PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 79

Physics

1. If the series limit wavelength of the Lyman series for hydrogen atom is 912Å, then the series

limit wavelength for the Balmer series for the hydrogen atom is

A. $912Å$

B. $1824Å$

C. $3648Å$

D. $456Å$

Answer: C

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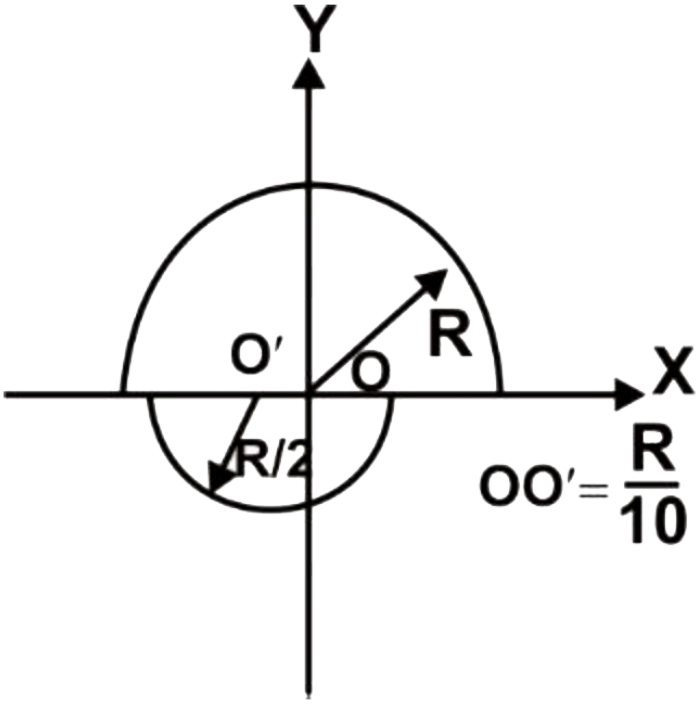
2. Two solid hemispheres of radii R and $\frac{R}{2}$ with centers O and O' respectively as shown in figure. The density of bigger hemisphere is ρ and that of smaller hemisphere is 2ρ. Taking center of bigger hemisphere is at origin and the distance between centres of two hemisphere OO' is $\frac{R}{10}$ find co -

ordinates of center of mass of the system.



A. $\left(-\frac{R}{50}, \frac{21R}{80}\right)$

B. $\left(-\frac{R}{30}, \frac{21R}{80}\right)$

C. $\left(-\frac{R}{50}, \frac{7R}{16}\right)$

D. $\left(-\frac{R}{30}, \frac{7R}{16}\right)$

Answer: A

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3. Two spherical conductors of radii 4 m and 5 m are charged to the same potential. If σ_1 and σ_2 be the respective value of the surface density of charge on the two conductors, then the ratio $\frac{\sigma_1}{\sigma_2}$ is

A. $\frac{25}{16}$

B. $\frac{16}{25}$

C. $\frac{5}{4}$

D. $\frac{4}{5}$

Answer: C

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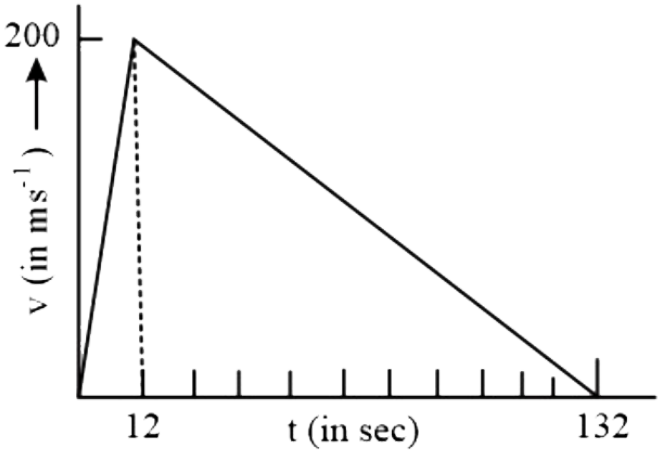
4. A rocket is fired upwards, its engine explodes fully in 12 s. The height reached by the rocket as

