PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 51

Physics

1. A sample consisting of Hydrogen atoms in the ground state is excited by monochromatic radiation of energy 12.75 eV. If we were to

observe the emission spectrum of this sample, then the number of spectral lines observed, will be

A. 3

B. 6

C. 10

D. 15

Answer: B

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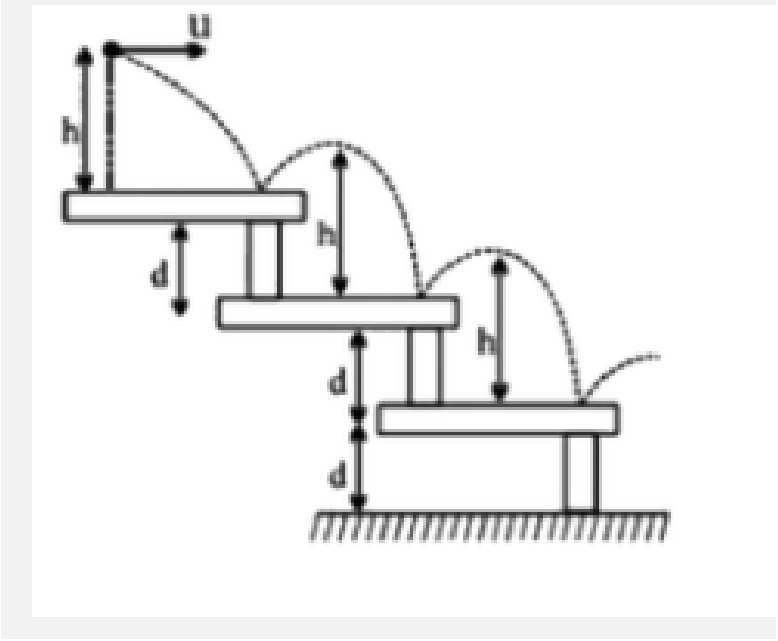
2. A ball is thrown horizontally from a height h above a staircase as shown in the figure. If the coefficient of restitution for any collision between the ball and the staircase is e, then the value of h for which the ball will bounce the same height above each step, is



A. $\frac{d}{1-e^2}$

B. $\frac{d}{1+e^2}$

C. $\frac{de^2}{1+e^2}$

D. $\frac{de^2}{1-e^2}$

Answer: A

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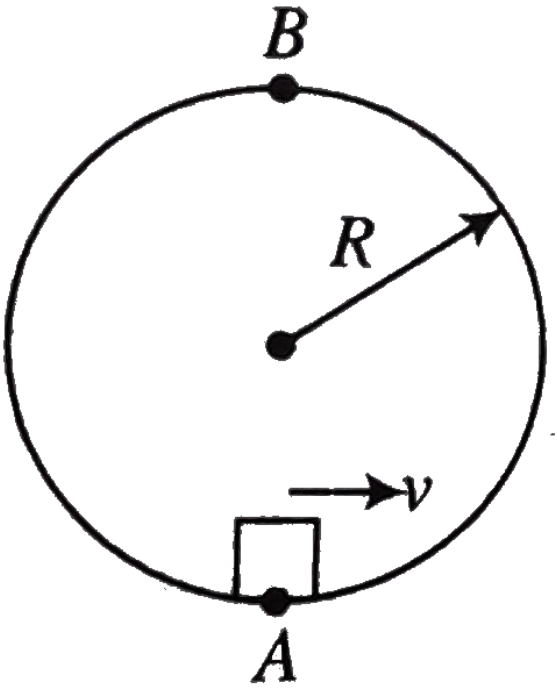
3. A block of mass m is projected on a smooth horizontal circular track with velocity v what is the average normal force exerted by the

circular walls on the block during motion A to B?



