# PHYSICS

## BOOKS - CAREER POINT

## MAJOR TEST

Physics

**1.** A charge praticle of charge q is kept at the centre of the semicircular charged, ring . If linear charge density is $\lambda$ every where, as shown in the figure. Then net electrostatic force on the particle is -

A. $\frac{\lambda q}{4\pi\varepsilon_0 R}$

B. $\frac{\sqrt{5}\lambda q}{4\pi\varepsilon_0 R}$

C. $\frac{3\lambda q}{4\pi\varepsilon_0 R}$

D. $\frac{\sqrt{2}\lambda q}{4\pi es\pi_0 R}$

**Answer: B**

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**2.** Two points are at distance $a$ and $b(a < b)$ from a long string of charge per unit length $\lambda$. The potential difference between th epoints is proportional to

A. $b/a$

B. $b^2/a^2$

C. $\sqrt{b/a}$

D. log (b/a)

**Answer: D**

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**3.** A capacitor of capacitance C is charged to a constant potential difference V and then connected in series with an open key and a pure resistor r. At tiem t=0 , the key is closed. If I is current at time t=0, a plot of log I against t is shown as in the graph (I) . Latter on of the parameters, i.e. V,R and C is changed, keeping the other two constant and graph (2) is recoded. Then -

A. C is reduced

B. C is increased

C. R is reduced

D. R is increased

**Answer: B**

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**4.** The resistivity of iron is $1 \times 10^{-7} ohm - m$ . The resistance of a iron wire of particular length and thickness is 1 ohm . If the length and the diameter of wire both are doubled, then the resistivity in ohm-m will be

A. $1 \times 10^{-7}$

B. $2 \times 10^{-7}$

C. $4 \times 10^{-7}$

D. None of these

**Answer: A**

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**5.** In the circuit shown

A. R=8 ohms

B. R=6 ohms

C. R=10 ohms

D. Potential difference between A and B is 2V

**Answer: B**

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**6.** An electron having kinetic energy T is moving in a circular orbit of radius R prependicular to a uniform magnetic field induction $\overline{B}$

. If kinetic energy is double and magentic field induction is triple, the radius will becomes :

A. $R\sqrt{\frac{9}{4}}$

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

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

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

**Answer: C**

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**7.** A train is moving towards north with a speed of 180 kilometre per hour. If the vertical comonent of the earth's magnetic field is $0.2 \times 10^{-4}$ T, the emf induced in the axle 1.5 m longs is -

A. 5.4 mV

B. 54 mV

C. 15 mV

D. 1.5 mV

**Answer: D**

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**8.** A place electromagnetic wave

$F_s = 100\cos\left(6 \times 10^8 t + 4x\right) V/m$

Propagates in a medium of dielectric constant. The refractive index is

A. $1.5$

B. $2.0$

C. $2.4$

D. $4.0$

**Answer: B**

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**9.** A piece of n-type semiconductor is sunjected to an electric E. The left end of the semiconductor is exposed to a radiation so that electron-hole pairs are generated continuously. Let n be the number density of electron. The electron current density $J_e$ is given $J_e = en\mu_e E_x + eD_e \frac{dn}{dx}$ . The dimensions of electron drift mobility $(\mu_e)$ . and electron diffusion coefficient $(D_e)$ are respectively

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

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

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

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

**Answer: B**

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**10.** An elevator of mass M is accelerated upwards by applying a force F.A mass m initially situated at a height of 1 m above the floor the elevator is falling freely. It will hit the floor of the elevator after a time equal to

A. $\sqrt{\frac{2M}{F+mg}}$

B. $\sqrt{\frac{2M}{F-mg}}$

C. $\sqrt{\frac{2M}{F}}$

D. $\sqrt{\frac{2M}{F+Mg}}$

**Answer: C**

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**11.** A particle of mass m is made to move with unifrom speed v along the perimeter of a regular hexagon. Magnitude of impulse applied at each corner of the heaxogen is

A. mv

B. $mv\sqrt{3}$

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

D. zero

**Answer: D**

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**12.** A force (F) acting on a body is dependent on its desplacement s. as $F \propto s^{-1/3}$ . Therefore , the power delivered by the force varies with its displacment as

A. $s^{2/3}$

B. $s^{1/2}$

C. $s^{-5/3}$

D. $s^{0}$

**Answer: A**

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**13.** The maximum tension in the string of a simple pendulum is 1.2 times the minimum tenstion. If $0_0$ is the angular amplitude, then

$0_0$ is

A. $\cos^{-1}\left(\frac{4}{5}\right)$

B. $\cos^{-1}\left(\frac{3}{4}\right)$

C. $\cos^{-1}\left(\frac{15}{16}\right)$

D. $\cos^{-1}\left(\frac{7}{8}\right)$

**Answer: D**

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**14.** Two bodies of masses $m_1$ and $m_2$ are attached to the two ends of a string. The passes over a pulley of mass m and radius R. if $m_1 > m_2$ . The acceleration the system will be

A. $\frac{m_1 - m_2}{m_1 + m_2} g$

B. $\frac{m_1 + m_2}{m_1 - m_2} g$

C. $\frac{m_1 + m_2}{m_1 + m_2(1/2)m}$

D. $\frac{m_1 + m_2}{m_1 - m_2 + m}$

**Answer: C**

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**15.** Let A and B be the points respectively above and below the earth's surface each at a distance equal to half the radius of the earth. If the acceleration due to gravity at these points be $g_A$ and $g_B$ respectivel, them $g_B : g_A$

A. $1:1$

B. $9:8$

C. $8:9$

D. zero

**Answer: C**

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**16.** Four functions given below describe motion of a particle.

