PHYSICS

BOOKS - NTA MOCK TESTS

JEE MOCK TEST 17

Physics

1. If $Z = \frac{A \sin\theta + B \cos\theta}{A + B}$, then

A. the dimensions of Z and A are the same

B. the dimensions of Z and B are the same

C. Z is dimensionless quantity

D. none of these

Answer: C

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2. A point moves in the plane xy according to the law $x = a\sin\omega t, y = a(1 - \cos\omega t)$, where a and ω are positive constants. Find:

(a) the distance s traversed by the point

during the time τ,

(b) the angle between the point's velocity and acceleration vectors.

A. $\frac{A\omega^2}{\tau}$

B. $A\omega^2\tau$

C. $A\omega\tau$

D. $\frac{A\omega}{\tau}$

Answer: C

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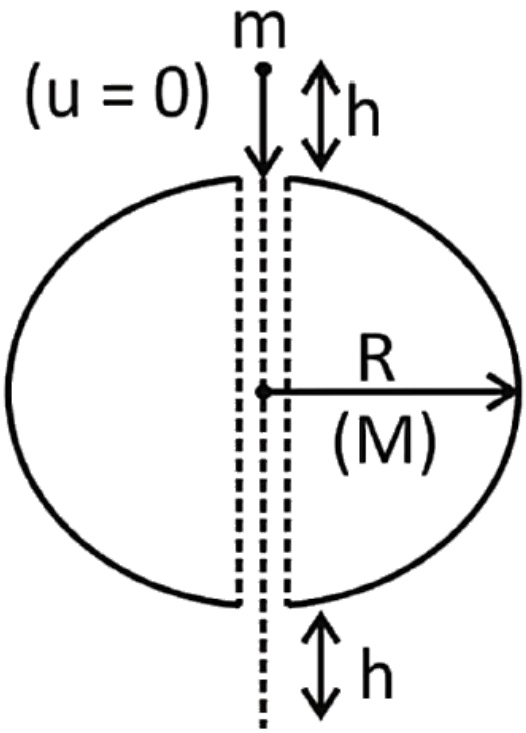
3. A ball of mass m is dropped from a height h in a tunnel, made across the earth (mass = M, radius = R) passing through its center. If $h << R$ such that the motion of the particle through h can be considered uniformly accelerated at g, then the time

period of the particle is



A. $2\pi\sqrt{\frac{R}{g}}+\sqrt{\frac{2h}{g}}$

B. $2\pi\sqrt{\frac{R}{g}}+2\sqrt{\frac{h}{g}}$

C. $2\pi\sqrt{\frac{R}{g}}+4\sqrt{\frac{2h}{g}}$

D. $2\pi\sqrt{\frac{2R}{g}}+2\sqrt{\frac{h}{g}}$

Answer: C

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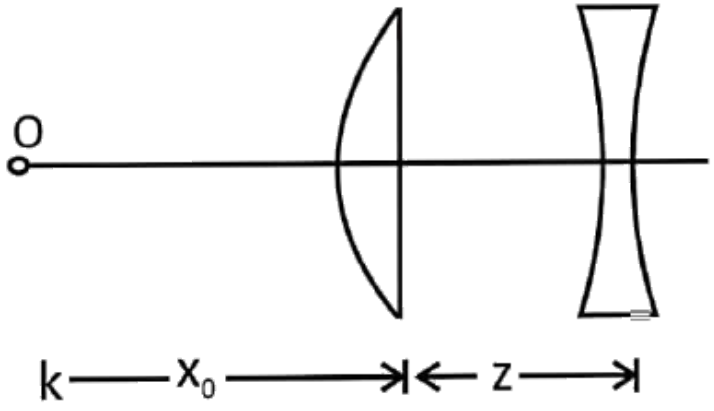
4. A plano-convex lens $\left(\mu=\frac{3}{2}\right)$ has a radius of curvature R = 15 cm and is placed at a distance z from a concave lens of focal length 20 cm as shown . At what distance x_0 should a point object be placed from the plano-convex lens, so that position of the final image is

independent of z?