A. $\frac{mv^2}{R}$

B. $\frac{mv^2}{\pi R}$

C. $\frac{2mv^2}{R}$

D. $\frac{2mv^2}{\pi R}$

Answer: D

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4. A fully charged capacitor C with initial charge q_0 is connected to a coil of self inductance L at t=0. The time at which the energy is stored equally between the electric and the magnetic fields is

A. $\frac{\pi}{4}\sqrt{LC}$

B. $\frac{2\pi}{4}\sqrt{LC}$

C. $\sqrt{LC}$

D. $\pi\sqrt{LC}$

Answer: A

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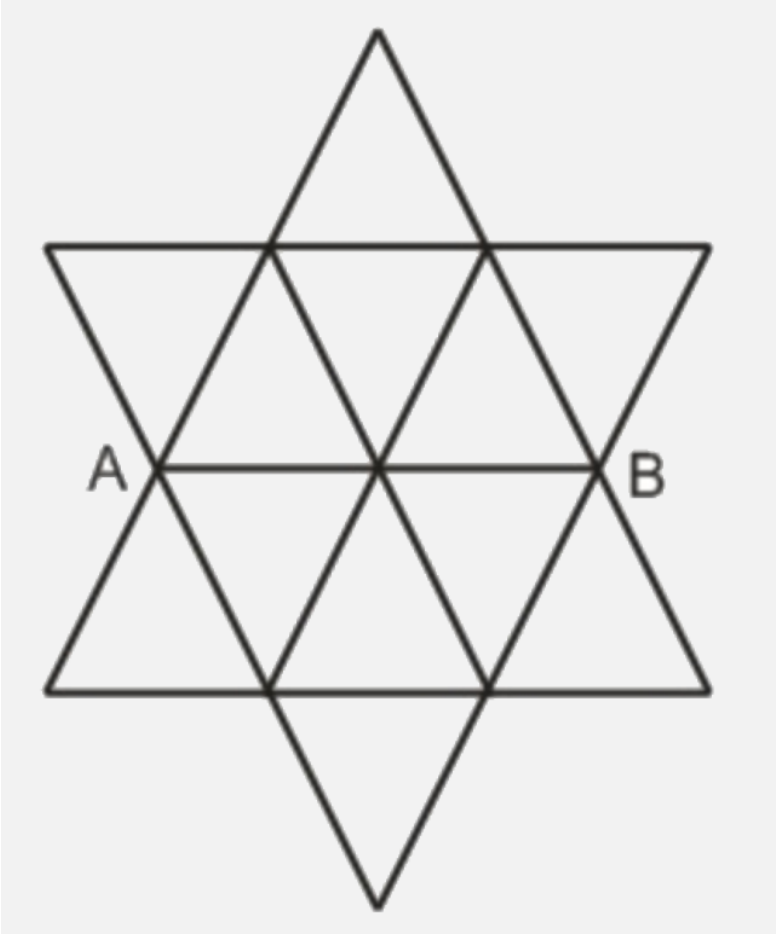
5. If the resistance of each branch of the circuit shown below is 1Ω , then the equivalent resistance of the circuit between the points A

and B is



A. $\frac{16}{24}\Omega$

B. $\frac{22}{35}\Omega$

C. $\frac{12}{30}\Omega$

D. $\frac{30}{12}\Omega$

Answer: B

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6. An electric motor runs a $D.C.$ source of e.m.f. $200V$ and draws a current of $10A$. If the efficiency is $40\,\%$, then resistance of the armature is:

A. 5Ω

B. 12Ω

C. 30Ω

D. 25Ω

Answer: B

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7. If $20J$ of work has to be done to move an electric charge of $4C$ from a point, where

potential is $10V$ to another point, where potential is V volt, find the value of v.

A. 20 V

B. 30 V

C. 5 V

D. 15 V

Answer: D

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8. In an experiment, a boy plots a graph between $(v_{\max})^2$ and $(a_{\max})^2$ for a simple pendulum for different values of (small) amplitudes, where $v_{\max}$ and $a_{\max}$ is the maximum velocity and the maximum acceleration respectively. He found the graph to be a straight line with a negative slope, making an angle of 30° when the experiment was conducted on the earth surface. When the same experiment was conducted at a height h above the surface, the line was at an angle of 60°. The value of h is [radius of the earth = R]