calculated from its velocity - time graph is



A. 13200 m

B. 158400 m

C. 18400 m

D. 15400 m

Answer: A

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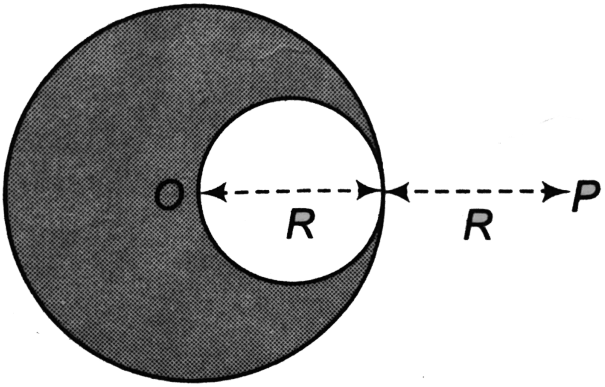
5. A solid sphere of uniform density and radius R applies a gravitational force of attraction equal to F_1 on a particle placed at P, distance $2R$ from the centre O of the sphere. A spherical cavity of radius $R/2$ is now made in the sphere as shown in figure. The particle with cavity now applies a gravitational force F_2 on same particle placed at

P. The radio F_2 / F_1 will be



A. $\frac{1}{2}$

B. $\frac{7}{9}$

C. 3

D. 7

Answer: B

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6. If a body at $27^{\circ}C$ emits 0.3 watt of heat then at $627^{\circ}C$, it will emit heat equal to -

A. 24.3 W

B. 0.42 W

C. 2.42 W

D. 0.9 W

Answer: A

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7. One mole of a certain ideal gas obtains an amount of heat $Q = 1.60kJ$ when its temperature is increased by $\Delta T = 72K$, keeping its pressure constant. The vlaue of $\frac{C_P}{C_V}$ for the gas is

A. 1.60

B. 1.40

C. 1.50

D. 1.30

Answer: A

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8. A rectangular loop of metallic wire is of length a and breadth b and carries a current i. The magnetic field at the centre of the loop is

A. $\frac{\mu_0 i}{4\pi}$

B. $\frac{\mu_0 i}{4\pi} \frac{4\sqrt{a^2+b^2}}{ab}$

C. $\frac{\mu_0 i}{4\pi} \frac{2\sqrt{a^2+b^\circ}}{ab}$

D. $\frac{\mu_0 i}{4\pi} \frac{\sqrt{a^2+b^2}}{ab}$

Answer: A

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9. Consider a collection of a large number of particles each with speed v in a plane.The direction of velocity is randomly distributed in the collection.The magnitude of the average relative velocity of a particle with velocities of all other particles is

A. v

B. 4v

C. $\frac{4v}{\pi}$

D. $4\pi v$

Answer: C

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10. A ball of mass 0.2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2 m while applying the force and the ball goes upto 2 m height further, find the magnitude of the force. (Consider $g = 10m/s^2$).

A. 4 N

B. 16 N

C. 20 N

D. 22 N

Answer: D

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11. A $.^{32}P$ radionuclide with half - life T = 14.3 days is produced in a reactor at a constant rate $q = 2.7 \times 10^9$ nuclei per second. How soon after the beginning of production of that nuclide will its activity be equal to $A = 1.0 \times 10^9 dis./s$?

A. 9.5 days

B. 8 days

C. 7.5 days

D. 6 days

Answer: A

12. A simple pendulum is taken to 64 km above the earth's surface. Its new time period will

A. Increase by 1%

B. Decrease by 1%

C. Increase by 2%

D. Decrease by 2%

Answer: A

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13. When a piece of metal is illuminated by monochromatic light of wavelength λ, then stopping potential is $3V_s$. When the same surface is illuminated by the light of wavelength 2λ, then stopping potential becomes V_s. The value of

threshold wavelength for photoelectric emission will be

A. 4λ

B. 8λ

C. $\frac{4}{3}\lambda$

D. 6λ

Answer: A

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14. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $\frac{h}{2}$ and from $\frac{h}{2}$ to zero is

A. $\sqrt{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\sqrt{2}-1$

D. $\frac{1}{\sqrt{2}-1}$

Answer: C

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15. A symmetric double convex lens is cut in two equal parts by a plane containing the principal axis. If the power of the original lens was 4D, the power of a cut lens will be

