

NEET 2022

QUESTION PAPER WITH SOLUTION

17th July 2022 (Sunday)

CODE - T3 | PHYSICS

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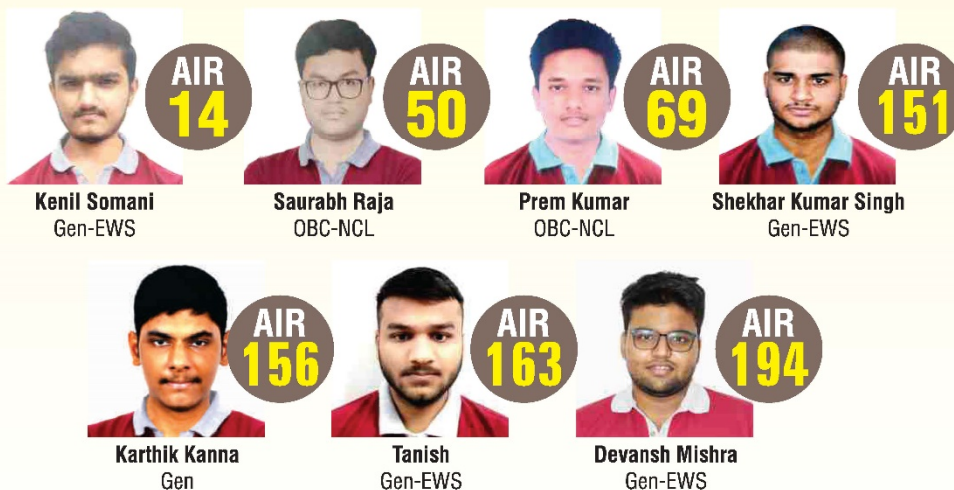
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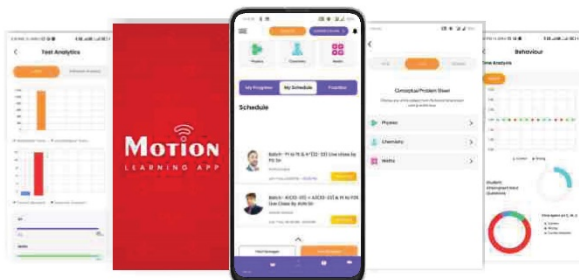
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SECTION - A

1. A long solenoid of radius 1 mm has 100 turns per mm. If 1 A current flows in the solenoid, the magnetic field strength at the centre of the solenoid is:

- (1) 12.56×10^{-2} T
 (2) 12.56×10^{-4} T
 (3) 6.28×10^{-4} T
 (4) 6.28×10^{-2} T

Sol. (1)

$$B = \mu_0 ni = \mu_0 \frac{N}{\ell} i$$

$$\therefore B = 4\pi \times 10^{-7} \times \frac{100}{10^{-3}} \times 1 = 12.56 \times 10^{-2} \text{ T}$$

2. A biconvex lens has radii of curvature, 20 cm each. If the refractive index of the material of the lens is 1.5, the power of the lens is:

- (1) +20 D
 (2) +5 D
 (3) infinity
 (4) +2 D

Sol. (2)

$$f = \frac{R}{2(\mu-1)}$$

$$= \frac{20}{2(1.5-1)} = \frac{20}{2 \times 0.5}$$

$$f = 20 \text{ cm}$$

$$p = 100/f$$

$$= 100/20 = 5 \text{ D}$$

3. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is :

- (1) 4 : 1
 (2) 4 : 9
 (3) 9 : 4
 (4) 1 : 4

Sol. (3)

First excited state $\Rightarrow n = 2$

$$T_1 = -13.6 \frac{z^2}{n^2} = -\frac{13.6}{4} \text{ eV}$$

Second excited state $\Rightarrow n = 3$

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$$T_2 = -13.6 \frac{z^2}{n^2} = -\frac{13.6}{9} \text{eV}$$

$$T_1 : T_2 = \frac{1}{4} : \frac{1}{9} = 9 : 4$$

4. The peak voltage of the ac source is equal to:
- (1) the rms value of the ac source
 - (2) $\sqrt{2}$ times the rms value of the ac source
 - (3) $1/\sqrt{2}$ times the rms value of the ac source
 - (4) the value of voltage supplied to the circuit.

Sol. (2)

Peak voltage is $\sqrt{2}$ times of rms voltages in ac.

5. Match List-I with List- II :

List - I

(Electromagnetic waves)

- (a) AM radio waves
- (b) Microwaves
- (c) Infrared radiations
- (d) X-rays

List - II

(Wavelength)

- (i) 10^{-10} m
- (ii) 10^2 m
- (iii) 10^{-2} m
- (iv) 10^{-4} m

Choose the correct answer from the options given below:

- (1) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)
- (2) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
- (3) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)
- (4) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Sol. (3)

- (a) AM radio wave $\approx 10^2$ m (ii)
 - (b) Microwave $\approx 10^{-2}$ m (iii)
 - (c) Infrared radiations $\approx 10^{-4}$ m (iv)
 - (d) X-ray $\approx \text{Å} = 10^{-10}$ m (i)
- (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

6. A square loop of side 1m and resistance 1Ω is placed in a magnetic field of 0.5T. If the plane of loop is perpendicular to the direction of magnetic field, the magnetic flux through the loop is :
- (1) 0.5 weber
 - (2) 1 weber
 - (3) zero weber
 - (4) 2 weber

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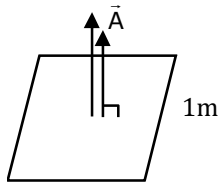
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Sol. (1)

$$\vec{B} = 0.5T$$



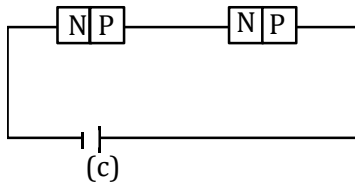
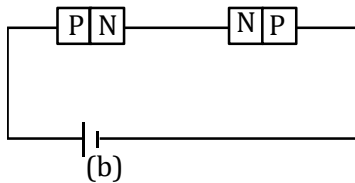
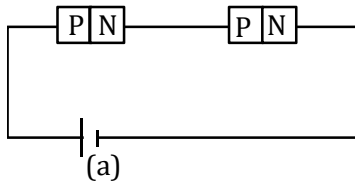
Angle between \vec{B} & \vec{A} is zero

$$\phi = B.A \cos 0$$

$$= 0.5 \times 1 \times 1$$

$$= 0.5 \text{ wb}$$

7.



In the given circuits (a), (b) and (c), the potential drop across the two p-n junctions are equal in :

(1) Circuit (b) only

(2) Circuit (c) only

(3) Both circuits (a) and (c)

(4) Circuit (a) only

Sol. (3)

In (a) & (c) circuits, both the p-n junctions are in same biasing conditions so offers equal resistances. Since both are in series, therefore equal potential will drop across the junction.