A. 0.5R

B. 0.24R

C. 0.73R

D. R

Answer: C

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9. 60 g of ice at $0^\circ C$ is added to 200 g of water initially at $70^\circ C$ in a calorimeter of unknown water equivalent W. If the final

temperature of the mixture is $40^{\circ}C$, then the value of W is [Take latent heat of fusion of ice $L_f = 80calg^{-1}$ and specific heat capacity of water $s = 1calg^{-1}.^{\circ}C^{-1}$]

A. 70 g

B. 80 g

C. 40 g

D. 20 g

Answer: C

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10. Air is filled at $60^\circ C$ in a vessel of open mouth. The vessel is heated to a temperature T so that $1/4th$ of air escapes. Assuming the volume of vessel remaining constant, the value of T is

A. $80^\circ C$

B. $444^\circ C$

C. $333^\circ C$

D. $171^\circ C$

Answer: D

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11. The capacity of a vessel is $3L$. It contains $6g$ oxygen, $8g$ nitrogen and $5gCO_2$ mixture at $27^\circ C$, If $R = 8.31J/molK$, then the pressure in the vessel in N/m^2 will be (approx.)

A. 5×10^5

B. 5×10^4

C. 1×10^6

D. 1×10^5

Answer: B

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12. A bullet emerges from a barrel of length $1.2m$ with a speed of $640ms^1$. Assuming constant acceleration, after the gun is fired is

A. 4 ms

B. 40 ms

C. $400\mu s$

D. 1 s

Answer: A

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13. When forces F_1 , F_2 , F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually perpendicular, then the particle remains stationary. If the force F_1 is now

removed then the acceleration of the particle is

A. $\frac{F_1}{m}$

B. $\frac{F_2 F_3}{m F_1}$

C. $\frac{(F_2 - F_3)}{m}$

D. $\frac{F_2}{m}$

Answer: A

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14. A candle flame 0.5 cm high is kept between a wall and a concave mirror of focal length 1.5 m such that its image 1.5 cm high is formed on the wall. Find the distance of candle from the wall and also the distance between the wall and the mirror.

A. 4 m, 6 m

B. 6 m, 7 m

C. 6 m, 8 m

D. 9 m, 7 m

Answer: A

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15. A particle executes simple harmonic motion with a period of $16s$. At time $t = 2s$, the particle crosses the mean position while at $t = 4s$, its velocity is $4ms^{-1}$ amplitude of motion in metre is

A. $\sqrt{2\pi}$

B. $16\sqrt{2\pi}$

C. $24\sqrt{2\pi}$

D. $\frac{32\sqrt{2\pi}}{\pi}$

Answer: D

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16. Two spherical soap bubbles of radii a and b in vacuum coalesce under isothermal conditions. The resulting bubble has a radius given by

A. $\frac{(a+b)}{2}$

B. $\frac{ab}{a+b}$

C. $\frac{ab}{a+b}$

D. $a+b$

Answer: C

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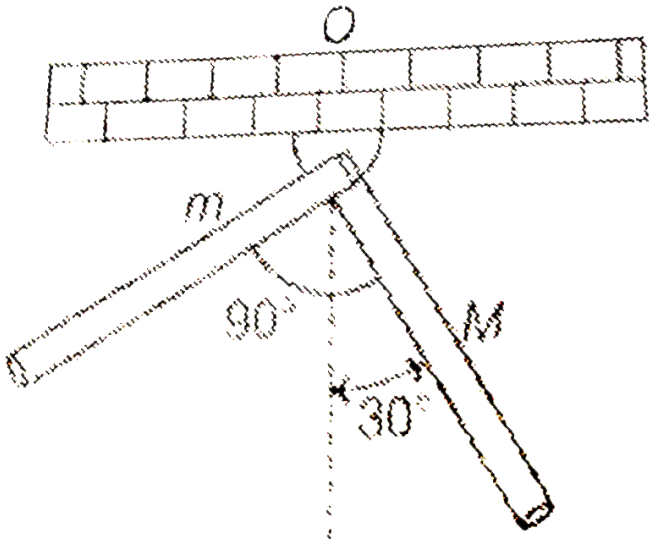
17. Two uniform rods of equal length but different masses are rigidly joined to form an L-shaped body, which is then pivoted as

shwon. If in equilibrium, the body is in the shown configuration, ratio `M//m will be



A. 2

B. 3

C. $\sqrt{2}$

D. $\sqrt{3}$

Answer: D

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18. What is the modulation index of an FM signal having a carrier swing of 100kHz when the modulating signal has a frequency of 8kHz?

