PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 83

Physics

1. A 100 W sodium lamp radiates energy uniformly in all directions. The lamp is located at the centre of a large sphere that absorbs all

the sodium light which is incident on it. The wavelength of the sodium light is 589 nm. What is the energy per photon associated with the sodium light ?

A. 2.11

B. 1.22

C. 0.5

D. 3.21

Answer: A

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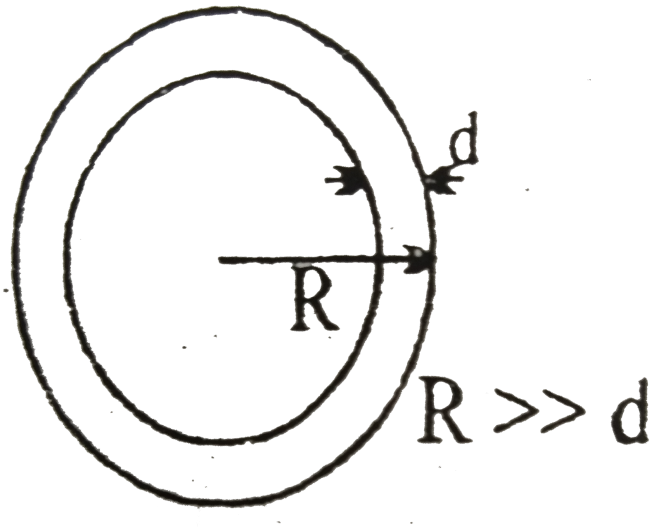
2. A soap bubble has radius R and thickness $d(<<R)$ as shown. It colapses into a spherical drop. The ratio of excess pressure in the drop to the excess pressure inside the bubble is



A. $\left(\frac{R}{3d}\right)^{\frac{1}{3}}$

B. $\left(\frac{R}{6d}\right)^{\frac{1}{3}}$

C. $\left(\frac{R}{24d}\right)^{\frac{1}{3}}$

D. None of these

Answer: C

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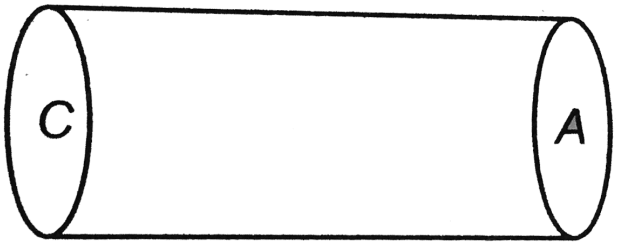
3. A hollow cylinder has a charge qC within it.

If ϕ is the electric flux in unit of voltmeter

associated with the curved surface B the flux linked with the plance surface A in unit of voltmeter will be



A. $\frac{1}{2}\left(\frac{q}{\varepsilon_0}-\phi\right)$

B. $\frac{q}{2\varepsilon_0}$

C. $\frac{\phi}{3}$

D. $\frac{q}{\varepsilon_0}-\phi$

Answer: A

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4. Every atom makes one free electron in copper. If 1.1 ampere current is flowing in the wire of copper having 1 mm diameter, then the drift velocity (approx.) will be (Density of copper $= 9 \times 10^3 kgm^{-3}$ and atomic weight = 63)

A. $0.1\ \text{mm s}^{-1}$

B. $0.2\ \text{mm s}^{-1}$

C. $0.3\ \text{mm s}^{-1}$

D. $0.2\ \mathrm{mm\ s^{-1}}$

Answer: A

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5. Two balls of masses 2 g and 6 g are moving with kinetic energy in the ratio of $3:1$. What is the ratio of their linear momentum ?

A. $1:1$

B. $2:1$

C. $1:2$

D. None of these

Answer: A

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6. A cylinder of radius R made of a material of thermal conductivity K_1 is surrounded by a cylindrical shell of inner radius R and outer radius 2R made of a material of thermal conductivity K_2. The two ends of the

combined system are maintained at two different temperatures. There is no loss of heat across the cylindrical surface and the system is in steady state. The effective thermal conductivity of the system is

(a) $K_1 + K_2$ (b) $K_1 K_2 / (K_1 + K_2)$

(c)$(K_1 + 3K_2) / 4$

(d) $(3K_1 + K_2) / 4$.

A. $\frac{K_1 K_2}{K_1 + K_2}$

B. $K_1 + K_2$

C. $\frac{K_1 + 3K_2}{4}$

D. $\frac{3K_1 + K_2}{4}$

Answer: C

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7. The density of a substance at $0^\circ C$ is $10g/cc$ and at $100^\circ C$, its density is $9.7g/cc$. The coefficient of linear expansion of the substance is

A. $10^{-4}.^\circ C^{-1}$

B. $10^{-2}.^{\circ} C^{-1}$

C. $10^{-3}.^{\circ} C^{-1}$

D. $10^{2}.^{\circ} C^{-1}$

Answer: A

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8. In a resonance column first and second resonance

are obtained at depths 22.7 cm and 70.2 cm.