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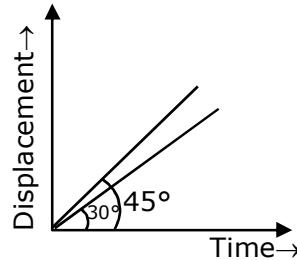
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8. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is :



- (1) 1 : 1
 (2) 1 : 2
 (3) 1 : $\sqrt{3}$
 (4) $\sqrt{3}$: 1

Sol.

(3)

Velocity is slope of x-t graph

$$V = \frac{dx}{dt} = \tan\theta$$

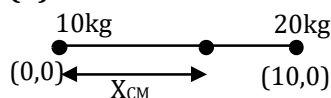
$$\frac{V_1}{V_2} = \frac{\tan\theta_1}{\tan\theta_2} = \frac{\tan 30^\circ}{\tan 45^\circ} = \frac{1}{\sqrt{3}}$$

9. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10m with negligible mass. The distance of the center of mass of the system from the 10kg mass is :

- (1) $\frac{20}{3}$ m
 (2) 10m
 (3) 5m
 (4) $\frac{10}{3}$ m

Sol.

(1)



$$X_{CM} = \frac{M_1 x_1 + M_2 x_2}{M_1 + M_2}$$

$$X_{CM} = \frac{0 + 20 \times 10}{10 + 20} = \frac{20}{3} \text{ m}$$

10. The angle between the electric lines of force and the equipotential surface is :

- (1) 45° (2) 90° (3) 180° (4) 0°

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Sol. (2)
Electric field is always perpendicular to EPS.

11. If the initial tension on a stretched string is doubled, then the ratio of the initial and final speeds of a transverse waves along the string is:

- (1) $\sqrt{2} : 1$ (2) $1 : \sqrt{2}$ (3) $1 : 2$ (4) $1 : 1$

Sol. (2)
 $v \propto \sqrt{\text{Tension}}$
 $\frac{v_i}{v_f} = \sqrt{\frac{T_i}{T_f}}$
 $\frac{v_i}{v_f} = \sqrt{\frac{T}{2T}}$
 $\frac{v_i}{v_f} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$

12. When two monochromatic lights of frequency, ν and $\frac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is :

- (1) 3ν
 (2) $\frac{2}{3}\nu$
 (3) $\frac{3}{2}\nu$
 (4) 2ν

Sol. (3)
 $h\nu = w + \frac{eV_s}{2}$ (i)
 $\frac{h\nu}{2} = w + eV_s$ (ii)
 Subtract (ii) from (i)
 $2h\nu - h\nu/2 = 2w - w$
 $\frac{3h\nu}{2} = w$
 $\frac{3h\nu}{2} = h\nu_{th}$
 $\nu_{th} = \frac{3\nu}{2}$

Numerically answer is correct but it is not practically possible.

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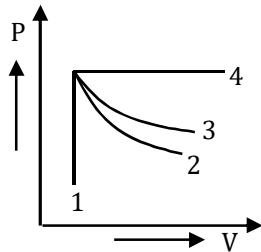
13. As the temperature increases, the electrical resistance:
- (1) decreases for both conductors and semiconductors
 - (2) increases for conductors but decreases for semiconductors
 - (3) decreases for conductors but increases for semiconductors
 - (4) increases for both conductors and semiconductors

Sol. (2)

For conductors α is (+) ve so, as temperature increases, Resistance will increase.

For semiconductors & Insulators α is (-)ve so, as temperature increases, Resistance will decrease.

14. An ideal gas undergoes four different processes from the same initial state as shown in the figure below. Those processes are adiabatic, isothermal, isobaric and isochoric. The curve which represents the adiabatic process among 1, 2, 3 and 4 is :



- (1) 2
- (2) 3
- (3) 4
- (4) 1

Sol. (1)

1 : Isochoric

2 : Adiabatic

3 : Isothermal

4 : Isobaric

15. The energy that will be ideally radiated by a 100 kW transmitter in 1 hour is :

- (1) 36×10^4 J
- (2) 36×10^5 J
- (3) 1×10^5 J
- (4) 36×10^7 J

Sol. (4)

$$E = P \times t = 100 \times 10^3 \times 3600$$

$$= 36 \times 10^7 \text{ J}$$

16. The ratio of the distances travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second :

- (1) 1 : 4 : 9 : 16
- (2) 1 : 3 : 5 : 7
- (3) 1 : 1 : 1 : 1
- (4) 1 : 2 : 3 : 4

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Sol. (2)

$$S_{n^{\text{th}}} = u + \frac{a}{2}(2n - 1)$$

$$= 0 + \frac{a}{2}(2n - 1)$$

$$S_{n^{\text{th}}} \propto (2n - 1)$$

$$\Rightarrow S_{1^{\text{st}}} : S_{2^{\text{nd}}} : S_{3^{\text{rd}}} : S_{4^{\text{th}}}$$

$$= [2(1) - 1] : [2(2) - 1] : [2(3) - 1] : [2(4) - 1]$$

$$= 1 : 3 : 5 : 7$$

17. Given below are two statements :

Statement I : Biot-Savart's law gives us the expression for the magnetic field strength of an infinitesimal current element (Idl) of a current carrying conductor only.

Statement II : Biot-Savart's law is analogous to Coulomb's inverse square law of charge q , with the former being related to the field produced by a scalar source, Idl while the latter being produced by a vector source, q .

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

- (1) Both **Statement I** and **Statement II** are incorrect
- (2) **Statement I** is correct and **Statement II** is incorrect
- (3) **Statement I** is incorrect and **Statement II** is correct
- (4) Both **Statement I** and **Statement II** are correct

Sol. (2)

$$d\vec{B} = \frac{\mu_0 (Id\vec{\ell} \times \vec{r})}{4\pi r^3}$$

As per Biot Savart law, the expression for magnetic field depends on current carrying element $Id\vec{\ell}$, which is a vector quantity, therefore, statement-I is correct and statement-II is wrong.

18. When light propagates through a material medium of relative permittivity ϵ_r and relative permeability μ_r , the velocity of light v is given by : (c : velocity of light in vacuum)

$$(1) v = \sqrt{\frac{\mu_r}{\epsilon_r}} \quad (2) v = \sqrt{\frac{\epsilon_r}{\mu_r}} \quad (3) v = \frac{c}{\sqrt{\epsilon_r \mu_r}} \quad (4) v = c$$

Sol. (3)

$$n = \sqrt{\epsilon_r \mu_r}$$

$$n = \frac{c}{v} \Rightarrow v = \frac{c}{n}$$

$$v = \left(\frac{c}{\sqrt{\epsilon_r \mu_r}} \right)$$

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19. A body of mass 60g experiences a gravitational force of 3.0N, when placed at a particular point. The magnitude of the gravitational field intensity at that point is :

- (1) 50 N/kg (2) 20 N/kg (3) 180 N/kg (4) 0.05 N/kg

Sol. (1)

$$I_g = \frac{F}{m}$$

$$= \frac{3}{60 \times 10^{-3}} = 50 \text{ N/kg}$$

20. In half wave rectification, if the input frequency is 60Hz, then the output frequency would be :

- (1) 30Hz (2) 60Hz (3) 120 Hz (4) zero

Sol. (2)

In half wave rectification

$$f_{in} = f_{out}$$

$$\Rightarrow f_{out} = 60\text{Hz}$$

21. If a soap bubble expands, the pressure inside the bubble:

- (1) increases (2) remains the same
(3) is equal to the atmospheric pressure (4) decreases

Sol. (4)

$$\Delta P = \frac{4T}{R}$$

$$P_{in} - P_{out} = \frac{4T}{R}$$

$$\Rightarrow P_{in} = P_o + \frac{4T}{R}$$

If soap bubble expands then R will increase and P_{in} will decrease.

