

JEE-MAIN EXAMINATION – JANUARY 2026

(HELD ON THURSDAY 22nd JANUARY 2026)

TIME : 3:00 PM TO 6:00 PM

PHYSICS

TEST PAPER WITH SOLUTION

SECTION-A

26. If ϵ , E and t represent the free space permittivity, electric field and time respectively, then the unit of $\frac{\epsilon E}{t}$ will be :

(1) Am (2) Am²
(3) A/m² (4) A/m

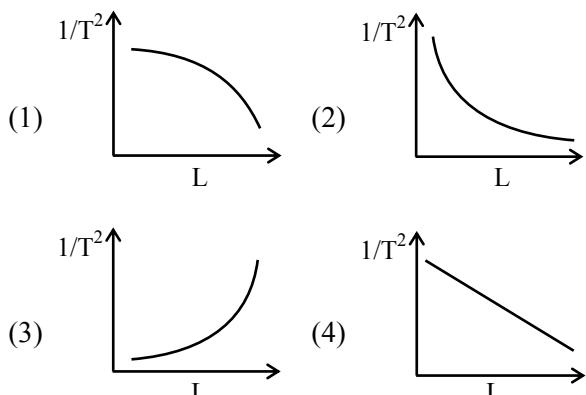
Ans. (3)

$$\text{Sol. } \frac{\epsilon E}{t} = \frac{\epsilon}{t} \frac{1}{4\pi\epsilon r^2} q$$

$$\Rightarrow \frac{AT}{TL^2} = (AL^{-2})$$

$$\Rightarrow A/m^2$$

27. Using a simple pendulum experiment g is determined by measuring its time period T. Which of the following plots represent the correct relation between the pendulum length L and time period T ?



Ans. (2)

$$\text{Sol. } T = 2\pi\sqrt{\frac{\ell}{g}} \quad T^2 = \frac{4\pi^2\ell}{g}$$

$$\frac{1}{T^2} = \frac{g}{4\pi^2\ell}$$

28. Consider two boxes containing ideal gases A and B such that their temperatures, pressures and number densities are same. The molecular size of A is half of that of B and mass of molecule A is four times that of B. If the collision frequency in gas B is $32 \times 10^{18}/s$ then collision frequency in gas A is _____/s.

(1) 32×10^8 (2) 4×10^8
(3) 2×10^8 (4) 8×10^8

Ans. (2)

$$\text{Sol. Collision frequency (z)} = \sqrt{2\pi d^2 N} \sqrt{\frac{8RT}{\pi M}}$$

Temp, N are same

$$Z \propto \frac{d^2}{\sqrt{M}}$$

$$d_A = \frac{d_B}{2}$$

$$M_A = 4M_B$$

$$\begin{aligned} \frac{Z_A}{Z_B} &= \frac{d_A^2}{\sqrt{M_A}} \times \frac{\sqrt{M_B}}{d_B^2} = \left(\sqrt{\frac{M_B}{M_A}} \right) \left(\frac{d_A}{d_B} \right)^2 \\ &= \left(\sqrt{\frac{1}{4}} \right) \left(\frac{1}{2} \right)^2 \end{aligned}$$

$$\frac{Z_A}{Z_B} = \frac{1}{2} \times \frac{1}{4} = \frac{1}{8}$$

$$\Rightarrow Z_A = \frac{32 \times 10^8}{8} = 4 \times 10^8 / s$$

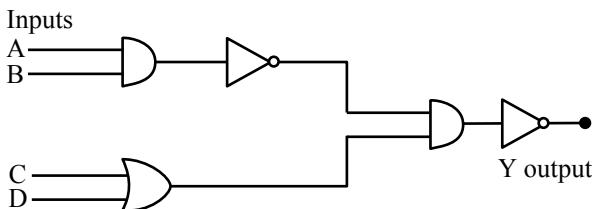


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35. The correct truth table for the given input data of the following logic gate is :