(I)$y = \sin\omega - \cos\omega t$, $(II) y = \sin^3 \omega t$,

(III) $y = 5\cos\left(\frac{3\pi}{4} - 3\omega t\right)$, $(IV) y = 1 + \omega + \omega^2 t^2$

Therefore, simple harmonic motion is represented by

A. only (I)

B. (I),(II) and (III)

C. (I) and (III)

D. (I) and (II)

**Answer: B**

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**17.** A vibratory motion is represented by $x = 24\cos\omega t + A\cos\left(\omega t + \frac{\pi}{2}\right) + A\cos(\omega t + \pi)\frac{A}{2}\cos\left(\omega t + \frac{3\pi}{2}\right)$ the resultant amplitude of the motion is

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

B. $\frac{\sqrt{5}A}{2}$

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

D. 2A

**Answer: B**

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**18.** There are two organ pipes of the same length and the same material but of different radii. When they are emitting fundamental notes-

A. borader pipe gives note of smaller frequency

B. both the pipes give notes of the same frequency

C. narrowe pipe gives not of smaller frequency

D. either of them gives not of smaller or larger frequency depending on the wavelength of the wave

**Answer: A**

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**19.** A contair of volume $0.1m^3$ is filled with nitrogen at a temperature of $47^\circ$ C and a gauge pressure of $4.0 \times 10^5$ Pa. After

ome time, due to leakage, the gauge pressure drops to $3.0 \times 10^5$ Pa and the temperature to $27^\circ$ C. The mass of nitrogen that has leaked out is about-

A. 128g

B. 84g

C. 154g

D. 226g

**Answer: B**

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**20.** Ninety precent of a radoactive sample is left over after a time interval t. The percentage of initial sample that will disntegrate in an interval 2t is-

A. $38\ \%$

B. $19\ \%$

C. $9\ \%$

D. $62\ \%$

**Answer: B**

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**21.** The stopping potential for photoelectrons emitted from a surface illuminated by light of wavelength 400 mm is 500 mV. When the incident wavelength is changed to a new value, the stopping potential is found to be 800 mV. New wavelength is about-

A. 365m

B. 250 nm

C. 640 nm

D. 340 nm

**Answer: A**

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**22.** Two identical non-relativitic partcles A and B move at right angles to each othre, processing de Broglie wavelengths $\lambda_1$ and $\lambda_2$, respectively. The de Broglie wavelength of each particle in their centre of mass frame of reference is

A. $\sqrt{\frac{\lambda_1^2 + \lambda_2^2}{2}}$

B. $\frac{\lambda_1 + \lambda_2}{2}$

C. $\frac{2\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

D. $\frac{2\lambda_1\lambda_2}{\sqrt{\lambda_1^2+\lambda_2^2}}$

**Answer: D**

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**23.** for the logic circuit give below , the outputs Y for A=0,B=0 and A=1,B=1 are-

A. 0 and 1

B. 0 and 0

C. 1 and 0

D. 1 and 1

**Answer: B**

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**24.** In a Young's double slit experiment sources of equal intensites are used. Distance between slits is d and wavelength of light used is $\lambda(\lambda << d)$ . Angular separation of the nearst points on either side of central maximum where intensities become half of the maximum vlaue is -

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

B. $\frac{\lambda}{2d}$

C. $\frac{\lambda}{4d}$

D. $\frac{\lambda}{6d}$

**Answer: B**

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**25.** A certain quantity of oxygen $(\gamma = 7/5)$ is comparessed isothermally until its pressure is doubled $(P_2)$ . The gas is then allowed to expand adiabatically until its original valume is restored. Then the final pressure $(P_3)$ in terms of initial pressure $(P_1)$ is

A. $P_3 = 0.55P_1$

B. $P_3 = 0.76P_1$

C. $P_3 = 0.68P_1$

D. $P_3 = 2.55P_1$

**Answer: B**

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**26.** In a meter bridge experiment the resistance to be meausred in connected int the right gap and a known resistance in the left

gap has value of $50 \pm 0.2\Omega$ when the null points is judged to be at $60 \pm 2.0$ cm. The students notes is judged to be of the bridge wire are not at 0.0 cn and 100.0 cm of the scale makes ends. The value of the unknown resistance should be expressed as

A. $33.33 \pm 1\Omega$

B. $75 \pm 1\Omega$

C. $75.0 \pm 0.9\Omega$

D. $33.4 \pm 0.5\Omega$

**Answer: D**

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**27.** How coffe is a mug cools form $90^\circ C \rightarrow 70^\circ C$ in 4.8 minutes. The room temeprature is $20^\circ C$. Applying Newton's law of cooling the time needed to cool I further by $10^\circ C$ should be nealry-

A. $4.2$ min

B. $3.8$ min

C. $3.2$ min

D. $2.4$ min

**Answer: C**

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**28.** Two cancave refracting surfacwe of equal radii fo curvature face each other in air as shown in figure. A point object O is placed midway between the centre and one of the poles. Then the separation between the images of O formed by each refracting surface is

A. $11.4$ R

B. $1.14$ R

C. $0.114R$

D. $0.0114R$

**Answer: C**

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**29.** The $Th_{90}^{232}$ atom has successive alpha and beta decays to the end product $Pb_{82}^{208}$ . The numbers of alpha and beta. Particles. Emitted in the process respecitvely are-

A. 4,6

B. 4,4

C. 6,2

D. 6,4

**Answer: D**

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**30.** In Fraumhroffer diffraction pattern due to a single slit, the screen is at distance of 100 cm from the slit and slit is illuminated by $\lambda = 5893\text{Å}$. The width of the slit is 0.1 mm. Then separation between central maxima and the first secondary minima

A. $0.5893cm$

B. $5.893cm$

C. $0.2946cm$

D. $2.946cm$

**Answer: A**

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