22. The ratio of the radius of gyration of a thin uniform disc about an axis passing through its centre and normal to its plane to the radius of gyration of the disc about its diameter is :

- (1) $\sqrt{2} : 1$ (2) 4 : 1 (3) 1 : $\sqrt{2}$ (4) 2 : 1

Sol. (1)

$$\frac{MR^2}{2} = MK_1^2 \dots\dots(1)$$

$$\frac{MR^2}{4} = MK_2^2 \dots\dots(2)$$

$$\frac{(1)}{(2)} \Rightarrow \frac{4}{2} = \frac{K_1^2}{K_2^2}$$

$$\frac{K_1}{K_2} = \sqrt{\frac{2}{1}} = \frac{\sqrt{2}}{1}$$

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23. Two hollow conducting spheres of radii R_1 and R_2 ($R_1 \gg R_2$) have equal charges. The potential would be:
- (1) more on smaller sphere
 - (2) equal on both the spheres
 - (3) dependent on the material property of the sphere
 - (4) more on bigger sphere

Sol. (1)

$$V = \frac{kQ}{R}$$

$$V_1 = \frac{kQ}{R_1}; V_2 = \frac{kQ}{R_2}$$

$$R_1 \gg R_2$$

$$\text{Then } V_1 \ll V_2$$

Smaller sphere has more potential.

24. Plane angle and solid angle have:
- (1) Dimensions but no units
 - (2) No units and no dimensions
 - (3) Both units and dimensions
 - (4) Units but no dimensions

Sol. (4)

Unit of plane angle – radian

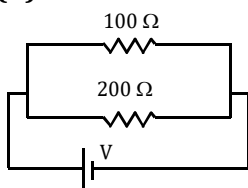
Unit of solid angle – steradian

But both are dimensionless

25. Two resistors of resistance, 100Ω and 200Ω are connected in parallel in an electrical circuit. The ratio of the thermal energy developed in 100Ω to that in 200Ω in a given time is :

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

Sol. (1)



$$\text{Thermal Energy } H = pt = \frac{v^2}{R} t$$

Resistors are connected in parallel. So, potential is same across them

$$H \propto \frac{1}{R}$$

$$\frac{H_1}{H_2} = \frac{R_2}{R_1} = \frac{200}{100} = \frac{2}{1}$$

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26. The angular speed of a fly wheel moving with uniform angular acceleration changes from 1200 rpm to 3120 rpm in 16 second. The angular acceleration in rad/s^2 is :

- (1) 4π
- (2) 12π
- (3) 104π
- (4) 2π

Sol. (1)

$$f_0 = \frac{1200}{60} = 20 \text{ Hz}$$

$$\omega_0 = 2\pi f_0 = 40\pi \text{ rad}$$

$$f = \frac{3120}{60} = 52 \text{ Hz}$$

$$\omega = 2\pi f = 104\pi \text{ rad}$$

$$t = 16 \text{ s}$$

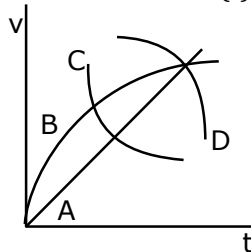
$$\omega = \omega_0 + \alpha t$$

$$104\pi = 40\pi + \alpha(16)$$

$$\frac{64\pi}{16} = \alpha$$

$$\alpha = 4\pi$$

27. A spherical ball is dropped in a long column of a highly viscous liquid. The curve in the graph shown, which represents the speed of the ball (v) as a function of time (t) is :



- (1) B
- (2) C
- (3) D
- (4) A

Sol. (1)

As ball is falling vertically downward at first velocity increases then become equal to terminal velocity (constant).

28. A light ray falls on a glass surface of refractive index $\sqrt{3}$, at an angle 60° . The angle between the refracted and reflected rays would be :

- (1) 60°
- (2) 90°
- (3) 120°
- (4) 30°

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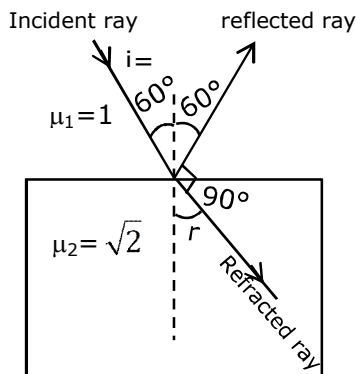
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Sol. (2)

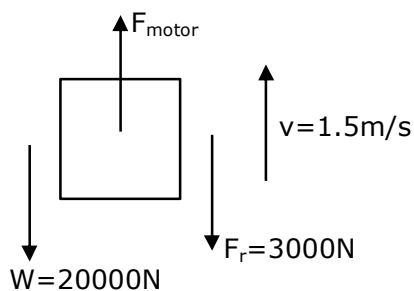


$$\begin{aligned} \mu_1 \sin i &= \mu_2 \sin r \\ 1 \times \frac{\sqrt{3}}{2} &= \sqrt{2} \sin r \\ \sin r &= \frac{1}{2} \\ r &= 30^\circ \end{aligned}$$

29. An electric lift with a maximum load of 2000 kg (lift + passengers) is moving up with a constant speed of 1.5 ms^{-1} . The frictional force opposing the motion is 3000N. The minimum power delivered by the motor to the lift in watts is : ($g = 10 \text{ ms}^{-2}$)

- (1) 20000
- (2) 34500
- (3) 23500
- (4) 23000

Sol. (2)



$$\begin{aligned} P &= f_m \cdot v \\ &= (20000 + 3000) \times 1.5 \\ &= 23000 \times 1.5 \\ &= 34500 \text{ watt} \end{aligned}$$

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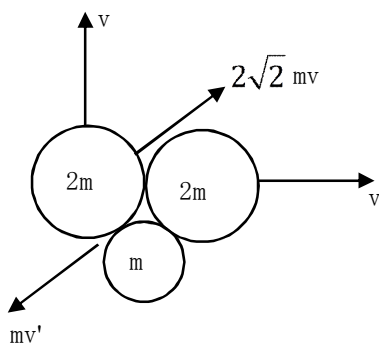
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30. A shell of mass m is at rest initially. It explodes into three fragments having equal mass in the ratio 2:2:1. If the fragments having equal mass fly off along mutually perpendicular directions with speed v , the speed of the third (lighter) fragment is:

- (1) $\sqrt{2} v$
- (2) $2\sqrt{2} v$
- (3) $3\sqrt{2} v$
- (4) v

Sol. (2)

Net linear momentum of the bomb after explosion must be zero.