A. 20 cm

B. 30 cm

C. 40 cm

D. 60 cm

Answer: B

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5. A block of mass m is gently placed over a massive plank moving horizontal over a smooth surface with velocity $10ms^{-1}$. The coefficient of friction between the block and the plank is 0.2. The distance travelled by the block till it slides on the plank is $[g = 10ms^{-2}]$

A. 10 m

B. 15m

C. 25 m

D. 35m

Answer: C

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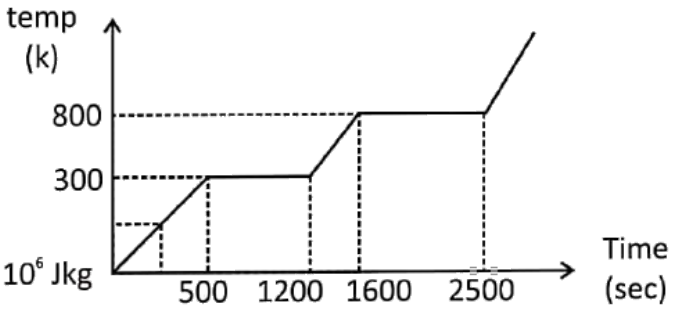
6. A heating curve has been plotted for a solid object as shown in the figure. If the mass of the object is 100g, then latent heat of vaporization for the material of the object is [Given, power supplied to the object is

constant and equal to 1 kW]



A. $1.5 \times 10^6 J/kg$

B. $2.5 \times 10^6 J/kg$

C. $3.5 \times 10^6 J/kg$

D. $9.0 \times 10^6 J/kg$

Answer: D

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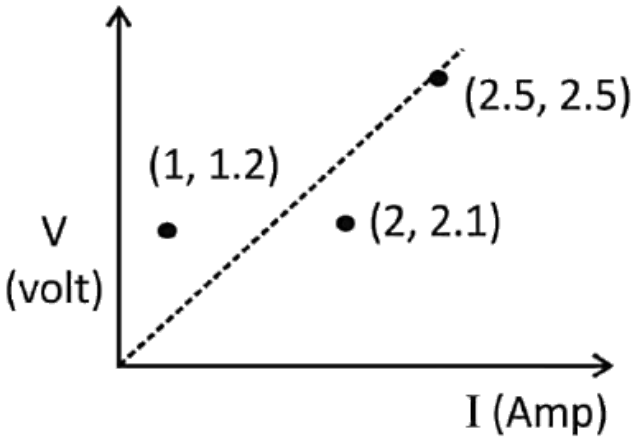
7. In the measurement of resistance of a wire using Ohm's the plot between V and I is drawn as shown, then resistance of given wire will be



A. 0.833Ω

B. 0.9Ω

C. 1Ω

D. none of these

Answer: C

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8. In young's double slit experiment, the screen is kept 1.6m from the slits. The coherent sources are 0.032 cm apart and fringes are observed on the screen. It is found that with a certain monochromatic source of light, the

fourth bright fringe is situated at a distance of 1.06 cm from the central fringe. The wavelength of the light used is

A. 530 nm

B. 265 nm

C. 1060 nm

D. 132.5 nm

Answer: A

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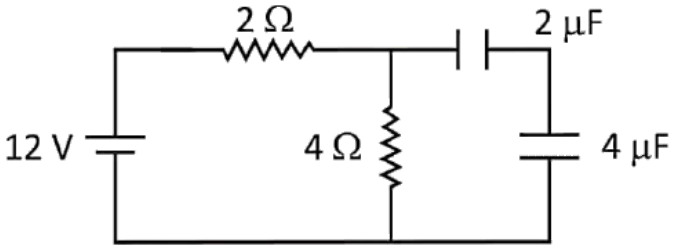
9. The charge on the $4\mu F$ capacitor in the steady state is



A. $10/3\mu C$

B. $32/3\mu C$

C. $4/3\mu C$

D. $8/3\mu C$

Answer: B

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10. Water from a tap emerges vertically downwards an intial speed of 1 m/s . The cross-sectional area of the tap is $10^{-4}m^2$. Assume that the pressure is contant throughout the stream of water and that the flow is steady . The cross-sectional area of the steam. 0.15 m below the tap is

A. $5.0 \times 10^{-4}m^2$

B. $1.0 \times 10^{-4}m^2$

C. $5.0 \times 10^{-5} m^2$

D. $2.0 \times 10^{-5} m^2$

Answer: C

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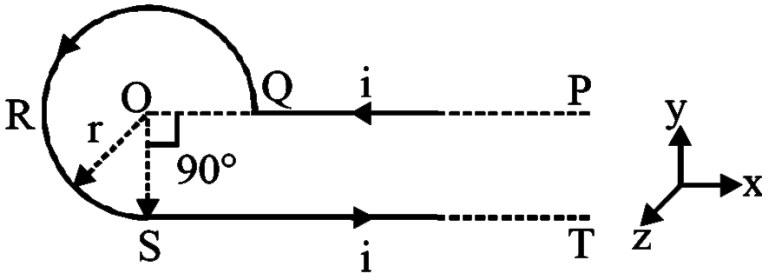
11. A current i is flowing in a conductor PQRST shaped as shown in the figure. The radius of curved part QRS is r and length of straight portions PQ and ST is very large. The magnetic

field at the centre O of the curved part is -



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

B. $\frac{3}{8}$

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

D. $\frac{9}{8}$

Answer: B

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12. A particle having mass m and charge q is released from the origin in a region in which electric field and megnetic field are given by $\overrightarrow{B} = -B_0\hat{j}$ and $\overrightarrow{E} = \overrightarrow{E}_0\hat{k}$. Find the speed of the particle as a function of its z-coordinate.

