PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 74

Physics

1. The de - Broglie wavelength of a ball of mass 120 g moving at a speed of $20\,\mathrm{m\,s^{-1}}$ is (Planck's constant $h = 6.6 \times 10^{-34} Js$)

A. $3.5 \times 10^{-34} m$

B. $2.8 \times 10^{-34} m$

C. $1.2 \times 10^{-34} m$

D. $2.1 \times 10^{-34} m$

Answer: B

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2. A 24 V battery of internal resistance 4.0Ω is connected to a variable resistance. At what value of the current drawn from the battery is the rate of heat produced in the resistor maximum?

A. 2A

B. 3A

C. 4A

D. 6A

Answer: B

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3. A transformer having effieciency of 90% is working on 200 V and 3kW power supply. If the current in the secondary coil is 6A, the voltage across the secondary coil and the current in the primary coil respectively are

A. 300 V, 15 A

B. 450 V, 15 A

C. 450 V, 13.5 A

D. 600 V, 15 A

Answer: B

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4. Three parallel plate air capacitors are connected in parallel. Each capacitor has plate area $\frac{A}{3}$ and the separation between the plates is d, 2d and 3d respectively. The equivalent capacity of combination is (ε_0 = absolute permittivity of free space)

A. $\frac{\tau\varepsilon_0 A}{18d}$

B. $\frac{11\varepsilon_0 A}{18d}$

C. $\frac{13\varepsilon_0 A}{18d}$

D. $\frac{17\varepsilon_0 A}{18d}$

Answer: B

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5. A planet of mass m is the elliptical orbit about the sun $(m << M_{\text{sun}})$ with an orbital period T. If A be the area of orbit, then its angular momentum would be:

A. $\frac{2mA}{T}$

B. mAT

C. $\frac{mA}{2T}$

D. 2mAT

Answer: A

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6. One mole of an ideal monatomic gas at temperature T_0 expands slowly according to the law $P = kV$ (k is constant). If the final temperature is $4T_0$ then heat supplied to gas is

A. $2RT_0$

B. $\frac{3}{2}RT_0$

C. $6RT_0$

D. $\frac{RT_0}{2}$

Answer: C

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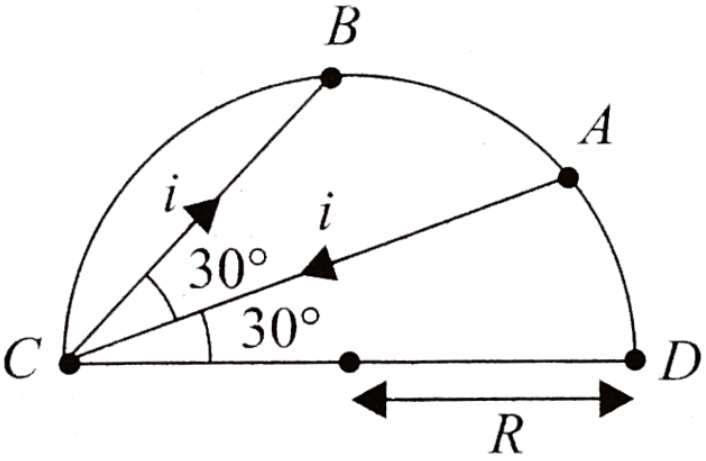
7. A current carrying wire is placed in the grooves of an insulating semicircular disc of radius 'R', as shown in Fig. The current enters at point A and leaves from point B.

Determine the magnetic field at Point D.



A. $\frac{\mu_0 I}{8\pi R\sqrt{3}}$

B. $\frac{\mu_0 I}{4\pi R\sqrt{3}}$

C. $\frac{\sqrt{3}\mu_0 I}{4\pi R}$

D. none of these

Answer: B

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8. A particle is projected at an angle of 60° above the horizontal with a speed of $10m/s$. After some time the direction of its velocity makes an angle of 30° above the horizontal. The speed of the particle at this instant is s

A. $\frac{5}{\sqrt{3}}ms^{-1}$

B. $5\sqrt{3}ms^{-1}$

C. $5ms^{-1}$

D. $\frac{10}{\sqrt{3}}ms^{-1}$

Answer: D

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9. A conveyor belt is moving at a constant speed of $2m/s$. A box is gently dropped on it. The coefficient of friction between them is $\mu = 0.5$. The distance that the box will move relative to belt before coming to rest on it taking $g = 10ms^{-2}$ is:

