PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 90

Physics

1. One end of thermally insulated rod is kept at a temperature T_1 and the other at T_2. The rod is composed of two section of length l_1 and l_2

thermal conductivities k_1 and k_2 respectively. The temerature at the interface of two section is

A. $\frac{(k_1 l_1 T_1 + K_2 l_2 T_2)}{(K_1 l_1 + K_2 l_2)}$

B. $\frac{(K_2 l_2 T_1 + K_1 l_1 T_2)}{(K_1 l_1 + K_2 l_2)}$

C. $\frac{(K_2 l_1 T_1 + K_1 l_2 T_2)}{(K_2 l_2 + K_1 l_2)}$

D. $\frac{(K_1 l_2 T_1 + K_2 l_2 T_2)}{(K_1 l_2 + K_2 l_1)}$

Answer: D

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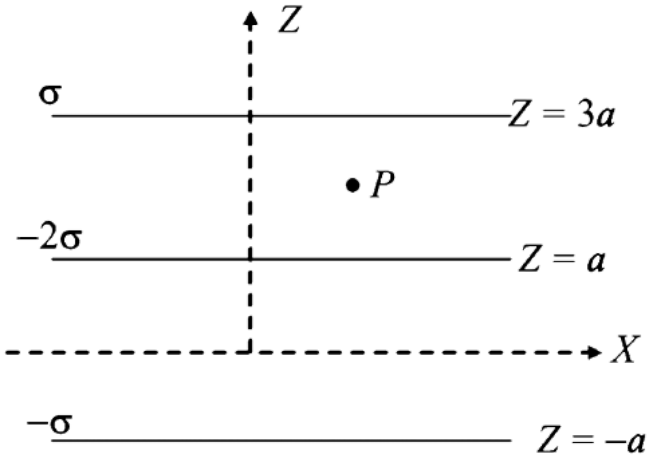
2. Three infinitely long charge sheets are placed as shown in figure. The electric field at point P is



A. $\frac{2\sigma}{\varepsilon_0}\hat{k}$

B. $-\frac{2\sigma}{\varepsilon_0}\hat{k}$

C. $\frac{4\sigma}{\varepsilon_0}\hat{k}$

D. $-\frac{4\sigma}{\varepsilon_0}\hat{k}$

Answer: B

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3. If lambda is the wavelength of hydrogen atom from the transition $n = 3 \rightarrow n = 1$,then what is the wavelength for doubly ionised lithium ion for same transition?

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

B. 3λ

C. $\frac{\lambda}{9}$

D. 9λ

Answer: C

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4. A radioactive sample S_1 having the activity A_1 has twice the number of nucleic as another sample S_2 of activity A_2. If $A_2 = 2A_1$, then the ratio of half-life of S_1 to the half-life of S_2 is

A. 4

B. 2

C. 0.25

D. 0.75

Answer: A

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5. The sun subtends an angle half a degree at the pole of a concave mirror which has a radius of curvature of 15 m. Then the size

(diameter) of the image of sun formed by the convace mirror is

A. 8.55 cm

B. 7.55 cm

C. 6.55 cm

D. 5.55 cm

Answer: C

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6. Calculate the rate of flow of glycerin of density $1.25 \times 10^3 kgm^{-3}$ through the conical section of a pipe, if the radii of its ends are 0.1 m and 0.04 m and the pressure drop across its length is $10Nm^{-2}$.

A. $6.4 \times 10^{-2} m^2 s^{-1}$

B. $6.4 \times 10^{-4} m^3 s^{-1}$

C. $12.8 \times 10^{-2} m^3 s^{-1}$

D. $12.8 \times 10^3 m^3 s^{-1}$

Answer: B

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7. When radiation is incident on a photoelectron emitter, the stopping potential is found to be 9V. If e/m for the electron is $1.8 \times 10^{11} C/kg$, the maximum velocity of the ejected electron is