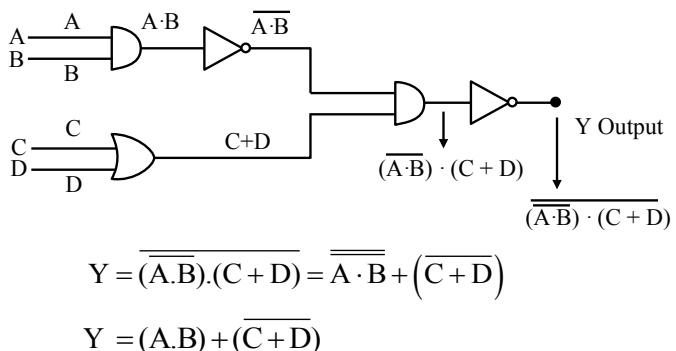
	Inputs				Output
	A	B	C	D	Y
(1)	1	1	0	1	1
	0	0	1	1	0
	1	0	1	0	1
	1	1	1	1	0

	Inputs				Output
	A	B	C	D	Y
(2)	1	1	0	1	1
	0	0	1	1	0
	1	0	1	0	0
	1	1	1	1	1

Inputs				Output
A	B	C	D	Y
1	1	0	1	0
0	0	1	1	0
1	0	1	0	1
1	1	1	1	1

Inputs				Output
A	B	C	D	Y
1	1	0	1	0
0	0	1	1	1
1	0	1	0	1
1	1	1	1	1

Sol.



Ans. (1)

Sol. $P = 1000 \text{ W}$

out
P = VI

$$1000 \equiv 250 \times 4$$

1888

$$P_{\text{loss}} = I^2 R = (4)^2 \times 2 = 3200$$

$$\eta_{\text{net}} = \left(\frac{P_{\text{out}}}{P_{\text{net}}} \right) \times 100 = \frac{1000}{1032} \times 100 = 96.9\%$$

Ans. (3)

$$\boxed{\text{Sol. } \frac{\mu_1}{\mu_2} = \frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1} \quad v = f\lambda}$$

$$\frac{\mu_1}{\mu_2} = \frac{\lambda_2}{\lambda_1}$$

$$\frac{\mu_B}{3/2} = \frac{\lambda}{540}$$

$$\lambda = \left(\frac{4 \times 2}{3 \times 3} \times 540 \right)$$

$$\lambda = 480 \text{ nm}$$



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Sol. $\beta_{cm} = \frac{2\lambda D}{a}$

(A) Correct $\beta \propto \lambda$

(B) Incorrect

(C) Correct $\beta \propto \frac{1}{d}$

(D) Incorrect

(E) Correct

Statement A, C & E are correct.

No option matching

41. Given below are two statements :

Statement I : An object moves from position r_1 to position r_2 under a conservative force field \vec{F} .

The work done by the force is $W = - \int_{r_1}^{r_2} \vec{F} \cdot d\vec{r}$.

Statement II : Any object moving from one location to another location can follow infinite number of paths. Therefore, the amount of work done by the object changes with the path it follows for a conservative force.

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

- (1) Both **Statement I** and **Statement II** are true
- (2) **Statement I** is false but **Statement II** is true
- (3) **Statement I** is true but **Statement II** is false
- (4) Both **Statement I** and **Statement II** are false

NTA Ans. (3)

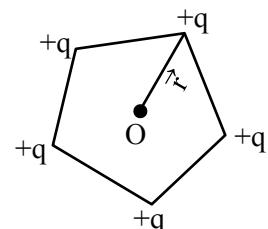
Allen Ans. (4)

Sol. Statement-I : Incorrect

Correct equation is $W = \int_{r_1}^{r_2} \vec{F} \cdot d\vec{r}$

Statement-II : Incorrect

42. Five positive charges each having charge q are placed at the vertices of a pentagon as shown in the figure. The electric potential (V) and the electric field (\vec{E}) at the center O of the pentagon due to these five positive charges are :



(1) $V = \frac{5q}{4\pi\epsilon_0 r}$ and $\vec{E} = 0$

(2) $V = \frac{5q}{4\pi\epsilon_0 r}$ and $\vec{E} = \frac{5\sqrt{3}q}{8\pi\epsilon_0 r^2} \hat{r}$

