PHYSICS

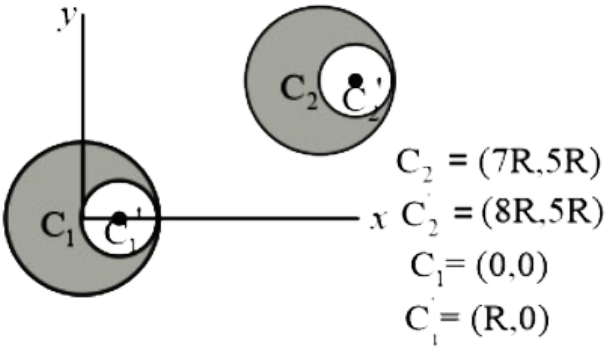
BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 36

Physics

1. A system of two identical, uniform discs with identical circular cavities, is shown in the figure. Different relevant coordinates are given

in the figure. The coordinates of the centre of mass of the system are



A. $\left(\frac{3R}{2}, \frac{5R}{4}\right)$

B. $\left(\frac{19R}{6}, \frac{5R}{2}\right)$

C. $\left(\frac{R}{6}, \frac{R}{4}\right)$

D. $\left(\frac{20R}{6}, \frac{5R}{2}\right)$

Answer: B

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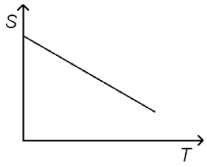
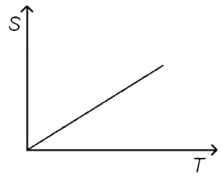
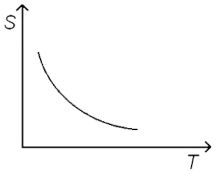
2. The correct graph which shows the variation of paramagnetic susceptibility S with temperature T is

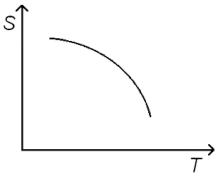
A. 

B. 

C.



D.



Answer: C

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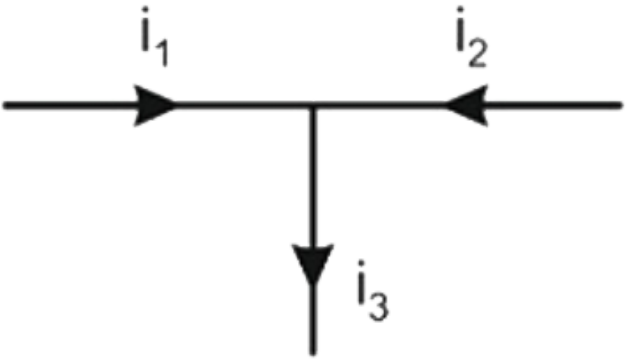
3. In the given figure, if $i_1 = 3\sin\omega t$ and $i_2 = 4\cos t$, then i_3 is



A. $5\sin(\omega t + 53^\circ)$

B. $5\sin(\omega t + 37^\circ)$

C. $5\sin(\omega t + 45^\circ)$

D. $5\cos(\omega t + 53^\circ)$

Answer: A

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4. In a uniform magneitc field of induced B a wire in the form of a semicircle of radius r rotates about the diameter of hte circle with an angular frequency ω. The axis of rotation is perpendicular to hte field. If the total resistance of hte circuit is R, the mean power generated per period of rotation is

A. $\frac{B\pi r^2\omega}{2R}$

B. $\frac{\left(B\pi^2\omega\right)^2}{8R}$

C. $\frac{\left(B\pi\omega\right)^2}{2R}$

D. $\frac{(B\pi r\omega)^2}{8R}$

Answer: B

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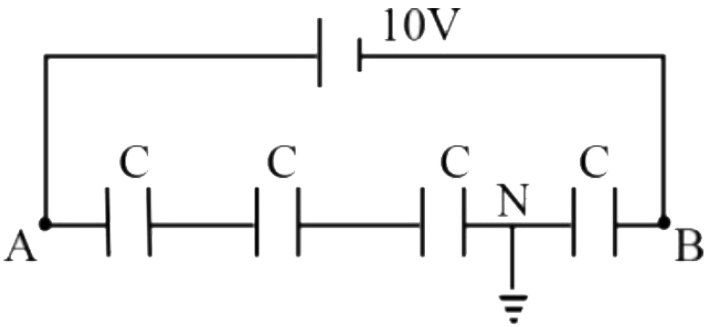
5. The potnetial at point A, in the circuit, is (Point N is grounded, i.e. the potential of that point is zero.)