A. $6 \times 10^5 ms^{-1}$

B. $8 \times 10^5 ms^{-1}$

C. $1.8 \times 10^6 ms^{-1}$

D. $1.8 \times 10^5 ms^{-1}$

Answer: C

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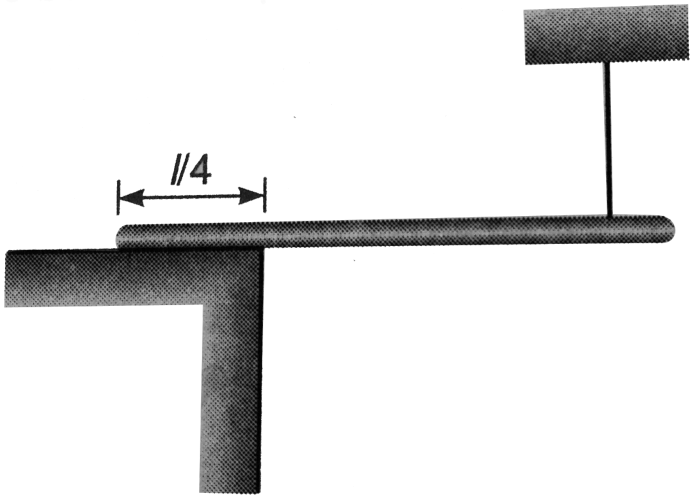
8.



One-fourth length of a uniform rod of mass m

and length l is placed on a rough horizontal surface and it is held stationary in horizontal position by means of a light thread as shown in the figure. The thread is then burnt and the rod start rotating about the edge. Find the angle between the rod and the horizontal when it is about to slide on the edge. The coefficient of friction between the rod and surface is μ.

A. 13

B. 11

C. 9

D. 7

Answer: A

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9. The potential energy of a particle varies with distance x from a fixed origin as $U = \frac{A\sqrt{x}}{x^2 + B}$, where A and B are dimensional constants, then find the dimensional formula for AB.

A. $\left[ML^{\frac{5}{2}}T^{-2}\right]$

B. $\left[M^1L^2T^{-2}\right]$

C. $\left[M^{\frac{3}{2}}L^{\frac{5}{2}}T^{-2}\right]$

D. $\left[M^1L^{\frac{7}{2}}T^{-2}\right]$

Answer: D

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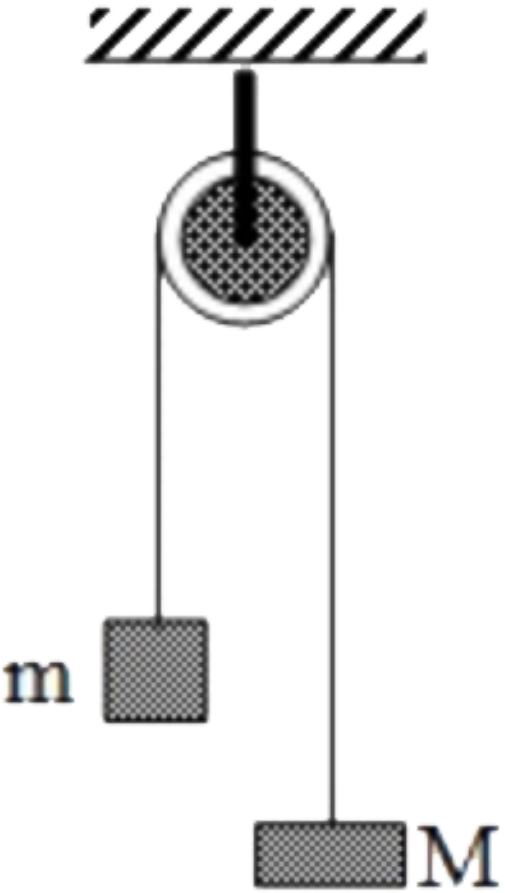
10. Two masses m and $M(>m)$ are joined by a light string passing over a smooth light pulley. The centre of mass of the system moves

with an acceleration



A. $g\left(\frac{M-m}{M+m}\right)$ downward

B. $g\left(\frac{M-m}{M+m}\right)^2$ downward

C. $g\left(\frac{M-m}{M+m}\right)^2$ upward if $M < m$

D. zero

Answer: B

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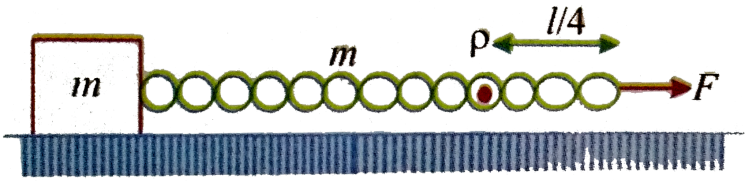
11. A block of mass m is pulled by a uniform chain of mass m tied to it by applying a force F at the other end of the chain.The tension at a point P which is at a distance of quarter of

the length of the chain from the free end,will be



A. $\frac{3F}{4}$

B. $\frac{7F}{8m}$

C. $\frac{6F}{7}$

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

Answer: B

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12. A ferromagnetic material is heated above its curie temperature. Which one is a correct statement?