(3) $V = \frac{5q}{4\pi\epsilon_0 r}$ and $\vec{E} = \frac{5q}{4\pi\epsilon_0 r^2} \hat{r}$

(4) $V = 0$ and $\vec{E} = 0$

Ans. (1)

Sol. Electric potential $\rightarrow V = \frac{5kq}{R}$

As regular polygon $\rightarrow \vec{E} = 0$

43. A laser beam has intensity of $4.0 \times 10^{14} \text{ W/m}^2$. The amplitude of magnetic field associated with beam is _____ T. (Take $\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$ and $c = 3 \times 10^8 \text{ m/s}$)

- (1) 2.0
- (2) 18.3
- (3) 5.5
- (4) 1.83

Ans. (4)

Sol. $I = \frac{1}{2} \epsilon_0 E_0^2 \cdot C$

$$\therefore E_0 = \sqrt{\frac{2I}{\epsilon_0 C}}$$

$$\& \frac{E_0}{B_0} = C$$

$$\therefore B_0 = \frac{E_0}{C} = \frac{1}{C} \sqrt{\frac{2I}{\epsilon_0 C}}$$

$$\therefore B_0 = \frac{1}{3 \times 10^8} \sqrt{\frac{2 \times 4 \times 10^{14}}{8.85 \times 10^{-12} \times 3 \times 10^8}}$$

$$B_0 = \frac{10}{3} \sqrt{\frac{8}{8.85 \times 3}}$$

$$B_0 = 1.83 \text{ T}$$



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44. Light is incident on a metallic plate having work function 110×10^{-20} J. If the produced photoelectrons have zero kinetic energy then the angular frequency of the incident light is _____ rad/s. ($h = 6.63 \times 10^{-34}$ J.s)

(1) 1.04×10^{16} (2) 1.04×10^{13}
 (3) 1.66×10^{16} (4) 1.66×10^{15}

Ans. (1)

Sol. $\phi = hv$

$$v = \frac{\phi}{h}$$

$$\omega = 2\pi v = \frac{2\pi\phi}{h} = \frac{2 \times 3.14 \times 110 \times 10^{-20}}{6.63 \times 10^{-34}}$$

$$\omega = 1.04 \times 10^{16} \text{ rad/sec}$$

45. Given below are two statements :

Statement I : For a mechanical system of many particles total kinetic energy is the sum of kinetic energies of all the particles.

Statement II : The total kinetic energy can be the sum of kinetic energy of the center of mass w.r.t. to the origin and the kinetic energy of all the particles w.r.t. the center of mass as the reference.

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

(1) Both **Statement I** and **Statement II** are true
 (2) **Statement I** is true but **Statement II** is false
 (3) **Statement I** is false but **Statement II** is true
 (4) Both **Statement I** and **Statement II** are false

Ans. (1)

$$\text{Sol. } KE = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$$

$$KE = \frac{1}{2} (m_1 + m_2) v_{cm}^2 + \frac{1}{2} \frac{m_1 m_2}{m_1 + m_2} |\vec{v}_1 - \vec{v}_2|^2$$

So Ans. is (1)

SECTION-B

46. A conducting circular loop is rotated about its diameter at a constant angular speed of 100 rad/s in a magnetic field of 0.5T perpendicular to the axis of rotation. When the loop is rotated by 30° from the horizontal position, the induced EMF is 15.4 mV. The radius of the loop is _____ mm.

$$\left(\text{Take } \pi = \frac{22}{7} \right)$$

Ans. (14)

$$\text{Sol. } E = B\omega A \sin\theta$$

$$15.4 \times 10^{-3} = \frac{1}{2} \times 100 \times \frac{22}{7} r^2 \times \frac{1}{2}$$

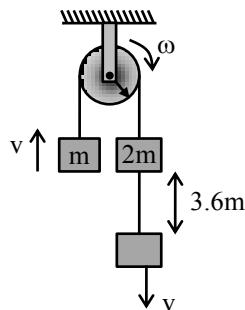
$$r = \sqrt{\frac{15.4 \times 28 \times 10^{-5}}{22}}$$

$$R = 14 \text{ mm}$$

47. Two masses m and $2m$ are connected by a light string going over a pulley (disc) of mass $30m$ with radius $r = 0.1 \text{ m}$. The pulley is mounted in a vertical plane and it is free to rotate about its axis. The $2m$ mass is released from rest and its speed when it has descended through a height of 3.6 m is _____ m/s. (Assume string does not slip and $g = 10 \text{ m/s}^2$)

Ans. (2)

Sol.