The

third resonance will be obtained at a depth of

A. 117.7 cm

B. 92.9 cm

C. 115.5 cm

D. 113.5 cm

Answer: A

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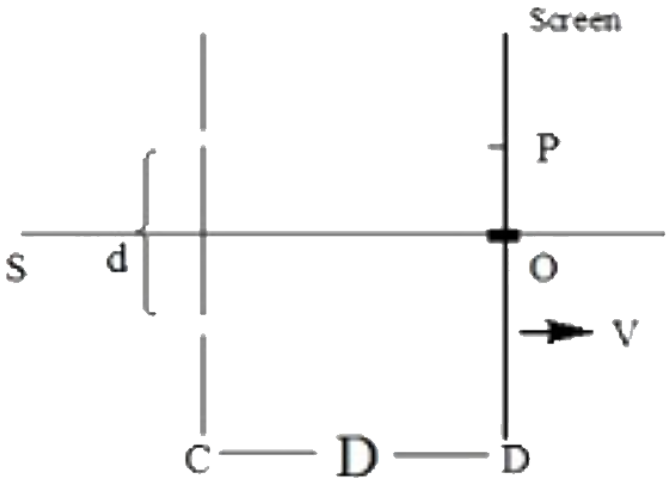
9. In YDSE and apparatus as shown in figure wavelength of light used in λ. The screen is moved away from the source with a constant speed V. Initial distance between screen and plane of slits was D. Suppose P is the point where 5^{th} order maxima was lying at t = 0, then after how much time third - order

maxima will lie at this point P on that screen?



A. $\frac{2D}{V}$

B. $\frac{2D}{3V}$

C. $\frac{3D}{2V}$

D. $\frac{3D}{V}$

Answer: B

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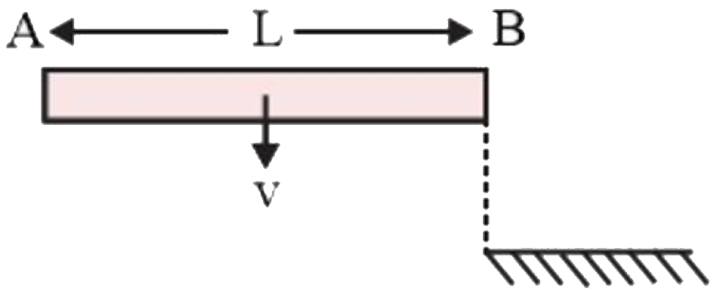
10. A rod AB of length L and mass M is free to move on a frictionless horizontal surface. It is moving with a velocity v, as shown in figure. End B of rod AB strikes the end of the wall. Assuming elastic impact, the angular velocity of the rod AB, just after impact, is



A. $\frac{v}{2L}$

B. $\frac{3v}{L}$

C. $\frac{3v}{2L}$

D. $\frac{v}{L}$

Answer: B

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11. A body starts from rest and is uniformly accelerated for 30 s. The distance travelled in

the first 10 s is x_1, next 10 s is x_2 and the last 10 s is x_3. Then $x_1 : x_2 : x_3$ is the same as :-

A. $1:2:3$

B. $1:2:5$

C. $1:3:5$

D. $1:3:9$

Answer: C

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12. In a transformer the number of primary turns is four times that of the secondary turns. Its primary is connected to an AC source of voltage V. Then

A. current through its secondary is about four times that of the current through its primary.

B. voltage across its secondary is about four times that of the voltage across its primary.

C. voltage across its secondary is about two times that of the voltage across the primary.

D. voltage across its secondary is about $\frac{1}{2\sqrt{2}}$ times of the voltage across its primary.

Answer: A

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13. If the earth be one-half of its present distance from the sun, how many days will be in one year ?

A. 183

B. 730

C. 129

D. 365

Answer: C

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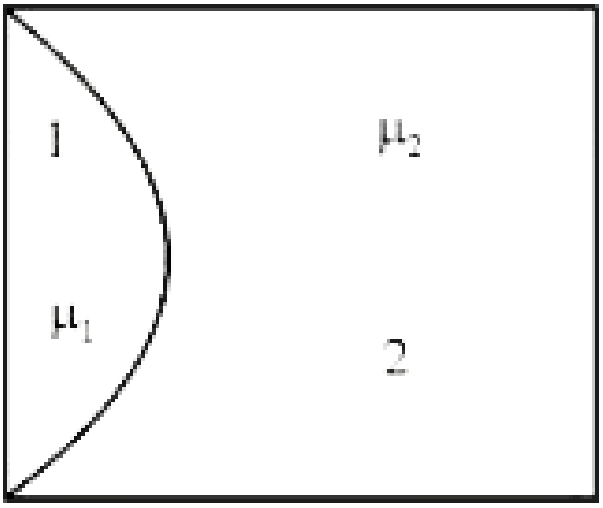
14. One plano -convex and one plano-concave lens of same radius of curvature R but of different materials are joined side by side as shown in the figure. If the refractive index of the meterial of 1 is μ_1 and that of 2 is μ_2, then the focal length of the combination is:



A. $\frac{R}{2-(\mu_1-\mu_2)}$

B. $\frac{R}{2(\mu_1-\mu_2)}$

C. $\frac{2R}{\mu_1-\mu_2}$

D. $\frac{R}{\mu_1-\mu_2}$

Answer: D

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15. Which two of the following five physical parameters have the same dimension?