$$mv' = 2\sqrt{2} mv$$

$$v' = 2\sqrt{2} v$$

31. The dimensions $[MLT^{-2}A^{-2}]$ belong to the :

- (1) self inductance
- (2) magnetic permeability
- (3) electric permittivity
- (4) magnetic flux

Sol. (2)

As we know

$$\frac{dF}{d\ell} = \frac{\mu_0 i_1 i_2}{2\pi d}$$

$$\therefore \mu_0 = \left(\frac{dF}{d\ell} \right) \left(\frac{2\pi d}{i_1 i_2} \right)$$

$$= \frac{[MLT^{-2}][L]}{[L][A^2]}$$

$$= [MLT^{-2}A^{-2}]$$

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32. A copper wire of length 10 m and radius $\left(\frac{10^{-2}}{\sqrt{\pi}}\right)$ m has electrical resistance of 10Ω . The current density in the wire for an electric field strength of $10(\text{V/m})$ is:
 (1) 10^6 A/m^2 (2) 10^{-5} A/m^2 (3) 10^5 A/m^2 (4) 10^4 A/m^2

Sol. (3)

$$\ell = 10\text{m}$$

$$\text{radius } r = \frac{10^{-2}}{\sqrt{\pi}} \text{ m}$$

$$R = 10\Omega$$

$$E = 10 \frac{\text{V}}{\text{m}}$$

As we know

$$J = \sigma E = \frac{E}{\rho}$$

$$\text{Now, } R = \frac{\rho \ell}{A}$$

$$\therefore \rho = \frac{RA}{\ell}$$

$$\text{Hence, } J = \frac{E \ell}{RA}$$

$$\text{Now, } A = \pi r^2 = \pi \frac{(10^{-2})^2}{\pi} = 10^{-4} \text{ m}^2$$

$$\therefore J = \frac{10 \times 10}{10 \times 10^{-4}} = 10^5 \text{ A/m}^2$$

33. In a Young's double slit experiment, a student observes 8 fringes in a certain segment of screen when a monochromatic light of 600 nm wavelength is used. If the wavelength of light is changed to 400 nm, then the number of fringes he would observe in the same region of the screen is:

- (1) 8
 (2) 9
 (3) 12
 (4) 6

Sol. (3)

$$n_1 \beta_1 = n_2 \beta_2$$

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

$$\therefore n_1 \lambda_1 = n_2 \lambda_2$$

$$8 \times 600 = n_2 \times 400$$

$$n_2 = \frac{4800}{400} = 12$$

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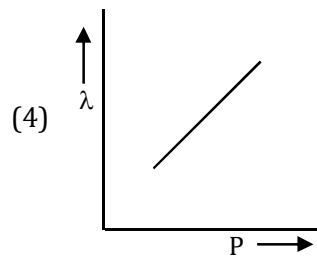
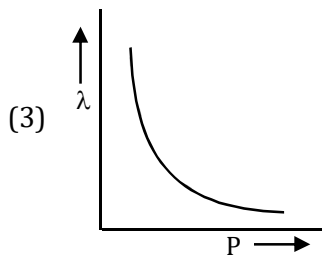
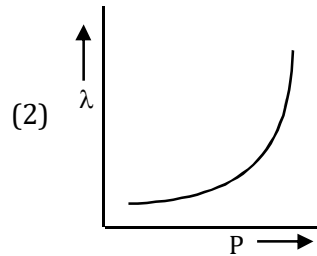
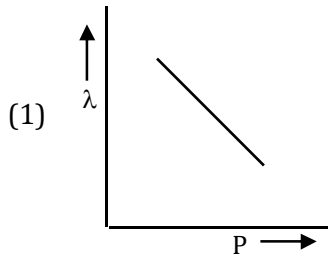
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34. The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is:

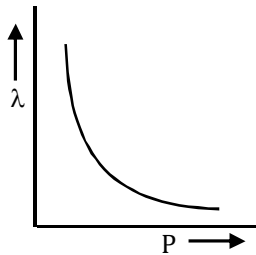


- Sol. (3)**
According to de Broglie

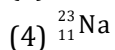
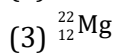
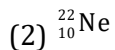
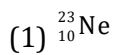
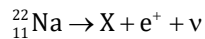
$$\lambda = \frac{h}{p}$$

$$\Rightarrow \lambda \propto \frac{1}{p}$$

Hence, graph will be hyperbola



35. In the given nuclear reaction, the element X is :



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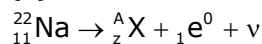
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Sol. (2)



$$Z + 1 = 11 \Rightarrow Z = 10$$

and $A = 22$

So X is ${}_{10}^{22}\text{Ne}$

SECTION - B

36. A series LCR circuit with inductance 10H, capacitance 10 μF , resistance 50 Ω is connected to an ac source of voltage, $V = 200 \sin(100t)$ volt. If the resonant frequency of the LCR circuit is ν_0 and the frequency of the ac source is ν then :

$$(1) \nu_0 = \nu = \frac{50}{\pi} \text{ Hz}$$

$$(2) \nu_0 = \frac{50}{\pi} \text{ Hz}, \nu = 50 \text{ Hz}$$

$$(3) \nu = 100 \text{ Hz}, \nu_0 = \frac{100}{\pi} \text{ Hz}$$

$$(4) \nu_0 = \nu = 5 \text{ Hz}$$

Sol. (1)

$$\text{Resonant frequency } (\nu_0) = \frac{1}{2\pi\sqrt{LC}}$$

Since, $L = 10 \text{ H}$

$C = 10 \mu\text{F} = 10^{-5} \text{ F}$

$$\nu_0 = \frac{1}{2\pi\sqrt{10 \times 10^{-5}}} = \frac{1}{2\pi \times 10^{-2}}$$

$$\frac{100}{2\pi} = \frac{50}{\pi} \text{ Hz}$$

On comparing with

$$\nu = \nu_0 \sin \omega t$$

$$\omega = 100$$

$$2\pi\nu = 100$$

$$\nu = \frac{100}{2\pi} = \frac{50}{\pi} \text{ Hz}$$

Hence, option (1) correct.

37. Match List-I with List-II.

List-I

- (a) Gravitational constant (G)
- (b) Gravitational potential energy
- (c) Gravitational potential
- (d) Gravitational intensity

(1) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

(2) (a) - (ii), (b) - (iv), (c) - (iii), (d) - (i)

(3) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)

(4) (a) - (ii), (b) - (i), (c) - (iv), (d) - (iii)

List-II

- (i) [L^2T^{-2}]
- (ii) [$M^{-1}L^3T^{-2}$]
- (iii) [LT^{-2}]
- (iv) [ML^2T^{-2}]

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Sol. (1)

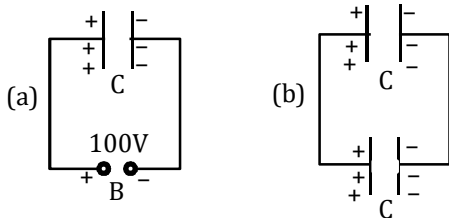
$$(a) G \rightarrow \frac{Fr^2}{m^2} = \frac{[MLT^{-2}][L^2]}{[M^2]} = [M^{-1}L^3T^{-2}]$$