A. $\sqrt{\frac{2(qVB_0 + qE_0)Z}{m}}$

B. $\sqrt{\frac{(-qVB_0 + qE_0)2Z}{m}}$

C. $\sqrt{\frac{qE_0Z}{m}}$

D. $\sqrt{\frac{2qE_0Z}{m}}$

Answer: D

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13. Electrons having kinetic energy 30 eV are made to collide with atomic hydrogen gas (in ground state) and 42.5% of electron energy is used to excite the hydrogen wavelength in emission spectra are

A. 3

B. 6

C. 12

D. 18

Answer: B

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14. The probability that a particular nucleus of $.^{38}Cl$ will undergo beta decay in any time interval of 4 s is

$[T_{1/2} \text{ for } .^{38}Cl \text{ is } 37.2\text{min}]$

A. 3.1×10^{-4}

B. 6.2×10^{-4}

C. 12.4×10^{-4}

D. 28.8×10^{-4}

Answer: C

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15. P - V diagram of a diatomic gas is a straight line parallel to P-axis. The molar heat capacity of the gas in the process will be

A. 4R

B. $2.5R$

C. $3R$

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

Answer: B

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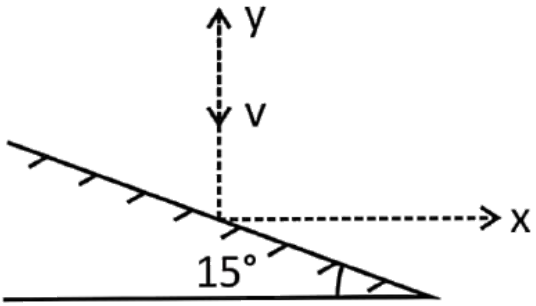
16. An object is moving towards a mirror with a velocity of $10ms^{-1}$ as shown in the figure. If the collision between the mirror and the

object is perfectly elastic, then the velocity of the image after collision with mirror in vector form is



A. $-10\hat{j}$

B. $-10\cos 15\hat{j}+10\sin 15\hat{j}$

C. $-10\hat{i}$

D. $-10\cos 30\hat{j}-10\sin 30\hat{i}$

Answer: D

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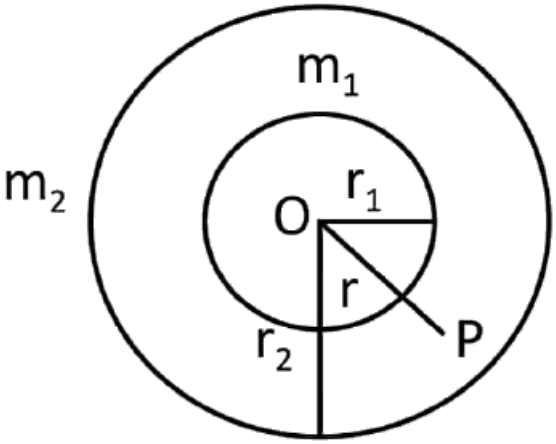
17. Two concentric spherical shells of masses and radii m_1, r_1 and m_2, r_2 respectively are as shown. The gravitational field intensity at

point P is



A. $\frac{Gm_1}{r_2^2 - r_1^2}$

B. $\frac{Gm_1}{r_1^2}$

C. $\frac{Gm_1}{r_1^2} + \frac{Gm_1}{r_2^2}$

D. $\frac{Gm_1}{r^2}$

Answer: D

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18. The zenar diode normally operates under reverse bias conditions, the major use of this fact is in the application where requirement is

A. large volume of current

B. a constant voltage

C. a current that is increasing without any change in applied voltage

D. all of the above

Answer: B

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19. An LCR series circuit is connected to an oscillator (AC supply) having RMS voltage 200 V. If the RMS voltages across resistor, inductor and capacitor are equal, then RMS voltage across the resistor would be

A. $100V$

B. $\frac{200V}{\sqrt{2}}$

C. $200V$

D. $\frac{100V}{\sqrt{2}}$

Answer: C

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20. The ends of a stretched wire of length l are fixed at x = 0 and x = l. in one experiment, the displacement of the wire is $y_1 = a\sin\left(\frac{\pi x}{l}\right)(\sin\omega t)$ and energy E_1 and in another experiment, its displacement is