(1) Energy density

(2) refractive index

(3) dielectric constant

(4) Young's modulus

(5) magnitic field

A. (B) and (D)

B. (C) and (E)

C. (A) and (D)

D. (A) and (E)

Answer: C

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16. A ball whose kinetic energy is E , is projected at an angle of $45(\circ)$ to the horizontal . The kinetic energy of the ball at the highest point of its flight will be

A. E

B. $\frac{E}{2}$

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

D. 0

Answer: B

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17. A potential difference of 20 kV is applied across an X-ray tube. The minimum wavelength of X-rays generated (in angstrom) is :-

A. 0.84Å

B. 0.31Å

C. 0.62Å

D. 0.96Å

Answer: C

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18. Define the activity of a radio nuclide. Write its S.I. unit. Give a plot of the activity of a radioactive species versus time.

How long will a radioactive isotope, whose half life is T years, take for its activity to reduce to $1/8$th of its initial value ?

A. T

B. $T/2$

C. $T/3$

D. 3T

Answer: D

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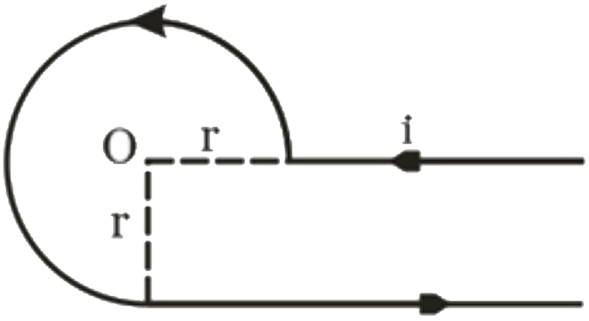
19. Find the magnetic induction at point O, if the current carrying wire is in the shape

shown in the figure.



A. $\frac{\mu_0 l}{5\pi r}\left[\frac{3\pi}{2}+1\right]\odot$

B. $\frac{\mu_0 l}{3\pi r}\left[\frac{3\pi}{4}+1\right]\odot$

C. $\frac{\mu_0 l}{2\pi r}\left[\frac{3\pi}{4}+1\right]\odot$

D. $\frac{\mu_0 l}{4\pi r}\left[\frac{3\pi}{2}+1\right]\odot$

Answer: D

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20. The frequency of a sonometer wire is f . When the weight producting the tensions are completely. Immersed in water the frequency becomes $f/2$ and on immersing the weight in acertain liquid the fequency becomes $f/3$. The specific gravity of the liquid is

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

B. $\frac{16}{9}$

C. $\frac{15}{12}$

D. $\frac{32}{27}$

Answer: D

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21. A ring of mass $(2\pi)kg$ and of radius $0.25m$ is making $300rpm$ about an axis through its perpendicular to its plane. The tension in newton developed in ring is approximately

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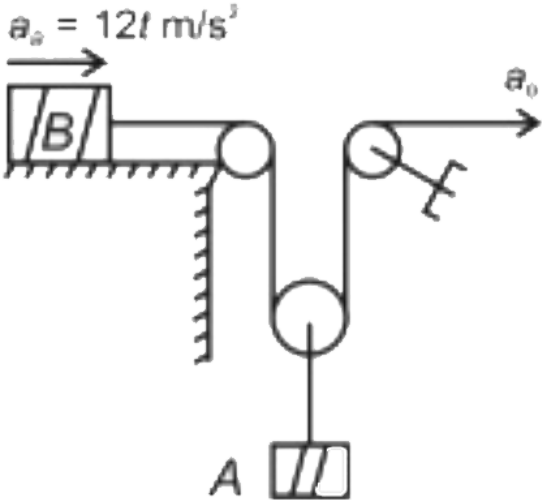
22. Block B starts from rest and accelerates as $a_B = 12tms^{-2}$. Simultaneously another end of the string is pulled with constant acceleration a_0. If at t = 3s, block A block A comes to rest than then the value of $a_0\left(\text{ in } ms^{-2}\right)$ is equal to



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23. If the displacement (x) and velocity (v) of a particle executing SHM are related through the expression $3v^2 = 30 - x^2$. If the time period of the particle is $T = \pi\sqrt{n}$, then what is the value of n?

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24. A carnot engine has efficiency $1/5$. Efficiency becomes $1/3$ when temperature of

sink is decreased by 50 K What is the temperature of sink ?

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25. In optical communication system operating at 1200nm, only 2% of the source frequency is available for TV t ransmission having a bandwidth of 5 MHz. the number of TV channels that can be transmitted is

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