PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 92

Physics

1. In the spectrum of hydrogen atom, the ratio of the longest wavelength in Lyman series to the longest wavelength in the Balmer series is

A. $\frac{5}{27}$

B. $\frac{1}{93}$

C. $\frac{4}{9}$

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

Answer: A

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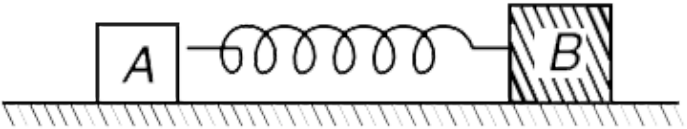
2. Two blocks A and B of mass m and $2m$ respectively are connected by a light spring of force constant k. They are placed on a smooth

horizontal surface. Spring is stretched by a length x and then released. Find the relative velocity of the blocks when the spring comes to its natural length



A. $x\sqrt{\frac{3k}{2m}}$

B. $x\sqrt{\left(2\frac{k}{3m}\right)}$

C. $x\sqrt{\frac{k}{3m}}$

D. $x\sqrt{\frac{2k}{m}}$

Answer: A

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3. A mass 2 kg is whirled in a horizontal circle by means of a string at an initial speed of 5 revolutions per minute . Keeping the radius constant the tension in the string is doubled. The new speed is nearly

A. 2.25 rpm

B. 7 rpm

C. 10 rpm

D. 14 rpm

Answer: B

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4. Two bulbs consume the same power when operated at 200 V and 300 V respectively. When these bulbs are connected in series across a DC source of 400 V, then the ratio of power consumed across them is

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

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

C. $\frac{4}{9}$

D. $\frac{9}{4}$

Answer: C

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5. Two coils have a mutual inductance $0.005H$. The current changes in the first coil according to equation $I = I_0 \sin \omega t$, where $I_0 = 10A$

and $\omega = 100\pi$ radian/sec. The maximum value of e.m.f. in the second coil is

A. 2π

B. 5π

C. π

D. 4π

Answer: B

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6. Let there be a spherical symmetric charge density varying as $p(r) = p_0 \frac{r}{R}$ upto r = R and $\rho(r) = 0$ for $r > R$, where r is the distance from the origin. The electric field at on a distance $r(r < R)$ from the origin is given by

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A. $\frac{\rho_0 r^2}{4\varepsilon_0 R}$

B. $\frac{\rho_0 r}{4\varepsilon_0 R}$

C. $\frac{\rho_0 r^4}{\varepsilon_0 R}$

D. $\frac{\rho_0 r^2}{\varepsilon_0 R}$

Answer: A

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7. A bar magnet of length $10cm$ and pole strength $2Am$ makes an angle 60^0 with a uniform magnetic field of induction $50T$. The couple acting on it is

A. $5\sqrt{3}Nm$

B. $\sqrt{3}Nm$

C. $10\sqrt{3}Nm$

D. $20\sqrt{3}Nm$

Answer: A

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8. The value of gravitational acceleration 'g' at a height 'h' above the earth's surface is $\frac{g}{4}$, then (R = _____) (where R = radius of the earth)

A. $h = R$

B. $h = \frac{R}{2}$

C. $h = \frac{R}{3}$

D. $h = \frac{R}{4}$

Answer: A

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9. A cup of tea cools from $80^\circ C$ to $60^\circ C$ in 40 seconds. The ambient temperature is $30^\circ C$. In cooling from $60^\circ C$ to $50^\circ C$, it will take time:

A. 35 s

B. 30 s

C. 32 s

D. 48 s

Answer: C

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10. A particle of charge per unit mass α is released from origin with a velocity $\vec{v} = v_0\hat{i}$ in a magnetic field

$\vec{B} = -B_0\hat{k}$ for $x \leq \frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}$

and $\vec{B} = 0$ for $x > \frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha}$

The x-coordinate of the particle at time $t\left(\frac{\pi}{3B_0\alpha}\right)$ would be

A. $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + \frac{\sqrt{3}}{2}v_0\left(t - \frac{\pi}{B_0\alpha}\right)$

B. $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + v_0\left(t - \frac{\pi}{3B_0\alpha}\right)$

C. $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + \frac{v_0}{2}\left(t - \frac{\pi}{3B_0\alpha}\right)$

D. $\frac{\sqrt{3}}{2}\frac{v_0}{B_0\alpha} + \frac{v_0 t}{2}$

Answer: C

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11. A ball is projected from point A with velocity $10ms^{-1}$ perpendicular to the inclined plane as shown in figure. Range of the ball on the inclined plane is

A. $\frac{40}{3}m$

B. $\frac{20}{13}m$

C. $\frac{13}{20}m$

D. $\frac{13}{40}m$

Answer: A

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12. Obtain the binding energy (in MeV) of a nitrogen nucleus $\left({}_{7}^{14}N\right)$, given $m\left({}_{7}^{14}N\right)$ $= 14.00307 \quad u$

