PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 38

Physics

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1. An X-ray tube produces a continuous spectrum of radiation with its short wavelength end at $0.45Å$. ...

The maximum energy of a photon in the radiation is

A. 27500

B. 22500

C. 17500

D. 12500

Answer: A

2. A paramagnetic substance in the form of a cube with sides 1 cm has a magetic dipole moment of $20 \times 10^{-6} J/T$ was when a magnetic intensity of $60 \times 10^3 A/m$ is applied .Its magnetic susceptibility is :

A. 3.3×10^{-4}

B. 2.3×10^{-2}

C. 4.3×10^{-2}

D. 3.3×10^{-2}

Answer: A

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3. There is a pair of fixed, parallel rails of negligible resistance in a horizontal plane, at a distance of L = 10 cm. The rails are connected, at one of their ends to an ideal battery of EMF 0.5 V, as shown in the figure. The system is placed in a vertically downward and perpendicular magnetic field of magnetic induction B = 1T. A metal rod of resistance $R = 10\Omega$ is placed perpendicularly on the rails. The rod placed perpendicularly on the rails. The rod and rails are frictionless. The magnitude of force, which is to be exerted on the rod in order to move it with a constant speed of

order to move it with a constant speed of $1ms^{-1}$ in the direction shown, is
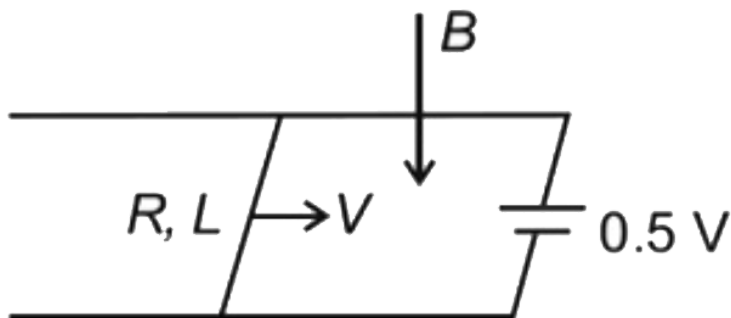
A. $2 \times 10^{-3} N$

B. $4 \times 10^{-3} N$

C. 8×10^{-3}

D. $5 \times 10^{-3} N$

Answer: B

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4. In series $L - C - R$ circuit, voltge drop across resistance is $8V$, across inductor is $6V$ and across capacitor is $12V$. Then,

A. the voltage of the source will be leading the current in the circuit

B. the voltage drop across each element will be less than the applied voltage

C. the power factor of the circuit will be $\dfrac{4}{3}$

D. none of these

Answer: D

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5. A satellite of Sun is in a circular orbit around the Sun, midway between the Suna and earth. Find the period of this satellite.

A. the period of the planet is nearly 229 days 129 days

B. the period of the planet is nearly 129 days

C. the speed of the planet is greater than the escape velocity of the earth

D. the acceleration of the planet is two times the acceleration of the earth

Answer: B

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6. Four rods with different radii r and length l are used to connect two reservoirs of heat at different temperatures. Which one will conduct most heat ?

    A. r = 2 cm, l = 0.5 m

    B. r = 1 cm, l = 0.5 m

    C. r = 2 cm, l = 2 m

    D. r = 1 cm, l = 1 m

Answer: A

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7. An ideal diatomic gas with $C_V = \dfrac{5R}{2}$ occupies a volume V_1 at a pressure P_1. The gas undergoes a process in which

the pressure is proportional to the volume. At the end of the process the rms speed of the gas molecules has doubled from its initial value.

Heat supplied to the gas in the given process is

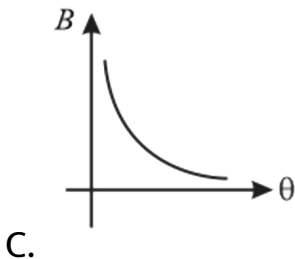A. $7P_1V_1$
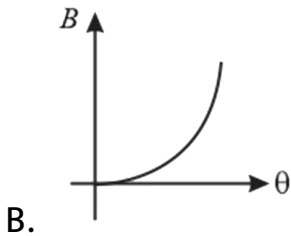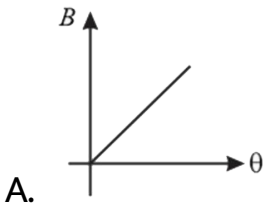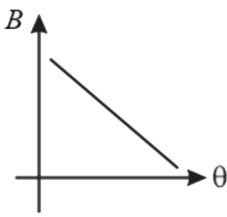
B. $8P_1V_1$

C. $9P_1V_1$

D. $10P_1V_1$

Answer: C

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8. A current - carrying wire of certain length is bent to form an arc that substends an angle θ at the centre. Let B be the magnetic field at the centre due to this wire. The correct graph between B and θ is

A.