A. 2 D

B. 3 D

C. 4 D

D. 5 D

Answer: A

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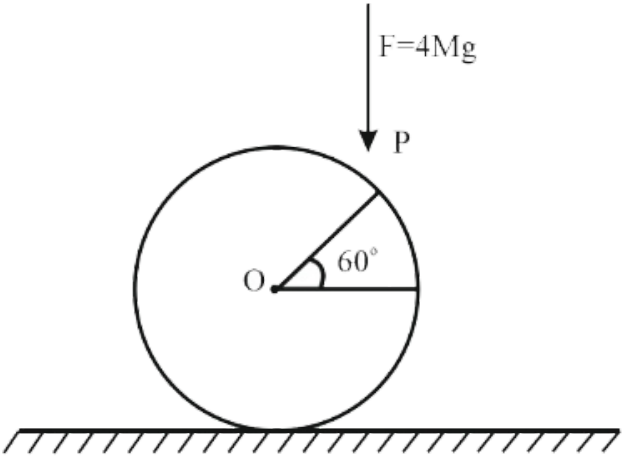
16. A uniform solid sphere of mass M and radius R is lying on a rough horizonal plane. A constant force $F = 4Mg$ acts vertically downwards at point P such that the line OP makes an angle of 60° with the horizontal as shown in the figure. The minimum value of the coefficient of friction μ

so that sphere performs pure rolling, is



A. $\frac{3}{7}$

B. $\frac{4}{7}$

C. $\frac{2}{7}$

D. $\frac{2}{5}$

Answer: C

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17. A silicon specimen is made into a P-type semiconductor by dopping, on an average, one helium atoms per 5×10^7 silicon atoms. If the number density of atoms in the silicon specimen is $5 \times 10^{28} atom/m^3$ then the number of acceptor atoms in silicon per cubic centimeter will be

A. 2.5×10^{20} atom cm^{-3}

B. 2.5×10^{25} atom cm^{-3}

C. 1×10^{13} atom cm^{-3}

D. 1×10^{15} atom cm^{-3}

Answer: D

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18. A lead bullet of mass 10 g travelling at $300 m / s$ strikes against a block of wood and comes to rest. Assuming $50\,\%$ of heat is absorbed by the bullet, the increase in its temperature is

(Specific heat of lead $= 150 J / kg^{\circ} C$)

A. $100^\circ C$

B. $125^\circ C$

C. $150^\circ C$

D. $200^\circ C$

Answer: C

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19. If Surface tension (S), Moment of Inertia (I) and Planck's constant (h), were to be taken as the

fundamental units, the dimensional formula for linear momentum would be :

A. $S^{1/2}T^{1/2}h^0$

B. $S^{1/2}T^{3/2}h^{-1}$

C. $S^{3/2}T^{1/2}h^0$

D. $S^{1/2}T^{1/2}h^{-1}$

Answer: A

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20. Two identical piano wires have a fundamental frequency of 600 cycle per second when kept under the same tension. What fractional increase in the tension of one wire will lead to the occurrence of 6 beats per second when both wires vibrate simultaneously?

A. 0.01

B. 0.02

C. 0.03

D. 0.04

Answer: B

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21. A stone of mass 1 kg tied to a light inextensible string of lenth $L = \frac{10}{3}m$, whirling in a circular path in a vertical plane. The ratio of maximum tension to the minimum tension in the string is 4. If g is taken to be $10ms^{-2}$, the speed of the stone at the highest point of the circle is