(b) Gravitational potential energy \Rightarrow Dimension of energy = ML^2T^{-2}

$$(c) \text{Gravitational potential} = \frac{w}{m} = \frac{ML^2T^{-2}}{M} = [L^2T^{-2}]$$

$$(d) \text{Gravitational intensity} = \frac{F}{m} = \frac{MLT^{-2}}{M} = [LT^{-2}]$$

38. A capacitor of capacitance $C = 900 \text{ pF}$ is charged fully by 100 V battery B as shown in figure (a). Then it is disconnected from the battery and connected to another uncharged capacitor of capacitance $C = 900 \text{ pF}$ as shown in figure (b). The electrostatic energy stored by the system (b) is :



(1) $3.25 \times 10^{-6} \text{ J}$

(2) $2.25 \times 10^{-6} \text{ J}$

(3) $1.5 \times 10^{-6} \text{ J}$

(4) $4.5 \times 10^{-6} \text{ J}$

Sol. (2)

Common potential

$$V_c = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$$

$$= \frac{C \times 100 + C \times 0}{C + C}$$

$$= 50 \text{ Volt}$$

Electrostatic energy stored

$$= \frac{1}{2} CV^2 + \frac{1}{2} CV^2 = CV^2$$

$$= 900 \times 10^{-12} \times (50)^2$$

$$= 225 \times 10^{-8} \text{ J}$$

$$= 2.25 \times 10^{-6} \text{ J}$$

39. Two transparent media A and B are separated by a plane boundary. The speed of light in those media are $1.5 \times 10^8 \text{ m/s}$ and $2.0 \times 10^8 \text{ m/s}$, respectively. The critical angle for a ray of light for these two media is :

(1) $\sin^{-1}(0.750)$

(2) $\tan^{-1}(0.500)$

(3) $\tan^{-1}(0.750)$

(4) $\sin^{-1}(0.500)$

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Sol. (1)

$$\begin{aligned} \sin i_c &= \frac{\mu_B}{\mu_A} = \frac{C/V_B}{C/V_A} = \frac{V_A}{V_B} \\ &= \frac{1.5 \times 10^8}{2 \times 10^8} = 0.750 \\ \therefore i_c &= \sin^{-1}(0.750) \end{aligned}$$

40. The volume occupied by the molecules contained in 4.5 kg water at STP if the intermolecular forces vanish away is :

- (1) $5.6 \times 10^3 \text{ m}^3$
 (2) $5.6 \times 10^{-3} \text{ m}^3$
 (3) 5.6 m^3
 (4) $5.6 \times 10^6 \text{ m}^3$

Sol. (3)

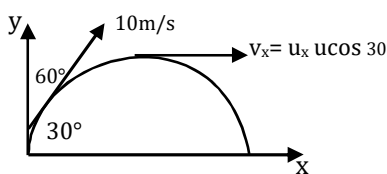
$$\begin{aligned} \mu &= \frac{\text{mass of water}}{\text{molecular weight}} = \frac{4.5}{18 \times 10^{-3}} = 250 \\ T &= 273, P = 10^5 \text{ N/m}^2 \\ PV &= \mu RT \\ V &= \frac{\mu RT}{P} \\ &= \frac{250 \times 8.3 \times 273}{10^5} \\ &= 5.6 \text{ m}^3 \end{aligned}$$

41. A ball is projected with a velocity, 10 ms^{-1} , at an angle of 60° with the vertical direction. Its speed at the highest point of its trajectory will be:

- (1) $5\sqrt{3} \text{ ms}^{-1}$ (2) 5 ms^{-1} (3) 10 ms^{-1} (4) Zero

Sol. (1)

At maximum height



$$\begin{aligned} u_x &= u \cos \theta \\ &= 10 \cos 30^\circ \\ &= 10 \times \frac{\sqrt{3}}{2} = 5\sqrt{3} \text{ m/s} \end{aligned}$$

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42. Given below are two statements: One is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) :

The stretching of a spring is determined by the shear modulus of the material of the spring.

Reason (R):

A coil spring of copper has more tensile strength than a steel spring of same dimensions.

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

- (1) Both **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**
 (2) **(A)** is true but **(R)** is false
 (3) **(A)** is false but **(R)** is true
 (4) Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**

Sol. (2)

Because the stretching of coil simply change its shape without any change in length of the wire used in coil. Due to which shear modulus of elasticity is involved.

$Y_{\text{steel}} > Y_{\text{copper}}$ and $Y \propto$ Tensile strength

43. Two pendulums of length 121 cm and 100 cm start vibrating in phase. At some instant, the two are at their mean position in the same phase. The minimum number of vibrations of the shorter pendulum after which the two are again in phase at the mean position is:

- (1) 9 (2) 10 (3) 8 (4) 11

Sol. (4)

$$n_s T_s = n_B T_B$$

$$n_s 2\pi \sqrt{\frac{100}{g}} = n_B 2\pi \sqrt{\frac{121}{g}}$$

$$10 n_s = 11 n_B$$

$$\frac{n_s}{n_B} = \frac{11}{10}$$

Hence, 11 oscillation of smaller is equal to 10 oscillation of T_1

44. A big circular coil of 1000 turns and average radius 10 m is rotating about its horizontal diameter at 2 rad s^{-1} . If the vertical component of earth's magnetic field at that place is $2 \times 10^{-5} \text{ T}$ and electrical resistance of the coil is 12.56Ω , then the maximum induced current in the coil will be:

- (1) 1.5 A (2) 1 A (3) 2 A (4) 0.25 A

Sol. (2)

$$i = \frac{e_{\text{max}}}{R} = \frac{NBA\omega}{R}$$

$$= \frac{1000 \times 2 \times 10^{-5} \times \pi \times 10^2 \times 2}{12.56}$$

$$= \frac{12.56}{12.56} = 1 \text{ A}$$

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45. Two point charges $-q$ and $+q$ are placed at a distance of L , as shown in the figure.



The magnitude of electric field intensity at a distance R ($R \gg L$) varies as:

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

Sol. (1)

as $R \gg L$, then given charge system will act as electric dipole. Electric field at axis of dipole is

$$E = \frac{2kP}{R^3} = E \propto \frac{1}{R^3}$$

46. A nucleus of mass number 189 splits into two nuclei having mass number 125 and 64. The ratio of radius of two daughter nuclei respectively is :

- (1) 4 : 5
(2) 5 : 4
(3) 25 : 16
(4) 1 : 1

Sol. (2)

$$R = R_0 (A)^{1/3}$$

$$R \propto A^{1/3}$$

$$\frac{R_1}{R_2} = \left[\frac{A_1}{A_2} \right]^{1/3}$$

$$\frac{R_1}{R_2} = \left[\frac{125}{64} \right]^{1/3}$$

$$\frac{R_1}{R_2} = \frac{5}{4}$$

47. From Ampere's circuital law for a long straight wire of circular cross-section carrying a steady current, the variation of magnetic field in the inside and outside region of the wire is :

- (1) a linearly increasing function of distance upto the boundary of the wire and then linearly decreasing for the outside region.
(2) a linearly increasing function of distance r upto the boundary of the wire and then decreasing one with $1/r$ dependence for the outside region.
(3) a linearly decreasing function of distance upto the boundary of the wire and then a linearly increasing one for the outside region.
(4) uniform and remains constant for both the regions.

