PHYSICS

BOOKS - KVPY PREVIOUS YEAR

MOCK TEST 9

Exercise

1. A slab of glass, of thickness 6 cm and refractive index μ=1.5 is placed in front of a concave mirror as shown in the figure. If the

radius of curvature of the mirror is 40 cm and the reflected image coincides with the object, then the distance of the object from the mirror is

A. 30cm

B. 22cm

C. 40 cm

D. 28cm

Answer:

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2. The dimensions of angular momentum, latent heat and capacitance are, respectively.

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

B. $\left[ML^2T^{-2}\right], \left[L^2T^2\right], \left[M^{-1}L^{-2}T^4A^2\right]$

C. $\left[ML^2T^{-1}\right], \left[L^2T^{-2}\right], \left[ML^2TA^2\right]$

D. $\left[ML^2T^{-1}\right], \left[L^2T^{-2}\right], \left[M^{-1}L^{-2}T^4A^2\right]$

Answer:

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3. Two radioactive materials X_1 and X_2 have decay constants 10λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of X_1 to that of X_2 will be $1/e$ after a time.

A. $1/(10\lambda)$

B. $1/(11\lambda)$

C. $11/(10\lambda)$

D. $1/(9\lambda)$

Answer:

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4. A fresh dry cell of 1.5 volt and two resistors of $10k\Omega$ each are connected in series. An analog voltmeter measures a voltage of 0.5 volt across each of the resistor. A $100\mu F$ capacitor is fully charged using the same source. The same voltmeter is now used to

measure the voltage across It. The initial value of the current and the time in which the voltmeter reading falls to 0.5 volt are respectively.

A. 60μA,11s

B. 120 μA,15s

C. 150μ A,15s

D. 150 μA, 11s

Answer:

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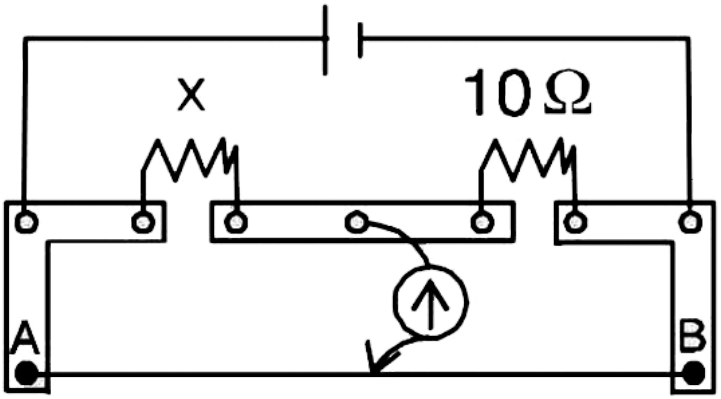
5. A meter bridge is set up as shown, to determine an unknown resistance X using a standard 10 ohm resistor. The galvanometer shows null point when tapping -key is at 52 cm mark. The end-corrections are 1 cm and 2 cm respectively for the ends A and B. The determine value of X is



A. 10.2 ohm

B. 10.6ohm

C. 10.8ohm

D. 11.1 ohm

Answer:

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6. The currect voltage relation of diode is given by $1 = \left(e^{1000V/T} - 1\right)mA$, where the applied voltage V is in volt and the

temperature T is in degree Kelvin. If a student makes an error measuring $\pm 0.01V$ while measuring the current of $5mA$ at $300K$, what will be error in the value of current in mA?

A. 0.05mA

B. 0.2mA

C. 0.02mA

D. 0.5mA

Answer:

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7. A person climbs up a stalled escalator in 60s. If standing on the same but escalator running with constant velocity, he takes 40 s. How much time is taken by the person to walk up the moving escalator?

A. 37s

B. 27 s

C. 24 s

D. 45s

Answer:

