of the following is **not** a measurable quantity ?

(1) Voltage difference (2) Resistance

(3) Voltage (4) Displacement current

Ans. (3)

Sol. Here from voltage, question refers to potential. We can measure potential difference between two points but not potential at any point.

Note : If the potential of reference point is known then we can measure potential as well.

39. A long cylindrical conductor with large cross section carries an electric current distributed uniformly over its cross-section. Magnetic field due to this current is :

A. maximum at either ends of the conductor and minimum at the midpoint

B. maximum at the axis of the conductor

C. minimum at the surface of the conductor

D. minimum at the axis of the conductor

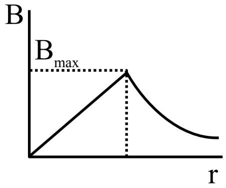
E. same at all points in the cross-section of the conductor

Choose the **correct** answer from the options given below :

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

Ans. **(1)**

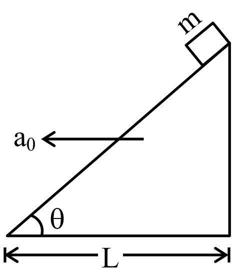
Sol. Solid cylinder



B_{max} at surface

B_{min} at Axis

40. A small block of mass m slides down from the top of a frictionless inclined surface, while the inclined plane is moving towards left with constant acceleration a_0. The angle between the inclined plane and ground is θ and its base length is L. Assuming that initially the small block is at the top of the inclined plane, the time it takes to reach the lowest point of the inclined plane is ________.



(1) $\sqrt{\dfrac{2L}{g\sin 2\theta - a_0(1+\cos 2\theta)}}$

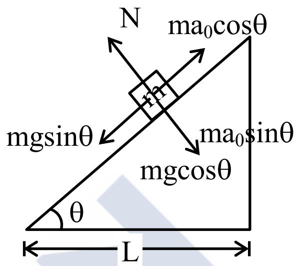
(2) $\sqrt{\dfrac{4L}{g\sin 2\theta - a_0(1+\cos 2\theta)}}$

(3) $\sqrt{\dfrac{4L}{g\cos^2\theta - a_0\sin\theta\cos\theta}}$

(4) $\sqrt{\dfrac{2L}{g\sin\theta - a_0\cos\theta}}$

Ans. **(2)**

Sol.



$mg\sin\theta - ma_0\cos\theta = ma$

$a = g\sin\theta - a_0\cos\theta$

Now using,

$$S = ut + \frac{1}{2}a_{down}t^2$$

$$\frac{L}{\cos\theta} = \frac{1}{2}(g\sin\theta - a_0\cos\theta)t^2$$

$$t = \sqrt{\frac{2L}{g\sin\theta\cos\theta - a_0\cos^2\theta}}$$

$$t = \sqrt{\frac{4L}{g\sin 2\theta - a_0(1+\cos 2\theta)}}$$

41. Identify the correct statements :

A. Electrostatic field lines form closed loops.

B. The electric field lines point radially outward when charge is greater than zero.

C. The Gauss-Law is valid only for inverse-square force.

D. The workdone in moving a charged particle in a static electric field around a closed path is zero.

E. The motion of a particle under Coulomb's force must take place in a plane.

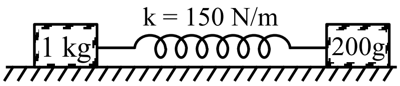
Choose the **correct** answer from the options given below :

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

Ans. **(3)**

Sol. Theoretical

42. As shown in the figure, a spring is kept in a stretched position with some extension by holding the masses 1 kg and 0.2 kg with a separation more than spring natural length and are released. Assuming the horizontal surface to be frictionless, the angular frequency (in SI unit) of the system is :



(1) 30 (2) 27 (3) 20 (4) 5

Ans. **(1)**

Sol. $\mu = \frac{m_1 m_2}{m_1 + m_2} = \frac{1 \times 0.2}{1.2}$

$\mu = \frac{1}{6}$

$\omega = \sqrt{\frac{k}{\mu}} = \sqrt{\frac{150}{1/6}} = 30$

43. For a transparent prism, if the angle of minimum deviation is equal to its refracting angle, the refractive index n of the prism satisfies.

(1) $\sqrt{2} < n < 2\sqrt{2}$ (2) $1 < n < 2$

(3) $n \ge 2$ (4) $\sqrt{2} < n < 2$

Ans. **(4)**

Sol. $\delta_{min} = 2i - A \Rightarrow i = \delta_{min} = A$

Also, $\mu = \frac{\sin\left(\frac{\delta_{min} + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$

$\Rightarrow \mu = \frac{\sin A}{\sin\frac{A}{2}} = 2\cos\left(\frac{A}{2}\right)$

$1 < \mu < 2$ … (1)

$\delta_{min} = 2i - A$

$A = 2i - A \Rightarrow i = A$

$i < 90°$ (grazing incidence)

$A < 90°$

$\mu = 2\cos(A/2)$

& $A < 90°$

$\mu > \sqrt{2}$ … (2)

from (i) & (2)

$\sqrt{2} < \mu < 2$

44. The time period of a simple harmonic oscillator is $T = 2\pi\sqrt{\frac{k}{m}}$. The measured value of mass (m) of the object is 10 g with an accuracy of 10 mg, and time for 50 oscillations of the spring is found to be 60 s using a watch of 2 s resolution**.** Percentage error in determination of spring constant(k) is ________%.