B.

C.

D.

Answer: B

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9. With what minimum acceleration can a fireman slide down a rope whose breaking strength is 2/3 of his weight ?

A. $\dfrac{2}{3}g$

B. g

C. $\dfrac{1}{3}g$

D. zero

Answer: C

10. A raioactive sample contains $2.2 mg$ of pure $._{6}^{11}C$ which has half-life period of 1224 seconds. Calculate

(i) the number of atoms present initially

(ii) the activity when $5\mu g$ of the sample will be left.

   A. $2.1 \times 106(20)$ atoms, 3.3×10^{-14} dps

   B. $3.1 \times 106(19)$ atoms, 2.6×10^{13} dps

   C. $2.3 \times 106(19)$ atoms, 1.6×10^{13} dps

   D. 1.2×10^{20} atoms, 1.55×10^{14} dps

Answer: D

11. A rod of mass 'M' and length '2L' is suspended at its middle by a wire. It exhibits torsional oscillations, if two masses each of 'm' are attached at distance $'L/2'$ from its centre on both sides, it reduces the oscillation frequency by 20%. The value of ratio m/M is close to :

A. 12

B. 14

C. 16

D. 18

Answer: C

12. Lights of two different frequencies whose photons have energies 1 and 2.5 eV, respectively, successively illuminate a metal whose work function is 0.5 eV. The ratio of the maximum speeds of the emitted electrons

A. $1:4$

B. $1:1$

C. $1:5$

D. $1:2$

Answer: D

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13. Two unequal soap bubbles are formed one on each side of a tube closed in the middle by a tap. What happens when the tap is opened to put the two bubbles in communication?

A. air flows from the bigger bubble to the smaller bubble till the sizes become equal

B. air flows from bigger bubble to the smaller bubble till their sizes are interchanged

C. air flows from the smaller bubble to the larger bubble
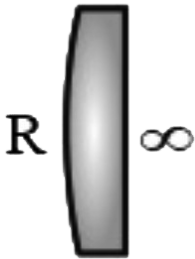
D. there is no flow of air

Answer: C

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14. Which one of the following spherical lenses does not exhibit dispersion? The radii of curvature of the surfaces of the lenses are as given in the diagrams. `
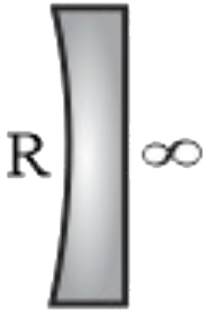
R_1 R_2

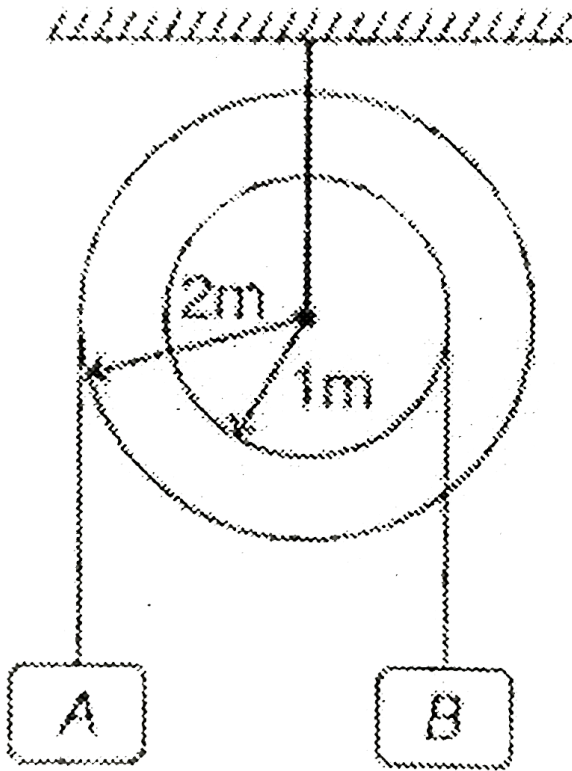$R_1 \neq R_2$

A.

R ∞
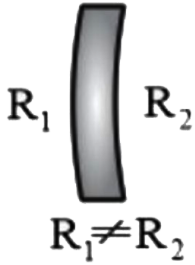
B.

C.

D.