A. 1.2 m

B. 0.6 m

C. zero

D. 0.4 m

Answer: D

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10. Two radioactive nuclei P and Q in a given sample decay into a stable nucleus R. At time t=0, number of P species are $4N_0$ and that of Q are N_0. Half-life of P (for conversion to R) is 1 min whereas that of Q is 2min. Initially there are no nuclei of R present in the sample. When number of nuclei of P and Q are equal, the number of nuclei of R present in the sample would be -

(A) $2N_0$

(B) $3N_0$

(C) $\frac{9N_0}{2}$

(D) $\frac{5N_0}{2}$

A. $2N_0$

B. $3N_0$

C. $\frac{9N_0}{2}$

D. $\frac{5N_0}{2}$

Answer: C

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11. Find the displacement equation of the simple harmonic motion obtained by conbining the motions.

$x_1 = 2\sin\ \omega t, x_2 = 4\sin\ \left(\omega t + \frac{\pi}{6}\right)$

and $x_3 = 6\sin\left(\omega t + \frac{\pi}{3}\right)$

A. $x = 10.25\sin(\omega t + \phi)$

B. $x = 10.25 \sin(\omega t - \phi)$

C. $x = 11.25 \sin(\omega t + \phi)$

D. $x = 11.25 \sin(\omega t - \phi)$

Answer: C

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12. The compressibility of water is 4×10^{-5} per unit atmospheric pressure. The decrease in volume of 100 cubic centimetre of water under a pressure of 100 atmosphere will be

A. $0.4 cm^3$

B. $4 \times 10^{-5} cm^3$

C. $0.025 cm^3$

D. $0.004 cm^3$

Answer: A

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13. A ray of sunlight enters a spherical water droplet $(n = 4/3)$at an angle of incidence 53° measured with respect to the normal to the surface.It is reflected from the back surface of the droplet and re-enters into air.The angle between the incoming and outgoing ray is [Take $\sin 53^\circ = 0.8$]

A. 15°

B. 34°

C. 138°

D. 30°

Answer: C

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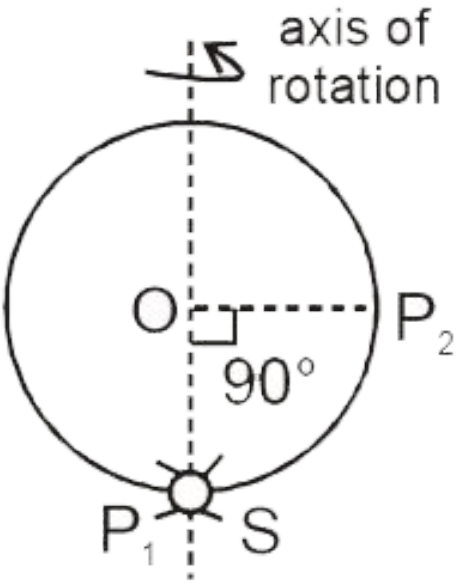
14. A uniform ring is rotating about vertical axis with angular velocity ω initially. A point insect (S) having the same mass as that of the ring starts walking from the lowest point P_1 and finally reaches the point P_2 (as shown in figure). The final angular velocity of the ring

will be equal to



A. $\omega/4$

B. ω

C. $\omega/2$

D. $\omega/3$

Answer: D

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15. The area of the region covered by the TV., broadcast by a T.V. tower of height 100 m is (in m^2)

A. $12.8\pi \times 10^8 km^2$

B. $1.28\pi \times 10^3 km^2$

C. $0.64\pi \times 10^3 km^2$

D. $1.28 \times 10^3 km^2$

Answer: B

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16. An iron rocket fragment initially at $-100^{\circ}C$ enters the earth's atmosphere almost horizontally and quickly fuses completely in atmospheric friction. Specific heat of iron is $0.11kcal/kg^{\circ}C$. Its melting point is $1535^{\circ}C$ and the latent heat of fusion is $30kcals/kg$. The minimum velocity with which the fragmento must have entered the atmosphere is

A. $0.45\ \mathrm{km\ s^{-1}}$

B. $1.32\ \mathrm{km\ s^{-1}}$

C. $2.32\ \mathrm{km\ s^{-1}}$

D. Zero

Answer: B

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17. The dimensional formula for entropy is

A. $[MLT^{-2}K^{-1}]$

B. $[ML^2T^{-2}]$

C. $[ML^2T^{-2}K^{-1}]$

D. $[ML^{-2}T^{-2}K^{-1}]$

Answer: C

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18. White light is used to illuminate the two slits in a Young's double slit experiment. The separation between the slits is b and theh screen is at a distance $d(>>b)$ from the slits At a point on the screen directly in front of one of the slits, certain wavelengths are missing some of these missing wavelengths are