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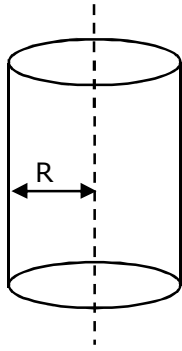
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Sol. (2)



$$B_{in} = \frac{\mu_0 I r}{2\pi R^2}; B_{in} \propto r$$

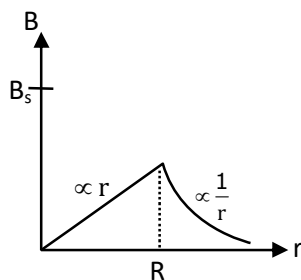
$$B_s = \frac{\mu_0 I}{2\pi R}; B_s = \text{max}^m$$

$$B_o = \frac{\mu_0 I}{2\pi r}; B_o \propto \frac{1}{r}$$

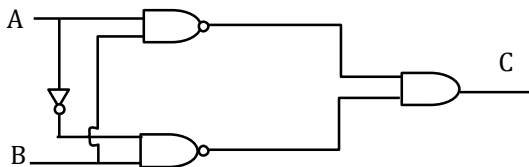
$$B_{in} \propto r$$

$$B_s = \text{Max}^m$$

$$B_o \propto \frac{1}{r}$$



48.



The truth table for the given logic circuit is :

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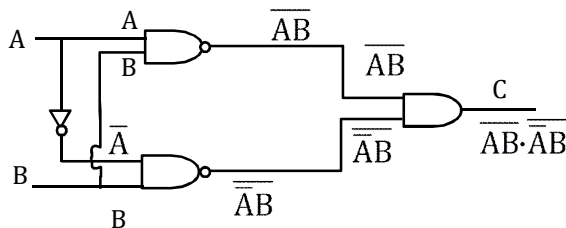
A	B	C
0	0	1
(1) 0	1	0
1	0	0
1	1	1

A	B	C
0	0	1
(2) 0	1	0
1	0	1
1	1	0

A	B	C
0	0	0
(3) 0	1	1
1	0	0
1	1	1

A	B	C
0	0	0
(4) 0	1	1
1	0	1
1	1	0

Sol. (2)

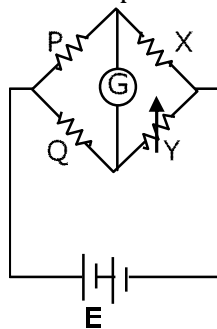


$$\begin{aligned}
 C &= \overline{AB} \cdot \overline{A+B} \\
 &= (\overline{A} + \overline{B}) \cdot (\overline{A+B}) \\
 &= \overline{A}\overline{A+B} + \overline{B}\overline{A+B} \\
 &= \overline{A}\overline{B} + \overline{A}\overline{A} + \overline{B}\overline{A} + \overline{B}\overline{B} \\
 &= \overline{A}\overline{B} + \overline{A} + \overline{B} \\
 &= \overline{A}\overline{B} + \overline{B}(A+1)
 \end{aligned}$$

$$C = \overline{B}(A+1)$$

A	B	\overline{A}	\overline{B}	C
0	0	1	1	1
0	1	1	0	0
1	0	0	1	1
1	1	0	0	0

49. A wheatstone bridge is used to determine the value of unknown resistance X by adjusting the variable resistance Y as shown in the figure. For the most precise measurement of X, the resistance P and Q :



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- (1) should be approximately equal and are small
- (2) should be very large and unequal
- (3) do not play any significant role
- (4) should be approximately equal to $2x$

Sol. (1)
Resistance of P & Q should be approximately equal as it decreases error in experiment.

50. The area of a rectangular field (in m^2) of length 55.3m and breadth 25m after rounding off the value for correct significant digits is :

- (1) 1382
- (2) 1382.5
- (3) 14×10^2
- (4) 138×10^1

Sol. (3)
 $A = L \times B$
 $= 55.3 \times 25$
 $= 1382.5 \approx 14 \times 10^2$
 Because according to rule, significant figure in answer is same as smallest number of significant figure in any of the number [for product and division]

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शिक्षा के क्षेत्र में उल्लेखनीय कार्य के लिए किया सम्मान

कोटा

मोशन एजुकेशन के फाउंडर और सीईओ नितिन विजय को ज.नी-म.नी बिजनेस वर्ल्ड डिसरप्ट 40 अंडर 40 से सम्मानित किया गया है। शिक्षा के क्षेत्र में उल्लेखनीय कार्य के लिए उन्हें यह सम्मान दिया गया।

गुरुग्राम के होटल लीला पैलेस में आयोजित समारोह में सम्मान पर प्रतिक्रिया में विजय ने कहा- मैं शिक्षा की काशी कहलाने वाले कोटा से आता हूँ और एक शिक्षक



के रूप में पहचाना जाता हूँ। कभी सोचा नहीं था कि एक उद्यमी के रूप में अवार्ड मिलेगा। उन्होंने अपनी उपलब्धि माता-पिता, पत्नी, मोशन टीम और विद्यार्थियों को समर्पित की। इस मौके पर विजय ने कहा कि हम शिक्षा की गुणवत्ता बढ़ाने और लागत कम करने के मिशन पर कार्य कर रहे हैं। फ्रंटलाइन एजुकेशन ऑफ एजुकेशन की ओर जा रहे हैं। उन्होंने कहा- हेल्थ केयर के क्षेत्र में जब भी पेशेंट आता है तो उसको बलाना पड़ता कि उसे क्या बीमारी है। दूसरी ओर हर बच्चा अलग होता है लेकिन बच्चों को एक जैसी ही शिक्षा दी जाती है जबकि उनकी समस्या का समाधान अलग-अलग ही होता है। गौरतलब है कि सम्मान समारोह का आयोजन नई दिल्ली आधारित ज.नी-म.नी बिजनेस वर्ल्ड डिसरप्ट 40 अंडर 40 से सम्मानित किया गया था। इस पत्रिका का प्रकाशन 1983 में टेलीग्राफ की प्रकाशक आनंद बाजार पत्रिका ने शुरू किया था। अनुराग बत्रा इसके संपादक हैं।



मोशन एजुकेशन के फाउंडर - सीईओ नितिन विजय को बिजनेस वर्ल्ड की ओर से बेस्ट इंटरप्रेन्योर अवार्ड-40 अंडर 40 के समारोह का वीडियो देखने के लिए यह क्यू आर कोड स्कैन करें।



कोटा अब मोशन में है नॉलेज के ऑशन में है...