(1) 3.43 (2) 3.35 (3) 7.60 (4) 6.76

Ans. **(4)**

Sol. $\frac{\Delta K}{K} = \frac{2\Delta T}{T} + \frac{\Delta m}{m}$

$T = \frac{60}{50} = 1.2\,\text{sec}$

$\Delta T = \frac{2}{50}$

$\therefore \frac{\Delta K}{K} = \frac{2 \times 2}{50 \times 1.2} + \frac{10 \times 10^{-3}}{10} = 0.0676$

$\therefore$ % Error = 6.76%

45. Match **List-I** with **List-II**.

	List-I		List-II
A.	Coefficient of viscosity	I.	$[ML^{-1}T^{-2}]$
B.	Surface tension	II.	$[ML^{2}T^{-2}]$
C.	Pressure	III.	$[ML^{0}T^{-2}]$
D.	Surface energy	IV.	$[ML^{-1}T^{-1}]$

Choose the **correct** answer from the options given below :

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

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

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

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

Ans. **(2)**

Sol. (A) $\eta = \frac{Fdr}{Adv} = \frac{[MLT^{-2}][L]}{[L^2][LT^{-1}]} = [ML^{-1}T^{-1}]$

(B) $S = \frac{F}{L} = \frac{[MLT^{-2}]}{[L]} = [MT^{-2}]$

(C) $P = \frac{F}{A} = \frac{[MLT^{-2}]}{[L^2]} = [ML^{-1}T^{-2}]$

(D) $E = S \times A = [MT^{-2}][L^2] = [ML^2T^{-2}]$

SECTION-B

46. Two tuning forks A and B are sounded together giving rise to 8 beats in 2 s. When fork A is loaded with wax, the beat frequency is reduced to 4 beats in 2 s. If the original frequency of tuning fork B is 380 Hz, then the original frequency of tuning fork A is ______ Hz.

Ans. **(384)**

Sol. $|f_A - f_B| = 4$

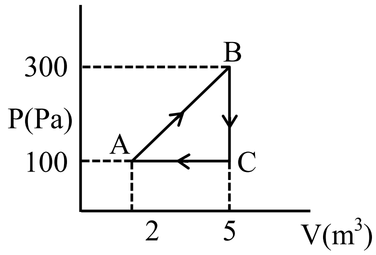
$|f_A - 380| = 4$

So, $f_A = 384$ Hz or 376 Hz

on loading with wax f_A decreases

So, $f_A = 384$ Hz

47. A thermodynamic system is taken through the cyclic process ABC as shown in the figure. The total work done by the system during the cycle ABC is ______ J.



Ans. **(300)**

Sol. Work done = Area bounded by cycle

$= \frac{1}{2} \times 3 \times 200 = 300$ J

48. An inductor stores 16 J of magnetic field energy and dissipates 32 W of thermal energy due to its resistance when an a.c. current of 2 A (rms) and frequency 50 Hz flows through it. The ratio of inductive reactance to its resistance is ________.
$(\pi = 3.14)$

Ans. **(314)**

Sol. $\frac{1}{2} L i_{rms}^2 = 16 \Rightarrow L = 8$

$i^2 R = 32 \Rightarrow R = 8$

$x_L = \omega L \Rightarrow 2 \times 3.14 \times 50 \times 8$

$\Rightarrow 800 \times 3.14$

$R = 8$

$\frac{x_L}{R} = 314$

49. A beam of light consisting of wavelengths 650 nm and 550 nm illuminates the Young's double slits with separation of 2 mm such that the interference fringes are formed on a screen, placed at a distance of 1.2 m from the slits. The least distance of a point from the central maximum, where the bright fringes due to both the wavelengths coincide, is ______ $\times 10^{-5}$ m.

Ans. **(429)**

Sol. $y = n\frac{\lambda D}{d}$

$y_1 = y_2$

$n_1 \lambda_1 \frac{D}{d} = n_2 \lambda_2 \frac{D}{d}$

$\frac{n_1}{n_2} = \frac{\lambda_2}{\lambda_1} = \frac{550}{650} = \frac{11}{13}$

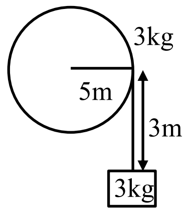
$y = 11 \times \frac{\lambda_1 D}{d} = \frac{11 \times 650 \times 10^{-9} \times 1.2}{2 \times 10^{-3}}$

$y = 429 \times 10^{-5}$

50. A fly wheel having mass 3 kg and radius 5 m is free to rotate about a horizontal axis. A string having negligible mass is wound around the wheel and the loose end of the string is connected to a 3 kg mass. The mass is kept at rest initially and released. Kinetic energy of the wheel when the mass descends by 3 m is ______ J. (g = 10 m/s²)

Ans. **(30)**

Sol.



$mg \times 3 = \frac{1}{2} \cdot \frac{mR^2}{2} \omega^2 + \frac{1}{2} mv^2$ ...(i)

& $v = \omega R$ ....(ii)

From equation (i) & (ii)

$g \times 3 = \frac{3}{4} \cdot v^2$

K.E. of flywheel $= \frac{1}{2} \times \frac{mR^2}{2} \times \omega^2 = \frac{1}{4} mv^2$

$= \frac{1}{4} \times 3 \times 40 = 30$ Joule