A. $\lambda = \frac{d^2}{D}(n-1)$

B. $\lambda = \frac{d^2}{D(2n-1)}$

C. $\lambda = \frac{d^2}{D}n$

D. $\lambda = \frac{d^2}{Dn}$

Answer: B

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19. Two loudspeakers are being compared. One is preceived to be 32 times louder than the other. The difference in intensity levels between the two, when measured in decibles, is

A. 60

B. 40

C. 50

D. 30

Answer: C

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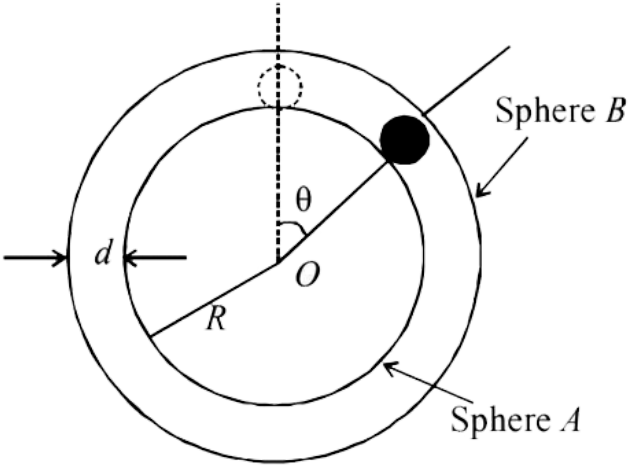
20. A spherical balll of mass m is the highest point in the space between two fixed , concentic sphere A and B the smaller the two sphere A has a radius R and the space between the two spheres has a width d . The bell has a disneter very dightly less then d . All surface are frictionless . The bell is a given a gentle push (owards the right in the figure) The upward vertical is denoted by θ (shown ijn the figure)



(a)Express the total normal reaction force exerted by the

sphore on the as a finction of angle θ

(b) Let N_(A) and $N_B$denote in the magnitubes of the normal reaction force on the bell evered by the sphare A and B repectively Skech the variation of N_A and N_(B)$as functionsof$cos theta $\in theran \geq$ 0 le theta le pi $bydraw \in gtwoseparategraph \in youranswerb\infty ktak \in g$ cos theta `an the horizental axas.

A. $mg(3\cos\theta - 2)$

B. $mg(2\cos\theta - 3)$

C. $3mg(2\cos\theta - 1)$

D. $2mg(3\cos\theta - 1)$

Answer: A

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21. A cart loaded with sand having total mass $m_0 = 1800kg$ moves on a straight horizontal road starting from rest under the action of a force of 120N. The sand spills through a small hole hole in the bottom at a rate of 0.5 kg/sec. What will be the vertically of cart after 20 min?

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22. An aeroplane is flying at a velocity of $900\,\mathrm{km\,h^{-1}}$ loops a vertical circular loop. If the maximum force pressing the pilot against the seat is five times his

weight, what would be the diameter (in m) of the loop?

$[g = 10ms^{-2}]$

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23. The position x of a particle with respect to time t along the x-axis is given by $x = 9t^2 - t^3$ where x is in meter and t in second. What will be the position of this particle when it achieves maximum speed along the positive x direction

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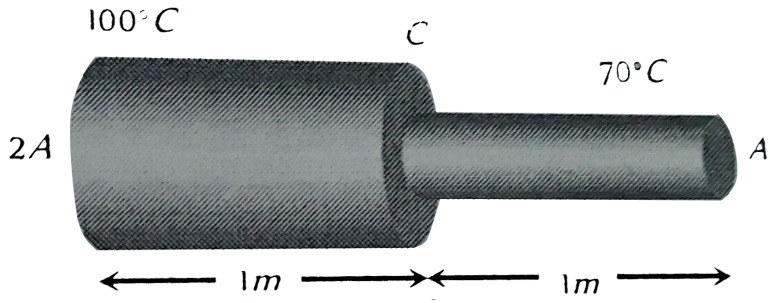
24. A metal rod of length 2 m has cross sectional areas 2 A and A as shown in figure. The ends are maintained at temperatures 100° C and 70° C . The temperature at middle point C is



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25. The number of photons falling per second on a completely darkened plate to produce a force of $6.62 \times 10^{-5} N$ is 'n'. If the wavelength of the light falling

is 5×10^{-7}m, then n= _____ $\times 10^{22}$.

$\left(h = 6.62 \times 10^{-34} J - s\right)$

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