स्टेशन पर अब ऑटो वाले बैगा कोर्सिंग के डायरेक्शन में है, राजीव गांधी नगर हो या जवाहर नगर, सारे होस्टल्स, पीजी भी फुल ऑन टशन में है, क्योंकि कोटा अब मोशन में है।

विद्यार्थियों की चहक और गरमा-गरम कचौड़ियों की महक के साथ पोहे, पेटीज और मोमोस भी फिर से सर्विलेसन में है क्योंकि कोटा अब मोशन में है।

क्लास में फिर बच्चों की खिलखिलाहट सुनकर हर टीचर के चेहरे पर मुस्कान है, स्टूडेंट्स भी अपनी आँखों में

जेईई-नीट जैक करने के सपने लिए क्लासरूम में पढ़ रहे पूरे डिवोशन में है, क्योंकि कोटा अब मोशन में है। अब क्लासरूम से कैफे तक हर जगह है शोर, एनबी सर कोई हंसगुल्ला छोड़े तो जोर से आवाज आती है वन्स मोर, डाउट कार्डर के बाहर स्टूडेंट्स भी अपने हर डाउट को नोट किए इंतजार-ए-सॉल्युशन में है, क्योंकि कोटा अब मोशन में है।

स्टेशनरी पर सिर्फ आरडी शर्मा, एचवी वर्मा सुनाई देता है, हर गली, कॉलोनी में बच्चों का जमावड़ा दिखाई देता है,



Nitin Vijay (NV Sir)



Amit Verma (AV Sir)



Dr. Ashish Maheshwari (AM Sir)



Jitendra Chandwani (JC Sir)



Ashish Bajpai (AB Sir)



Lalit Vijay (LV Sir)

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नीट में चयनित विद्यार्थी इन कॉलेज में ले सकते है एडमिशन

18 लाख विद्यार्थी दे रहे हैं नीट 2022 की परीक्षा, 612 मेडिकल कॉलेज और 91927 सीट्स के लिए परीक्षा का आयोजन

नीट, मेडिकल जैसे विभिन्न पाठ्यक्रमों में उम्मीदवारों को प्रवेश देने के लिए स्वयं की प्रवेश परीक्षा का संचालन करता है। इस बार NEET 2022 का कट ऑफ प्रतिशत अंको के रूप में जारी किया जाएगा, कट ऑफ परीक्षार्थी के योग माने जाने का मापदंड होता है। परीक्षार्थियों द्वारा प्रवेश परीक्षा में प्राप्त किये गए अंको के आधार पर प्रतिशत अंक की गणना की जाएगी और फिर आगे सामान्य प्रक्रिया लागू होगी। जो परीक्षार्थी NEET 2022 की कट-ऑफ के बराबर या उससे अधिक अंक प्राप्त करेंगे,

केवल उन्हें ही प्रवेश की आगामी प्रक्रियाओं के लिए योग्य घोषित किया जाएगा। परीक्षा उत्तीर्ण करने के बाद, उम्मीदवार योग्य है या नहीं यह जानने के लिए मेरिट प्रतिशत को ध्यान में रखा जाएगा। मेरिट सूची में अधिकारियों द्वारा विशेष श्रेणियों में उपलब्ध सीटों की संख्या से चार गुना ज्यादा परीक्षार्थियों को शामिल किया जाएगा। प्रत्येक श्रेणी में अंतिम परीक्षार्थी द्वारा प्राप्त किया गया प्रतिशत स्कोर NEET 2022 का मेरिट कट ऑफ बन जाएगा।

TOP COLLEGES ON THE BASIS OF AIIMS 2021

Top Government Medical College	Seats	UR Rank	OBC Rank	SC Rank	ST Rank
AIIMS New Delhi	125	53	256	875	4820
AIIMS Jodhpur	125	8855	1242	84045	16903
AIIMS Bhopal	125	572	1235	7905	24629
AIIMS Bibi Nagar Telangana	62	19796	6841	34449	49612
AIIMS Bhubaneswar	125	3719	1306	7136	63824
AIIMS Bathinda	100	8855	3130	84045	48344
AIIMS Mangalagiri	125	4388	6544	27923	46174
AIIMS Rishikesh	125	7027	1836	14388	51247
AIIMS Raipur	125	17941	2146	23342	58873
AIIMS Kalyani	125	12259	6856	49984	66326
AIIMS Patna	125	12041	19793	105598	60121
AIIMS Guwahati	50	5580	20156	43097	81716
AIIMS Bilaspur	50	4142	7191	42343	63142
AIIMS Nagpur	125	18186	3394	21841	45713
AIIMS Guwahati	50	8319	8483	105837	71700
AIIMS Gorakhpur	125	3437	4662	34677	62192
AIIMS Jammu	50	8115	20074	86250	64858
AIIMS Rai Bareilly	100	4572	5080	103776	62084
AIIMS Deoghar	62	6318	19831	104065	124211

JIPMER 2021

JIPMER Puducherry	150	26107	42658	906861	146530
JIPMER Karaikal	50	62036	49453	NA	171972

TOP COLLEGES ON THE BASIS OF NEET (ALL INDIA QUOTA) 2021

Top Government Medical College	UR Rank	OBC Rank	SC Rank	ST Rank
Maulana Azad Medical College, New Delhi	87	372	6966	1438
Stanley Medical College, Chennai	9446	12003	106238	55081
University College of Medical Science, New delhi	2085	830	16798	3319
Lady Hardinge Medical College, Delhi	579	1127	37077	8726
Seth Gordhandas Sunderdas Medical College, Mumbai	773	6783	56313	26577
Grant Medical College, Mumbai	18292	10505	94949	103436
Madras Medical College, Chennai	755	3728	55718	39570
Vardhman Mahavir College, Delhi	143	472	12809	28650
SMS Medical College, Jaipur	731	19765	26396	20366
SN Medical College, Jodhpur	19737	8496	54600	66248
Government Medical College Hospital, Patiala	4492	20651	117465	55398
Lokamanyu Tilak Municipal Medical College, Mumbai	4264	14527	111607	106911
R.G. Kar Medical College and Hospital, Kolkata	1674	3468	76324	11687
Gandhi Medical College, Secunderabad	4014	5997	35330	42201
B. J Medical College, Ahmedabad	721	2168	124146	9767

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NEET 2023/24 की तैयारी!



- ◆ **Why is there a requirement for a separate girls' NEET batch?**
Comparing the registration ratio of students in the NEET programs, it is discovered that the ratio of girls in the NEET batch is always high. Hence, to maintain the comfort zone of girls and discipline in the batch, Motion Education has divided the NEET batches. There is not only a separate batch for girls and boys but also the batch strength is limited. Through this, students enrolled in the NEET girls batch get the proper attention of their faculties. In addition, this batch is safe and conducted during the even hours so that girls don't face trouble coming to classes.
- ◆ **What are the benefits of joining the NEET girls batch?**
There are many benefits that students can avail themselves of through the classroom course of NEET program. Some of these include:
 - ❖ Get the guidance of Kota's top NEET faculties
 - ❖ Comprehensive study material
 - ❖ Regular doubt support
 - ❖ Exam pattern-based test series (weekly/monthly test)
 - ❖ DPP, PYQs, CPS, and access to Motion Learning App
- ◆ **What will be the teaching medium of the lectures and study material provided to aspirants in the NEET girls batch?**
Motion's priority is to facilitate the best resources and aid to students of both English and Hindi mediums. This is the reason we conduct classes for English as well as Hindi medium students. Study material distributed to students is also based on the choice of medium they opt for during the registration.
- ◆ **Is the fee structure for classes XI, XII and XII passed the same?**
The discounted fee for enrollment in the NEET girls batch is 75,000 INR per year. All the girls enrolling in this NEET program whether they are in class XI, XII or drop year have to only pay 75,000 INR. Also, there will be no extra charges taken for the facilities offered by Motion Education like the study material and unlimited access to Motion Learning App.