Answer: C

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15. In the pully system shown, if radii of the bigger and

smaller pulley are 2m and 1m respectively and the

acceleration of block A is $5m/s^2$ in the downward direction, then the acceleration of block B will be

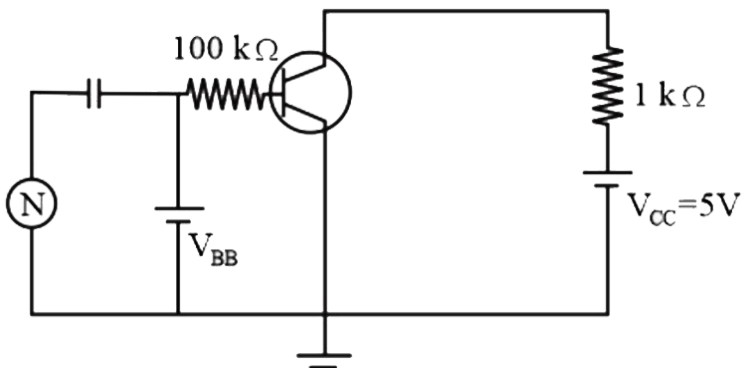A. $0ms^{-2}$

B. $5ms^{-2}$

C. $10ms^{-2}$

D. $\dfrac{5}{2}ms^{-2}$

Answer: D

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16. V_{BB} can vary between 0 and 5 V. Find the minimum value of base current and V_{BB}, so that transistor works in saturation mode. $\left[\text{Given } \beta = 200 \text{ and } V_{BE} = 1V\right]$

A. $20\mu A, 2.8V$

B. $25\mu A$, $3.5V$

C. $20\mu A$, $3.5V$

D. $25\mu A$, $2.8V$

Answer: C

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17. The coefficient of volume expansion of glycerine is $49 \times 10^{-5}/^\circ C$. What is the fractional change in its density (approx.) for $30^\circ C$ rise in temperature?

    A. 1.45×10^{-2}

    B. 2×10^{-4}

    C. 3.5×10^{-3}

D. 2.5×10^{-2}

Answer: A

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18. The pressure on a square plate is measured by measuring the force on the plate and the length of the sides of the plate . If the maximum error in the measurement of force and length are , respectively , 4% and 2%. Find the maximum error in the measurement of pressure.

A. 1%

B. 2%

C. 6 %

D. 8 %

Answer: D

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19. Consider two coherent, monochromatic (wavelength λ) sources S_1 and S_2, separated by a distance d. The ratio of intensities of S_1 and that of S_2 (which is responsible for interference at point P, where detector is located) is 4. The distance of point P from S_1 is (if the resultant intensity at point P is equal to $\dfrac{9}{4}$ times of intensity of S_1) (Given : $\angle S_2 S_1 P = 90°$, $d > 0$ and n is a positive integer)

A. $\dfrac{d^2 - n^2 \lambda^2}{2n\lambda}$

B. $\dfrac{d^2 + n^2\lambda^2}{2n\lambda}$

C. $\dfrac{n\lambda d}{\sqrt{d^2 - n^2\lambda^2}}$

D. $\dfrac{2n\lambda d}{\sqrt{d^2 - n^2\lambda^2}}$

Answer: A

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20. A thin plastic of refractive index 1.6 is used to cover one of the slits of a double slit arrangement. The central point omn the screen is now occupied by what would have been the 7th bright fringe before the plastic was used. If the wavelength of light is 600 nm, what is the thickness (in μm) of the plastic?

A. 7

B. 4

C. 8

D. 6

Answer: A

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21. A ball of mass m moving horizontally at a speed v collides with the bob of a simple pendulum at rest. The mass of the bob is also m. If the collision is perfectly inelastic and both balls sticks, the height to which the two balls rise after the collision will be given by:

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22. A wire of length L and 3 identical cells of negligible internal resistance are connected in series. Due to the current, the temperature of the wire is raised by ΔT in a time t. A number N of similar cells is now connected in series with a wire of the same material and cross-section but of length 2L. The temperature of the wire is raised by the same amount ΔT in the same time t. the value of N is

23. A helicopter takes off along the vertical with an acceleration $a = 3m/s^2$ and zero initial velocity. In a certain time the pilot switches off the engine. At the point

of take off, the sound dies away in a time $t_2 = 30\,\text{sec}$. Determine the velocity of the helicopter at the moment when its engine is switched off assuming that velocity of sound is 320 m/s.

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24. A body A, oFIGURE m=0.1 kg has a initial velocity oFIGURE $3\hat{i}kms^{-1}$. It collides elastically with another body. B oFIGURE the same mass which has an initial velocity oFIGURE $5\hat{j}ms^{-1}$. AFIGUREter collision, A moves with a velocity $\overrightarrow{v} = 4\left(\hat{i} + \hat{j}\right)$. The energy oFIGURE B aFIGUREter collision is written as $\dfrac{x}{10}J$. The value oFIGURE x is _.

25. If potential energy function for the force between two atoms in a diatomic molecule is approximately given by $U(x) = \dfrac{a}{x^8} - \dfrac{b}{x^4}$, where a and b are constants in standard SI units and x in meters. Find the dissociation energy of the molecule (in J).

$\left[\text{Take a } = 4 \text{ J m}^8 \text{ and } b = 20 \text{ J m}^4 \right]$