$y_2 = a\sin\left(\frac{3\pi x}{l}\right)(\sin 3\omega t)$ and energy is E_2 then

A. $E_2 = E_1$

B. $E_2 = 3E_1$

C. $E_2 = \frac{E_1}{3}$

D. $E_2 = 9E_1$

Answer: D

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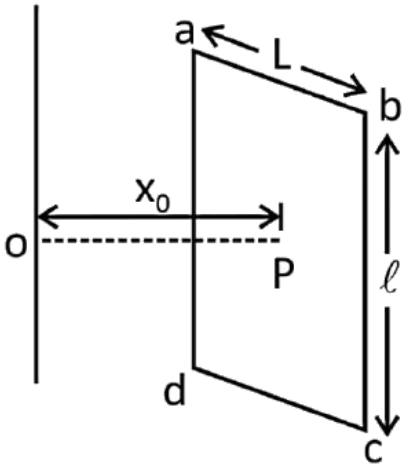
21. Find the electric flux (in S.I. unit) through the rectangular plate abcd of length $l = 2m$ width L and whose centre is at a distance $OP = x_0 = \frac{L}{2}$ from an infinite line of charge with linear charge density $\lambda = \frac{1}{36\pi} \times 10^{-9} Cm^{-1}$. Consider that the plate of the frame is perpendicular to line OP.



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22. water rises in a capillary tube to a height of 1 cm. In another capillary where the radius is one-third of it, how high will the water rise (in cm)?

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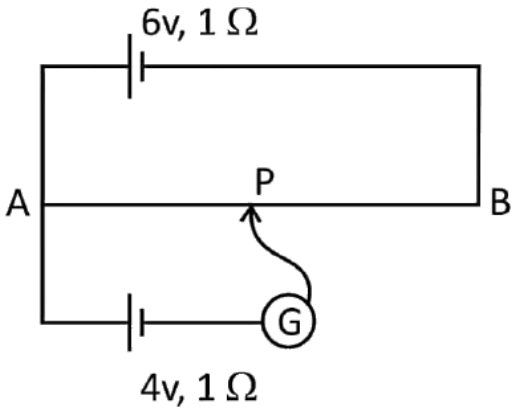
23. A 6V battery of internal resistance 1Ω is connected across a uniform wire AB of length

100 cm. The positive terminal of another battery of E.M.F 4V and internal resistance 1Ω is joined to the point A as shown. The distance of point P from A is $\alpha \times 10cm$. Find the value of α, for which there is no current through the galvanometer. (resistance of AB wire is 5Ω)



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24. A disc of mass m and radius R is attached to a rectangular plate of the same mass m, breadth R and length 2R as shown in figure. The moment of inertia of the system about the axis AB passing through the centre of the disc and along the plane is $I = \frac{1}{\alpha}\left(\frac{31}{3}mR^2\right)$

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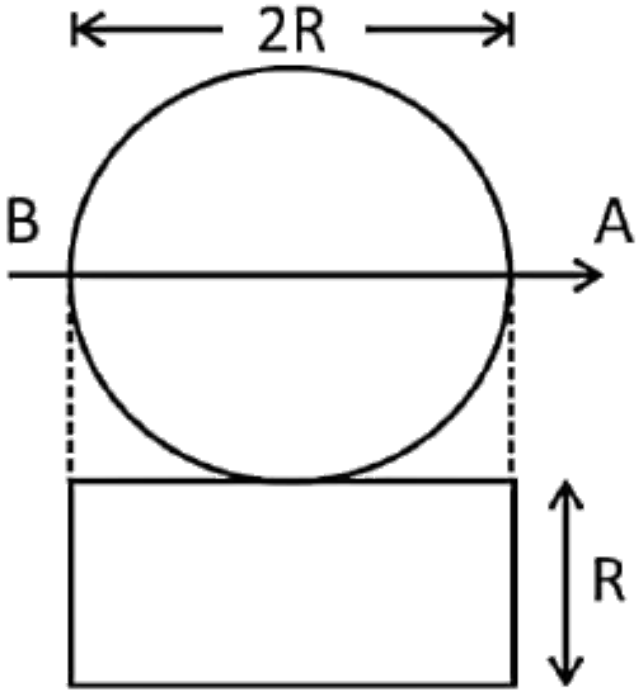

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25. A closed organ pipe and an open organ pipe of same length produce 4 beats when they are set into vibrations simultaneously. If the length of each of them were twice their initial lengths, the number of beats produced will be

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