◆ मोशन प्रयास के अंतर्गत विद्यार्थियों को क्या-क्या सुविधाएं मिलेंगी?
मोशन प्रयास के अंतर्गत कोचिंग, हॉस्टल, भोजन एवं स्कूल की सुविधा दी जाएगी जिससे परिजन इन सभी आवश्यकताओं की उपलब्धता एवं गुणवत्ता को लेकर निश्चित हो सकें एवं विद्यार्थी अपना सम्पूर्ण ध्यान प्रतियोगी परीक्षा की तैयारी में लगा सकें।

◆ मोशन प्रयास में प्रवेश लेने वाले विद्यार्थियों को पाठ्य सामग्री किस भाषा में प्राप्त होगी?
मोशन प्रयास के अंतर्गत विद्यार्थियों की सुविधानुसार सम्पूर्ण पाठ्य सामग्री (स्टडी मटेरियल), टेस्ट सीरीज, डेली प्रॉब्लम प्रेक्टिस शीट इत्यादि हिंदी माध्यम में उपलब्ध होगी जिससे उन्हें समझने में कोई समस्या ना हो और विद्यार्थी मन लगाकर अध्ययन कर सकें।

◆ क्या हॉस्टल, स्कूल एवं भोजन आदि की फीस मोशन प्रयास की फीस के अतिरिक्त होगी?
मोशन प्रयास में एडमिशन लेने वाले विद्यार्थियों के लिए कोचिंग एवं स्कूल के साथ साथ ही 31 मार्च 2023 तक हॉस्टल एवं भोजन की सभी सुविधाएं एक ही फीस में होगी। जहां प्रयास कोर्स फीस रूपए 160000/- जमा कराने के पश्चात विद्यार्थी पूरी तरह से मोशन एजुकेशन की जिम्मेदारी पर होगा।

◆ मोशन प्रयास में 11वीं एवं 12वीं के हिंदी-इंग्लिश जैसे अनिवार्य विषय की तैयारी के लिए कोई सुविधा होगी?
मोशन प्रयास के अंतर्गत आवश्यकता अनुसार बोर्ड परीक्षाओं की दृष्टि से हिंदी एवं इंग्लिश जैसे विषयों की तैयारी भी विषय विशेषज्ञों द्वारा करवाई जाएगी जिससे विद्यार्थी को बेहतर बोर्ड स्कोर में भी मदद मिल सकेगी।

◆ मोशन प्रयास के अंतर्गत छात्र एवं छात्राओं के लिए किस तरह से हॉस्टल की सुविधा प्रदान की जाएगी?
मोशन प्रयास में छात्र एवं छात्राओं के लिए

पृथक-पृथक हॉस्टल की व्यवस्था होगी जिससे वे शांत एवं सुरक्षित वातावरण में अध्ययन कर सकें।

◆ मोशन प्रयास के अंतर्गत अध्ययन करने वाले विद्यार्थियों को क्लासरूम कोचिंग के अतिरिक्त और क्या सुविधा मिलेगी?
मोशन प्रयास के अंतर्गत अध्ययन करने वाले विद्यार्थियों को क्लासरूम कोचिंग के अतिरिक्त मोशन लर्निंग एप की सुविधा भी दी जाएगी जिससे वे वीडियो लेक्चर के माध्यम से रिवीजन कर सकते हैं और क्लास की लाइव रिकॉर्डिंग को फिर से दोहराने के साथ साथ ही अपने स्तर के अनुसार टेस्ट देकर अपनी तैयारी को परख सकते हैं।

◆ मोशन प्रयास में क्या केवल मेडिकल एवं इंजीनियरिंग की तैयारी करावाई जाएगी। 12वीं बोर्ड की तैयारी कैसे करें?
मोशन प्रयास के अंतर्गत हर छोटे से लेकर बड़े टॉपिक को इस तरह से पढ़ाया जाएगा कि विद्यार्थियों को मेडिकल अथवा इंजीनियरिंग के साथ ही 11वीं एवं 12वीं की भी तैयारी हो सके। विद्यार्थियों को इसके लिए अतिरिक्त कोचिंग लेने की आवश्यकता नहीं होगी।

◆ मोशन प्रयास में फीस जमा करने का तरीका?
मोशन प्रयास कोर्स में रजिस्ट्रेशन होने के बाद स्टूडेंट बैंक की ब्याज रहित आसान मासिक किश्तों में अपनी फीस जमा कर सकता है।

◆ मोशन प्रयास में कौन-कौन सी कक्षा का प्रस्ताव दिया जा रहा है?
मोशन प्रयास में कक्षा 11वीं अथवा 12वीं साइंस के विद्यार्थियों को मेडिकल अथवा इंजीनियरिंग प्रवेश के साथ साथ बोर्ड परीक्षा एवं 12वीं पास विद्यार्थियों को पूरी तरह से मेडिकल अथवा इंजीनियरिंग प्रवेश परीक्षा की तैयारी करवाई जावेगी।

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कक्षा 11वीं, 12वीं एवं
12वीं पास विद्यार्थियों के लिए



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NITIN VIJAY (NV Sir)
Founder & CEO

NATION'S BEST SELECTION PERCENTAGE (%) RATIO

STUDENT QUALIFIED IN NEET

2021	3296 / 3411 = 93.12%
2020	2663 / 2843 = 93.66%
2019	2041 / 2212 = 92.27%

STUDENT QUALIFIED IN JEE ADVANCED

2021	1256 / 2994 = 41.95%
2020	994 / 2538 = 39.16%
2019	969 / 2105 = 36.53%

STUDENT QUALIFIED IN JEE MAIN

2021	2994 / 4089 = 73.25%
2020	2538 / 3554 = 71.44%
2019	2288 / 3316 = 68.99%

Dear Students,

Which one would you choose a rank or just the selection? If you take my advice don't pressurize yourself, just concentrate on your studies and continue working hard. Once a student starts preparing for NEET/JEE exam, their entire focus must be on systematic preparation for the selection. At Motion Education, we ensure to cater to every student's need, our teachers impart lessons after understanding the psychology of students and help them in attaining stress-free results. Through our Classroom program aided with technology, we facilitate a highly advanced nurturing platform & believe in Customising studying techniques helping students in strengthening their concepts and making their exam preparations more effective.

NITIN VIJAY (NV Sir) Founder & CEO

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NEET Score	FEE After Scholarship
600+	10,000 (Kit Cost)
571-600	22,881
551-570	34,322
531-550	40,042
511-530	45,762
491-510	51,483
471-490	57,203
451-470	62,923
431-450	68,644
351-430	80,084
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*GST Extra

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