A. Ferromagnetic domains are perfectly arranged

B. Ferromagnetic domains become random

C. Ferromagnetic domains are not influenced

D. Ferromagnetic material changes into diamagnetic material

Answer: B

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13. Sensitivity of moving coil galvanometer is 's'. If a shunt of $\left(\frac{1}{8}\right)^{th}$ of the resistance of galvanometer is connected to moving coil galvanometer, its sensitivity becomes

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

B. $\frac{s}{6}$

C. $\frac{s}{9}$

D. $\frac{s}{12}$

Answer: C

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14. A ceiling fan rotates about its own axis with some angular velocity. When the fan is switched off, the angular velocity becomes

$\left(\frac{1}{4}\right)$th of the original in time 't' and 'n' revolutions are made in that time. The number of revolutions made by the fan during the time interval between switch of and rest are (Angular retardation is uniform)

A. $\frac{4n}{15}$

B. $\frac{8n}{15}$

C. $\frac{16n}{15}$

D. $\frac{32n}{15}$

Answer: C

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15. A ball is thrown from the ground to clear a wall 3 m high at a distance of 6 m and falls 18 m away from the wall the angle of projection of ball is :-

A. $\tan^{-1}\left(\frac{3}{2}\right)$

B. $\tan^{-1}\left(\frac{2}{3}\right)$

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

D. $\tan^{-1}\left(\frac{3}{4}\right)$

Answer: B

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16. The potential energy of a 1kg particle free to move along the x-axis is given by $V(x) = \left(\frac{x^4}{4} - \frac{x^2}{2}\right)J$ The total mechanical energy of the particle is 2J then the maximum speed (in m/s) is

A. $\frac{4}{\sqrt{2}}$

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

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

D. 2

Answer: C

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17. When a wave travels in a medium, the particle displacement is given by the equation $y = a\sin 2\pi(bt - cx)$, where a, b and c are constants. The maximum particle velocity will be twice the wave velocity. If

A. $ac = \frac{1}{\pi}$

B. $ac = \pi$

C. $b = ac$

D. $b = \frac{1}{ac}$

Answer: A

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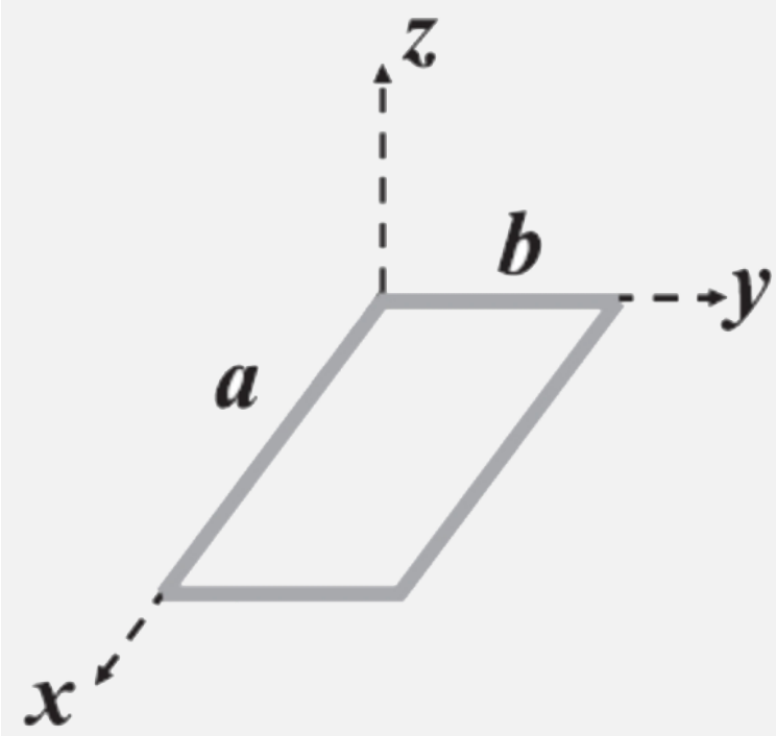
18. A rectangular wire loop with length a and width b lies in the xy-plane as shown. Within the loop, there is a time dependent magnetic