A. 6.25

B. 6.23

C. 6.55

D. 6.33

Answer: A

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19. In YDSE, the slits have different widths. As a result, amplitude of waves from slits are A and 2A respectively. If I_0 be the maximum intensity of the intensity of the interference pattern then the intensity of the pattern at a point where the phase difference between waves is

ϕ is given by $\frac{I_0}{P}(5+4\cos\phi)$. Where P is in in integer. Find the value of P ?

A. 9

B. 6

C. 1

D. 3

Answer: A

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20. The transverse displacement $y(x, t)$ of a wave on a string is given by $y(x, t) = e^{-\left(ax^2 + bt^2 + 2\sqrt{(ab)}xt\right)}$. This represents a :

A. Wave moving along + x-axis with a speed $\sqrt{\frac{a}{b}}$

B. Wave moving along x-axis with speed $\sqrt{\frac{b}{a}}$

C. Standing wave of frequency $\sqrt{b}$

D. Standing wave of frequency $\frac{1}{\sqrt{b}}$

Answer: B

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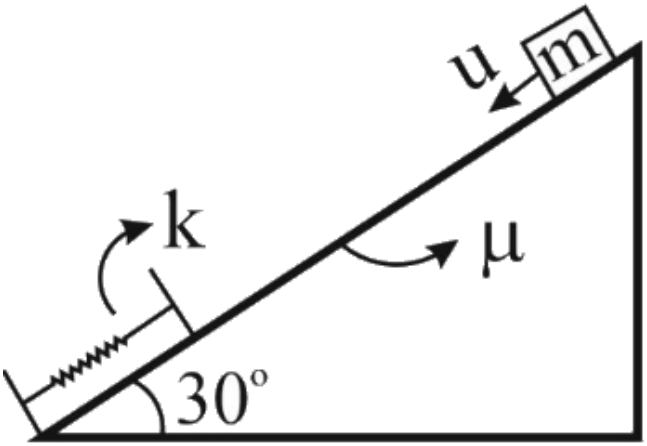
21. A block of mass 1 kg is released from the top of a rough incline having $\mu = \frac{1}{\sqrt{3}}$. The initial speed of the block is $2ms^{-1}$. The inclined plane has unknown length and has a spring of spring constant $k = 1Nm^{-1}$ connected at the base as in the figure. Find the maximum compression of spring. (answer

in meter).



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22. In a sample initially there are equal number of atoms of two radioactive isotopes A and B. 3 days later the number of atoms of A is twice

that of B. Half life of B is 1.5 days. What is half life of isotope A? (in days)