A. 10 V

B. 7.5 V

C. 5 V

D. 2.5 V

Answer: B

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6. A satellite of mass m orbits around the Earth of mas M in an elliptical orbit of semi - major and semi - minor axes 2a and a

respectively. The angular momentum of the satellite about the centre of the Earth is

A. $\pi m\sqrt{\frac{GMa}{4}}$

B. $\pi m\sqrt{\frac{GMa}{4}}$

C. $m\sqrt{\frac{GMa}{8}}$

D. $m\sqrt{\frac{GMa}{2}}$

Answer: D

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7. The amount of heat energy required to freeze 4.5 g of water of $6^{\circ}C$ to ice at $0^{\circ}C$ is $\left[S = 41900 Jkg^{-1}K^{-1}, L = 3.33 \times 10^{5} Jkg^{-1}\right]$

A. 1612 J

B. 1512 J

C. 1132 J

D. 1499 J

Answer: A

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8. An ideal gas $(\gamma = 1.5)$ undergoes a thermodynamic process in which the temperature and pressure of the gas are related as $T^{-1}P^{2}$= constant. The molar heat capacity of the gas during the process is

A. $\frac{3}{2}R$

B. $\frac{4}{3}R$

C. $\frac{5}{2}R$

D. $3R$

Answer: C

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9. One of the two identical conducting wires of length L is bent in the form of a circular loop and the other one into a circular coil of N identical turns. If the same current passed in both, the ratio of the magnetic field at the central of the loop (B_L) to that at the central of the coil (B_C), i.e. $\frac{B_L}{B_C}$ will be :

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

B. $\frac{1}{N}$

C. N

D. N^2

Answer: A

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10. Half-life of radioactive sample, when activity of material initially was 8 counts and after 3 hours it becomes 1 count is

A. 2 h

B. 1 h

C. 3 h

D. 4 h

Answer: B

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11. The time period of a spring - mass system is T. If this spring is cut into two parts, whose lengths are in the ratio $1:2$, and the same

mass is attached to the longer part, the new time period will be

A. $\sqrt{\frac{1}{3}}T$

B. $\sqrt{\frac{2}{3}}T$

C. $\frac{\sqrt{3}T}{2}$

D. $\sqrt{3}T$

Answer: B

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12. Two soap bubble are combined isothermally to form a big bubble of radius R. If ΔV is change in volume, ΔS is change in surface area and P_0 is atmospheric pressure then show that $3P_0(\Delta V) + 4T(\Delta S) = 0$

A. $4pV + 3SA = 0$

B. $3pV - 4SA = 0$

C. $4pV - 3SA = 0$

D. $3pV + 4SA = 0$

Answer: D

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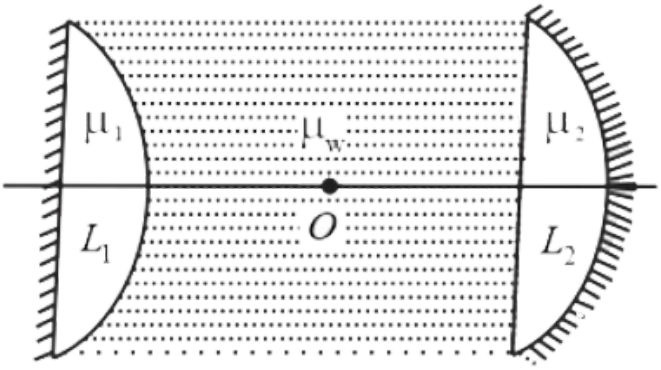
13. A cylindrical tube filled with water $\left(\mu_w = \frac{4}{3}\right)$ is closed at its both ends by two thin, silvered plano - convex lenses, as shown in the figure. Refractive index of lenses L_1 and L_2 and 2.0 and 1.5, while their radii of curvatures are 5 cm and 9 cm, respectively. A point O on the axis of the cylindrical tube. If it is found that all the images formed by multiple refractions and reflections coincide with the object, then the distance with the

object, then the distance between both the lenses is



A. 8 cm

B. 18 cm

C. 10 cm

D. 14 cm

Answer: B

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14. A transistor connected in common emitter configuration has input resistance $R_{\text{in}} = 2K\Omega$ and load resistance of $5K\Omega$. If $\beta = 60$ and an input signal 12 mV is applied , calculate the resistance gain, voltage gain and power gain.

A. 9000

B. 4000

C. 6000

D. 8000

Answer: A

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15. A clock which keeps correct time at $20^\circ C$ is subjected to $40^\circ C$. If coefficient of linear expansion of the pendulum is

$12 \times 10^{-6} / {}^{\circ}C$. How much will it gain or loss in time ?

A. 10.3 s day^{-1}

B. 20.6 s day^{-1}

C. 5 s day^{-1}

D. 20 min day^{-1}

Answer: A

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16. The density of a cube is measured by measuring its mass and length of its sides. If the maximum error in the measurement of mass and length are 4% and 3% respectively, the maximum error in the measurement of density will be

A. $1\,\%$

B. $7\,\%$

C. $5\,\%$

D. $13\,\%$

Answer: D

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17. In a Young's double slit experiment, the slit separation is $1mm$ and the screen is $1m$ from the slit. For a monochromatic light of wavelength $500nm$, the distance of 3rd minima from the central maxima is