field given by $\overrightarrow{B} = c\left[(x\cos\omega t)\hat{i} + (y\sin\omega t)\hat{k}\right]$. Here , c and ω are constants. The magnitude of emf induced in the loop as function of time is



A. $\left|\frac{ab^2c}{2}\omega\cos\omega t\right|$

B. $\left|ab^2c\omega\cos\omega t\right|$

C. $\left|\frac{a^2bc}{2}\omega\sin om \geq at\right|$

D. None of the options

Answer: A

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19. Two points mass m and $2m$ are kept at a distance a. Find the speed of particles and their relative velocity of approach when separation becomes $a/2$.

A. $2\sqrt{\frac{3a}{2Gm}}$

B. $\sqrt{\frac{a}{2Gm}}$

C. $2\sqrt{\frac{2Gm}{3a}}$

D. $\sqrt{\frac{6Gm}{a}}$

Answer: D

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20. In a common base transistor circuit, the current gain is 0.98. On changing the emitter

current by 5.00 mA, the change in collector current is

A. 0.196 mA

B. 2.45 mA

C. 4.9 mA

D. 5.1 mA

Answer: C

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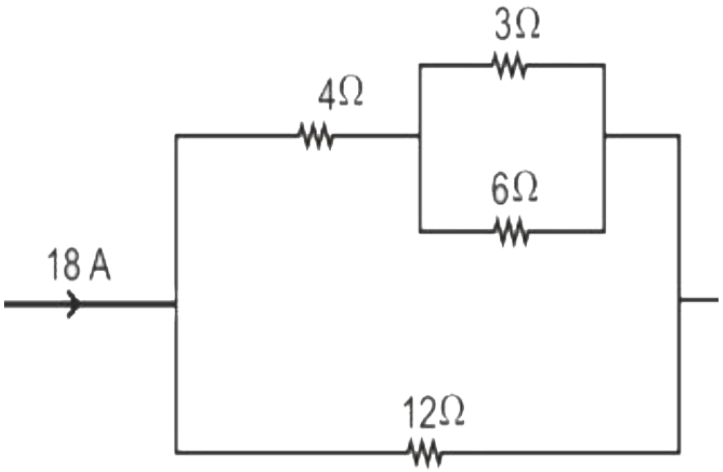
21. In the electrical network shown in the figure, What will be the potential difference (in volt) across 3Ω resistance ?



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22. Internal energy of n_1 mol of hydrogen of temperature T is equal to the internal energy of n_2 mol of helium at temperature $2T$. The ratio n_1 / n_2 is

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23. What is the amount of heat required (in calories) to convert 10 g of ice at $-10^{\circ} C$ into steam at $100^{\circ} C$? Given that latent heat of vaporization of water is $540 \, \text{cal g}^{-1}$, latent

heat of fusion of ice is $80\,\text{cal g}^{-1}$, the specific heat capacity of water and ice are $1\,\text{cal g}^{-1}.^{\circ}C^{-1}$ and $0.5\,\text{cal g}^{-1}.^{\circ}C^{-1}$ respectively.

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24. A thin film of soap solution $(\mu_s = 1.4)$ lies on the top of a glass plate $(\mu_g = 1.5)$. When visible light is incident almost normal to the plate, two adjacent reflection maxima are

observed at two wavelengths 420 and 630 nm. The minimum thickness of the soap solution is

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25. A police car moving at $30\,\mathrm{m\,s^{-1}}$, chases a motorcyclist. The policeman sounds his horn at 180 Hz, while both of them move towards a stationary siren of frequency 160 HZ. He does not observe any beats then, calculate the speed $\left(\mathrm{in\,m\,s^{-1}}\right)$ of the motorcyclist round

off two decimal places? [speed of sound $= 330 m s^{-1}$]

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