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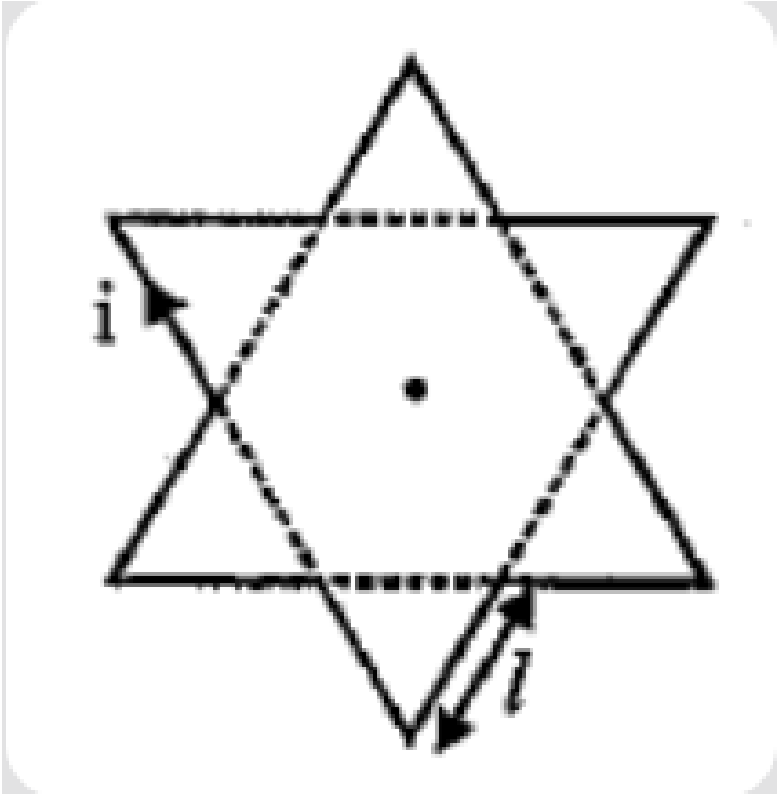
8. A star shaped loop (with $l =$ length of each section) carries current i. Magnetic field

at the centroid of the loop is



A. $\frac{3\mu_0 i}{\pi \ell}$

B. $\frac{3\mu_0 i}{2\pi \ell}$

C. $\frac{\pi m v_0}{q B_0}$

D. $\frac{\pi m v_0 \sqrt{3}}{qB}$

Answer:

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9. Equal masses of two substance of densities ρ_1 and ρ_2 are mixed together. What is the density of the mixture?

A. $\frac{1}{2}(\rho_1 + \rho_2)$

B. $(\rho_1 + \rho_2)$

C. $\sqrt{\rho_1 \cdot \rho_2}$

D. $\frac{\rho_1 \cdot \rho_2}{(\rho_1 + \rho_2)}$

Answer:

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10. Two identical photocathodes receive light of frequencies f_1 and f_2. If the velocities of the photo electrons (of mass m) coming out are respectively v_1 and v_2 then

A. $v_1 - v_2 = \left[\frac{2h}{m}(f_1 - f_2)\right]^{1/2}$

B. $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$

C. $v_1 + v_2 = \left[\frac{2h}{m}(f_1 + f_2)\right]^{1/2}$

D. $v_1^2 + v_2^2 = \frac{2h}{m}(f_1 + f_2)$

Answer:

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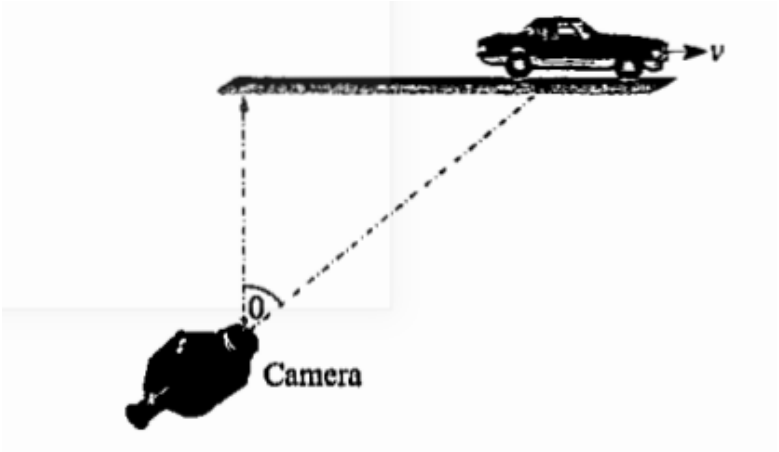
11. A racing car travelling along a track at a constant speed of 40 m/s. A television

cameraman is recording the event from a distance 40m directly away from the track as shown in figure.In order to keep the car under view, with what angular velocity the camera should be rotated ?



A. 5/2 rad/s

B. 2 rad/s

C. 3/2 rad/s

D. 1/2 rad/s

Answer:

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12. Two narrow bores of diameters 3.0mm and 6.0 mm are joined together to form a U-shaped tube open at both ends. If th U-tube contains water, what is the difference in its levels in the two limbs of the tube? Surface

tension of water at the temperature of the experiment is $7.3 \times 10^{-2} Nm^{-1}$. Take the angle of contact to be zero. and density of water to be $1.0 \times 10^{3} kg/m^{3}$.

$(g = 9.8ms^{-2})$

A. 2.4mm

B. 5.4mm

C. 4.9mm

D. 6.3mm

Answer:

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13. A U-shaped wire is dipped in a soap solution, and removed. A thin soap film formed between the wire and a light slider supports a weight of $1.5 \times 10^{-2} N$ (which includes the small weigh of the slider). The length of the slider is 30cm. What is the surface tension of the film?