A. 56 MeV

B. 98 MeV

C. 104 MeV

D. 112 MeV

Answer: C

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13. A U tube of uniform bore of cross sectional area A has been set up vertically with open ends facing up Now m gm of a liquid of density d is poured into it. The column of liquid in this tube will oscillation with a period T such that

A. $2\pi\sqrt{\frac{M}{g}}$

B. $2\pi\sqrt{\frac{MA}{dg}}$

C. $2\pi\sqrt{\frac{M}{Adg}}$

D. $2\pi\sqrt{\frac{M}{2Adg}}$

Answer: D

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14. Calculate the number of photons emitted per second by a 10 watt sodium vapor lamp. Assume that 90% of the consumed energy is

converted into light. Wavelength of sodium light is 590nm. $h = 6.62 \times 10^{-34} Js$

A. 0.267×10^{18}

B. 0.267×10^{19}

C. 0.267×10^{20}

D. 0.267×10^{17}

Answer: C

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15. A cylinder with a movable piston contains air under a pressure p_1 and a soap bubble of radius r. The pressure p_2 to which the air should be compressed by slowly pushing the piston into the cylinder for the soap bubble to reduce its size by half will be : (The surface tension is σ, and the temperature T is maintained constant)

A. $P_1 = \frac{4T}{r}$

B. $4P_1 + \frac{12T}{r}$

C. $8P_1 + \frac{24T}{r}$

D. $P_1 = \frac{2T}{r}$

Answer: C

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16. A narrow parallel beam of light is incident on a transparent sphere of refractive index n if the beam finally gets focused at a point situated at a distance=$2 \times (\text{radius of sphere})$ form the center of the sphere then find n?

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

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

C. $-\frac{4}{6}$

D. $\frac{-2}{3}$

Answer: A

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17. The moment of inertia of a door of mass m, length $2l$ and width l about its longer side is.

A. $\frac{11ml^2}{24}$

B. $\frac{5ml^2}{24}$

C. $\frac{ml^2}{3}$

D. None of these

Answer: C

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18. A steel ball of mass $m_1 = 1kg$ moving with velocity $50ms^{-1}$ collides with another ball of mass $m_2 = 200g$ lying on the ground. Due the collision, the KE is lost and their internal

energies change equally and T_1 and T_2 are the temperature changes of masses m_1 and m_2 respectively. If the specific heat of steel is unity and $J = 4.18\ \text{J cal}^{-1}$, then

A. $T_1 = 7.1^\circ C$ and $T_2 = 1.47^\circ C$

B. $T_1 = 1.47^\circ C$ and $T_2 = 7.1^\circ C$

C. $T_1 = 3.4^\circ C$ and $T_2 = 17.0^\circ C$

D. $T_1 = 17.0^\circ C$ and $T_2 = 3.4^\circ C$

Answer: C

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19. Fraunhoffer diffraction pattern of a single slit is obtained in the focal plane of lens of focal length $1m$. If third maximum is formed at a distance of 5mm from the central maximum and wavelength of light used is 5000Å, then width of the slit will be –

A. $0.02cm$

B. $0.03cm$

C. $0.04cm$

D. $1cm$

Answer: B

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20. For simple harmonic vibrations

$y_1 = 8\cos\omega t$

$y_2 = 4\cos\left(\omega t + \frac{\pi}{2}\right)$

$y_3 = 2\cos(\omega t + \pi)$

$y_4 = \cos\left(\omega t + \frac{3\pi}{2}\right)$ are superimposed on one another. The resulting amplitude and phase are respectively

A. $\sqrt{45}$ and $\tan^{-1}\left(\frac{1}{2}\right)$

B. $\sqrt{45}$ and $\tan^{-1}\left(\frac{1}{3}\right)$

C. $\sqrt{75}$ and $\tan^{-1}(2)$

D. $\sqrt{75}$ and $\tan^{-1}\left(\frac{1}{3}\right)$

Answer: A

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21. A Carnot engine whose sinl is at $300K$ has an efficiency of 40%. By how much should the temperature of source be increased so as to

increase its efficiency by $50\,\%$ of original efficiency.

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22. A book of weight $20N$ is pressed between two hands and each hand exerts a force of $40N$. If the block just starts to slide down Coefficient of friction is .

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23. A light emitting diode (LED) has a voltage drop of $2V$ across it and passes a current of $10mA$. When it operates with a $6V$ battery through a limiting resistor R. The value of R is

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24. In a screw gauge, 5 complete rotations of the screw cause if to move a linear distance of $0.25cm$. There are 100 circular scale divisions.

The thickness of a wire measured by this screw gauge gives a reading of 4 main scale divisions and 30 circular scale divisions. Assuming negligible zero error, the thickness of the wire is :

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25. A 3 kg object has initial velocity $\left(6\hat{i}-2\hat{j}\right)ms^{-1}$. What will be the total work done (in joule) on the object if its velocity changes to $\left(8\hat{i}+4\hat{j}\right)ms^{-1}$?

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