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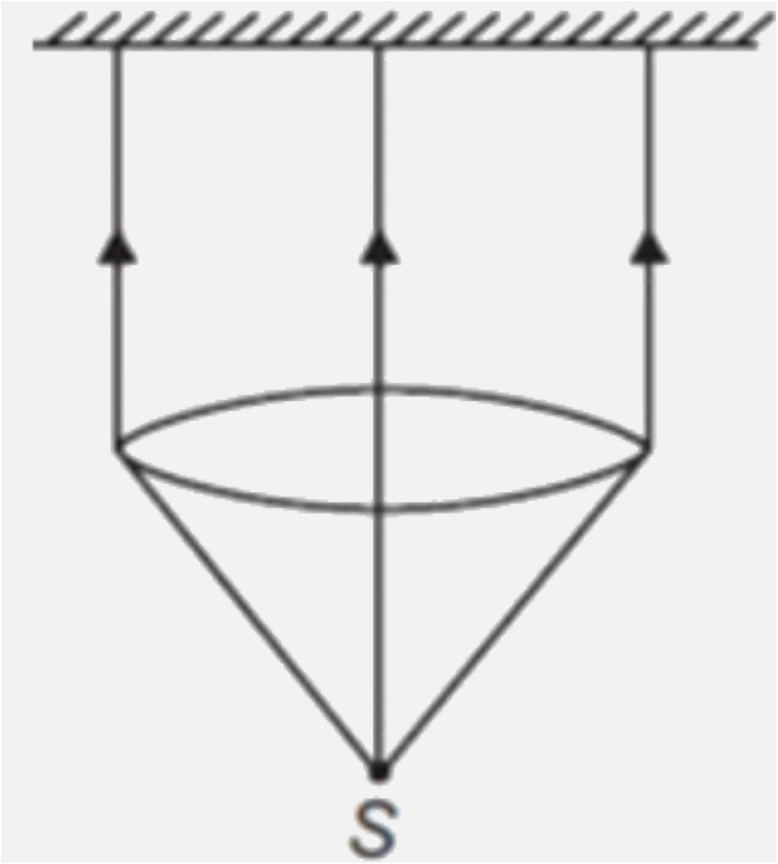
23. A totally reflecting small plane mirror placed horizontally faces a parallel beam of light as shown in the figure. The mass of the mirror is 200 g. Assume that there is no absorption in the lens and that $20\,\%$ of the light emitted by the source goes through the lens. The power of the source needs to

support the weight of the mirror is $P \times 10^8$ watt, where P is [take $g = 10ms^{-2}$]



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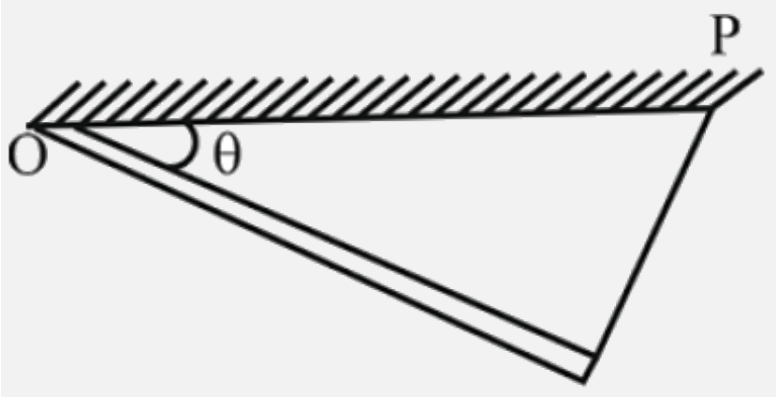
24. A uniform rod of mass m and length L is hinged at one of its end with the ceiling and another end of the rod is attached with a thread which is attached with the horizontal ceiling at point P. If one end of the rod is slightly displaced horizontally and perpendicular to the rod and released. If the time period of small oscillation is $2\pi\sqrt{\frac{2l\sin\theta}{xg}}$

. Find x.



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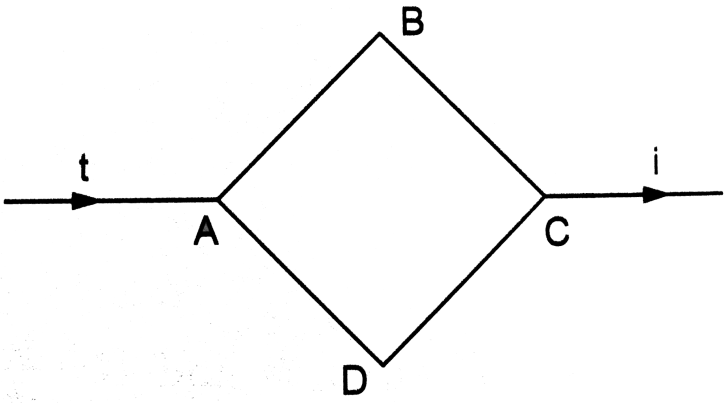
25. Figure shows a square loop ABCD with edge length a. The resistance of the wire ABC is r and that of ADC is $2r$. Find the magnetic field B at the centre of the loop assuming

uniform wires. `



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