A. 2.5×10^{-2} N/m

B. 5×10^{-3} N/m

C. 6×10^{-4} N/m

D. 9×10^{-2} N/m

Answer:

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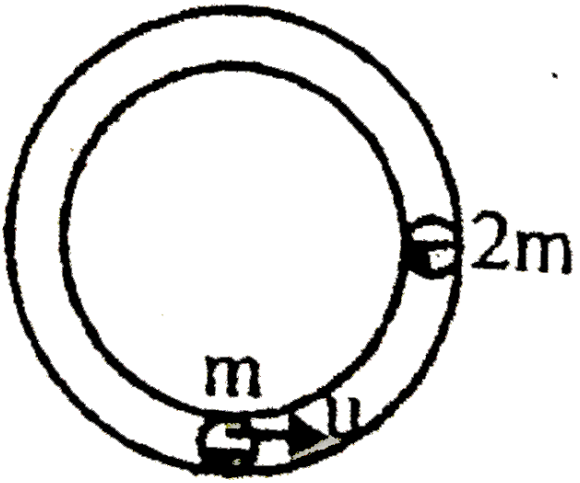
14. Two masses m and $2m$ are placed in fixed horizontal circular smooth hollow tube of radius r as shown. The mass m is moving with speed u and the mass $2m$ is stationary. After their first collision, the time elapsed for next

collision. (coefficient of restituation $e = 1/2$)



A. $\frac{2\pi r}{u}$

B. $\frac{4\pi r}{u}$

C. $\frac{3\pi r}{u}$

D. $\frac{12\pi r}{u}$

Answer:

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15. If a drop of liquid breaks into smaller droplets, it result in lowering of temperature of the droplets. Let a drop of radius R, breaks into N small droplets each of radius r. Estimate the drop in temperature.

A. $\frac{3S}{\rho s}\left(\frac{1}{R^2}-\frac{1}{r^2}\right)$

B. $\frac{3S}{\rho s}\left(\frac{1}{R}-\frac{1}{r}\right)$

C. $\frac{2S}{\rho s}\left(\frac{1}{R}-\frac{1}{r}\right)^2$

D. $\frac{4S}{\rho s}\left(\frac{1}{R^2}-\frac{1}{r^2}\right)$

Answer:

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16. An ideal gas is taken through a cyclic thermodynamic process through four steps. The amounts of heat involved in these steps are $Q_1 = 5960J$, $Q_2 = -5585J$, $Q_3 = -2980J$ and $Q_4 = 3645J$ respectively.

The corresponding quantities of work involved are $W_1 = 2200J,$ $W_2 = -825J,$ $W_3 = -1100J$ and W_4 respectively.

(a) Find the value of W_4.

(b) What are the efficiency of the cycle?

A. 765 J,10.83%

B. 675J,10.83%

C. 765 J,18.03%

D. 675J,18.03%

Answer:

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17. A wooden ball of density σ is released from the bottom of a tank which is filled with a liquid of density $\rho(\rho > \sigma)$up to a height h_1. The ball rises in the liquid, emerges from its surface and attains a height h_2 in air.If viscous effects are neglected,the ratio $\frac{h_2}{h_1}$ is

A. $\left(\frac{\rho}{\sigma} + 1\right)$

B. $\left(\frac{\rho}{\sigma} - 1\right)$

C. $\left(\frac{\rho}{\sigma}\right)$

D. $\left(\frac{\sigma}{\rho}\right)$

Answer:

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18. Two identical thin ring, each of radius R meters, are coaxially placed a distance R metres apart. If Q_1 coulomb, and Q_2 coulomb, are repectively the charges uniformly spread on the two rings, the work done in moving a

charge q from the centre of one ring to that of the other is

A. zero

B. $\frac{q(Q_1 - Q_2)\left(\sqrt{2} - 1\right)}{\sqrt{2}.\, 4\pi\varepsilon_0 R}$

C. $\frac{q\sqrt{2}(Q_1 + Q_2)}{4\pi\varepsilon_0 R}$

D. $\frac{q(Q_1 + Q_2)\left(\sqrt{2} + 1\right)}{\sqrt{2}.\, 4\pi\varepsilon_0 R}$

Answer:

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19. Glycerine flows steadily through a horizontal tube of length 1.5m and radius 1.0 cm. if the amount of glycerine collected per second at one end is $4.0 \times 10^{-3} kgs^{-1}$, what is the pressuer difference between the two ends of the tube? (density of glycerine = $1.3 \times 10^{3} kgm^{-3}$ and viscosity of glycerine = $0.83 Nsm^{-2}$).

A. 7.95×10^{2} Pa

B. 9.75×10^{2} Pa

C. 5.95×10^{2}Pa

D. 9.57×10^2 Pa

Answer:

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