A. 0.50 mm

B. 1.25 mm

C. 1.50 mm

D. 1.75 mm

Answer: B

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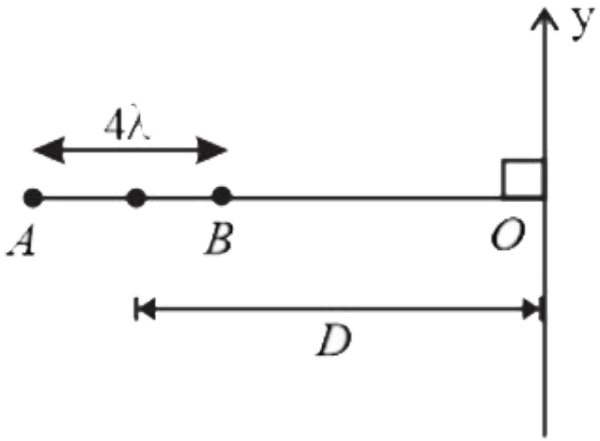
18. Two coherent sound sources A and B produce a sound of wavelength λ. If at $t = 0$ a detector starts moving with constant velocity v_0 from point O along y - direction, then the minimum time, after which it detects

the sound of maximum intensity, is

$(D > > \lambda)$



A. $\frac{\sqrt{7}D}{v_0}$

B. $\frac{D}{3v_0}$

C. $\frac{D}{v_0}$

D. $\frac{\sqrt{7}D}{3v_0}$

Answer: D

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19. Two particles of same mass m moving with velocities u_1 and u_2 collide perfectly inelastically. The loss of energy would be :

A. $\frac{1}{2}M(v_1 - v_2)$

B. $\frac{1}{2}M\left(v_1^2 - v_2^2\right)$

C. $\frac{1}{4}M(v_1 - v_2)^2$

D. $2M\left(v_1^2 - v_2^2\right)$

Answer: C

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20. A car is travelling at a velocity $10\,\mathrm{km\,h^{-1}}$ on a straight road. The driver of the car throws a parcel with a velocity $10\sqrt{2}kmh^{-1}$ with respect to the car, when the car is passing by a man standing on the side of the road. If the parcel is to reach the man, the direction of throw makes the following angle with the direction of motion of the car

A. 135°

B. 45°

C. $\tan^{-1}\sqrt{2}$

D. $\tan^{-1}\left(\frac{1}{\sqrt{2}}\right)$

Answer: A

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21. The potential different across the Coolidge tube is $20kV$ and $10mA$ current flows

through the voltage supply. Only $0.5\,\%$ of the energy carried by the electrons striking the largest is converted into X-ray. The power carried by the X-ray beam is p. Then

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22. An athlete, initially at rest, takes 2 s to reach his maximum speed of $36\,\mathrm{km\,h^{-1}}$. The magnitude of his average accleration (inms^{-2}) is

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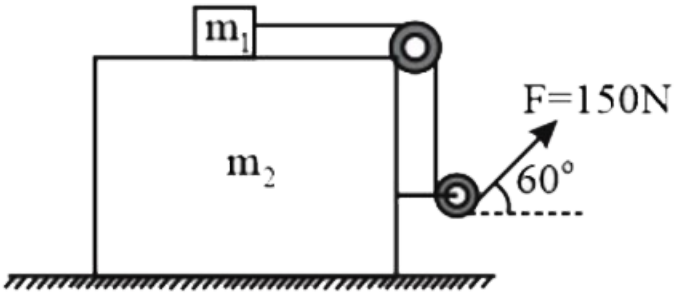
23. In the arrangement shown in the figure, friction exists only between the two blocks, A and B. The coefficient of static friction $\mu_s = 0.6$ and coefficient of kinetic friction $\mu_k = 0.4$, the masses of the blocks A and B are $m_1 = 20kg$ and $m_2 = 30kg$, respectively. Find the acceleration (in ms^{-2}) of m_1, if a force $F = 150N$ is applied, as shown in the figure.

[Assume that string and pulleys are massless]



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24. A metal surface having a work function $\phi = 2.2 \times 10^{-19} J$, is illuminated by the light of wavelengh 1320Å. What is the maximum kinetic energy (in eV) of the emitted photoelectron ? [Take $h = 6.6 \times 10^{-34} Js$]

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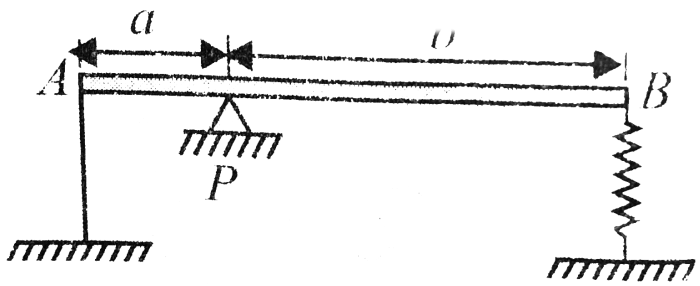
25. A uniform rod AB of mass $m = 2kg$ and length $l = 1.0m$ is placed on a sharp support P such that $a = 0.4m$ and $b = 0.6m$. A. spring of force constant $k = 600N/m$ is attached to end B as shown in Fig. To keep the rod horizontal, its end A is tied with a thread such that the spring is B elongated by $1CM$. Calculate reaction of support P when

the thread is burnt.



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