Using energy conservation

$$\frac{1}{2} mv^2 + \frac{1}{2} 2mv^2 + \frac{1}{2} \frac{30mR^2}{2} \times \frac{v^2}{R^2} = mgh$$

$$9mv^2 = mgh$$

$$v = \sqrt{\frac{gh}{9}} = \sqrt{\frac{10 \times 3.6}{9}}$$

$$v = \sqrt{4} = 2 \text{ m/s}$$



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48. A capacitor P with capacitance 10×10^{-6} F is fully charged with a potential difference of 6.0 V and disconnected from the battery. The charged capacitor P is connected across another capacitor Q with capacitance 20×10^{-6} F. The charge on capacitor Q when equilibrium is established will be $\alpha \times 10^{-5}$ C (assume capacitor Q does not have any charge initially), the value of α is _____.

Ans. (4)

Sol.

$$C_1 = 10^{-5} \text{ F}$$

$$C_2 = 2 \times 10^{-5} \text{ F}$$

$$V_2 = 0$$

$$V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2} = \frac{10^{-5} \times 6 + 0}{3 \times 10^{-5}}$$

$$V = 2 \text{ volt}$$

$$Q_2 = C_2 V = 2 \times 10^{-5} \times 2 = 4 \times 10^{-5} \text{ C}$$

49. A cylindrical conductor of length 2m and area of cross-section 0.2 mm^2 carries an electric current of 1.6 A when its ends are connected to a 2V battery. Mobility of electrons in the conductor is $\alpha \times 10^{-3} \text{ m}^2/\text{V.s}$. The value of α is :

(electron concentration = $5 \times 10^{28}/\text{m}^3$ and electron charge = $1.6 \times 10^{-19} \text{ C}$)

Ans. (1)

Sol. $V_\ell = \mu E = \mu \times \frac{V}{\ell}$

$$I = neAV_d$$

$$V_d = \frac{I}{neA}$$

$$\mu = \frac{I\ell}{NneA}$$

$$\mu = \frac{1.6 \times 3}{2 \times 5 \times 10^{26} \times 1.6 \times 10^{-19} \times 2 \times 10^{-7}}$$

$$\mu = 1 \times 10^{-3} \text{ m}^2/\text{V.s}$$

$$\alpha = 1$$

50. An insulated cylinder of volume 60 cm^3 is filled with a gas at 27°C and 2 atmospheric pressure. Then the gas is compressed making the final volume as 20 cm^3 while allowing the temperature to rise to 77°C . The final pressure is _____ atmospheric pressure.

Ans. (7)

Sol. $PV = nRT$

$$\frac{P_1 V_1}{R T_1} = \frac{P_2 V_2}{R T_2}$$

$$\frac{2 \times 10^5 \times 60}{300} = \frac{P_2 \times 20}{350}$$

$$P_2 = \frac{2 \times 10^5 \times 7 \times 3}{6}$$

$$P_2 = 7 \times 10^5 = 7 \text{ atm}$$



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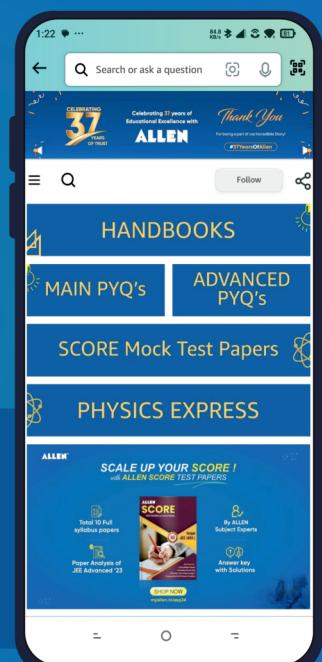
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