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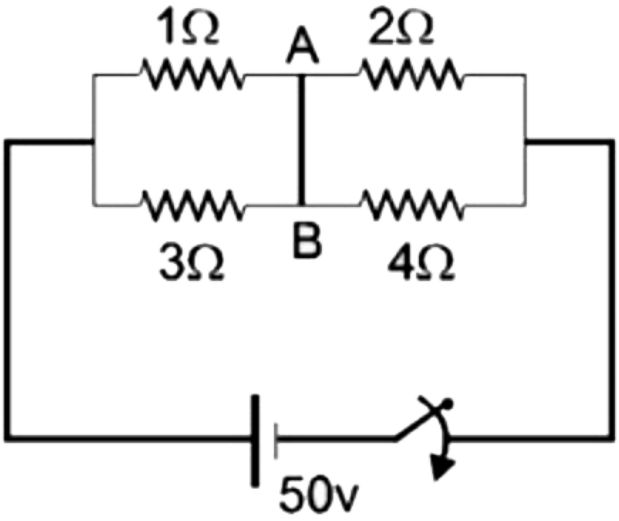
22. For resistances are connected by an ideal battery of emf 15 V, the circuit is in steady - state then the current (in ampere) in wire AB is :



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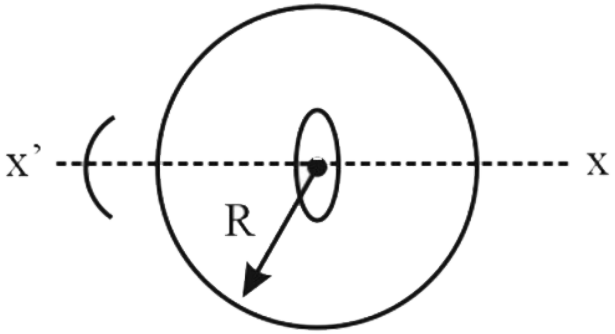
23. A non-conducting ring of radius R having uniformly distributed charge Q starts rotating about x-x' axis passing through diameter with an angular acceleration α, as shown in the figure. Another small conducting ring having radius $a(a << R)$ is kept fixed at the centre of bigger ring is such a way that axis xx' is passing through its centre and perpendicular to its plane. If the resistance of small ring is $r = 1\Omega$, find the induced current in it in ampere.

(Given

$q = \frac{16 \times 10^2}{\mu_0} C, R = 1m, a = 0.1m, \alpha = 8 \text{rad s}^{-2}$



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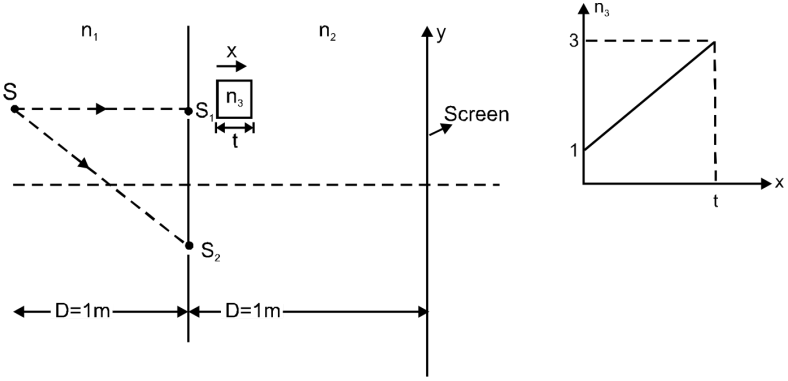
24. In YDSE arrangement as shown in figure, fringes are seen on screen using monochromatic source S having wavelength 3000 Å (in air). S_1 and S_2 are two slits seperated by d = 1 mm and D = 1m. Left of slits S_1 and S_2 medium of refractive

index $n_1 = 2$ is present and to the right of S_1 and S_2 medium of $n_2 = \frac{3}{2}$, is present. A thin slab of thickness 't' is placed in front of S_1 . The refractive index of n_3 of the slab varies with distance from it's starting face as shown in figure.



In order to get central maxima at the centre of screen, the thickness of slab required is :

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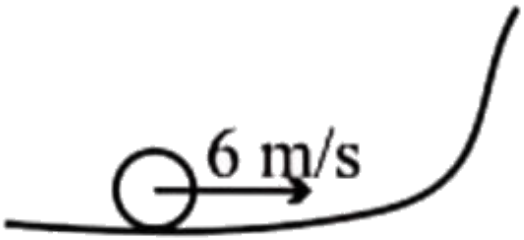
25. A disc of radius 0.1 m rolls without sliding on a horizontal surface with a velocity of $6ms^{-1}$. It then ascends a smooth continuous track as shown in figure. The height upto which it will ascend is $\left(g = 10ms^{-2}\right)$



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