PHYSICS

NTA MOCK TESTS ENGLISH

NTA JEE MOCK TEST 99

Physics

1. The coefficient of linear expansion of an inhomogeneous rod changes linearly from α_1 to α_2 from one end to the other end of the rod. The effective coefficient of linear expansion of rod is :

A. $\alpha_1 + \alpha_2$

B. $\dfrac{\alpha_1 + \alpha_2}{2}$

C. $\sqrt{\alpha_1 \alpha_2}$

D. $\alpha_1 - \alpha_2$

Answer: B

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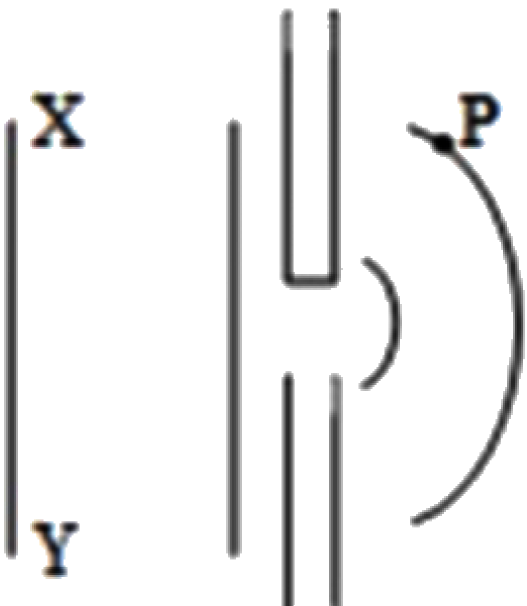
2. A monochromatic plane wave of speed c and wavelength λ is diffracted at a small aperture . The diagram illustrates successive wavefront. After what time will some portion of the wavefront XY reach P ?



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

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

C. $\frac{3\lambda}{c}$

D. $\frac{4\lambda}{c}$

Answer: C

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3. The x-z plane separates two media A and B of refractive indices $\mu_1 = 1.5$ and $\mu_2 = 2$. A ray of light travels from A to B. Its directions in the two media are given by unit vectors

$u_1 = a\hat{i} + b\hat{j}$ and $u_2 = c\hat{i} + a\hat{j}$. Then

A. $\frac{a}{c} = \frac{4}{3}$

B. $\frac{a}{c} = \frac{3}{4}$

C. $\frac{b}{d} = \frac{4}{3}$

D. $\frac{b}{d} = \frac{3}{4}$

Answer: A

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4. A particle executing SHM has a maximum speed of 0.5m s^{-1} and a maximum acceleration of $1.0 \ \text{m s}^{-2}$. The angular frequency of oscillation is

A. $2rads^{-1}$

B. $0.5rads^{-1}$

C. $2\pi rads^{-1}$

D. $0.5\pi rads^{-1}$

Answer: A

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5. A small sphere of mass m is suspended by a thread of length l. It is raised upto the height of suspension with thread fully stretched and released. Then, the maximum tension in thread will be

A. $g\sqrt{1+3\cos^2\theta}$

B. $g\sqrt{1+\cos^2\theta}$

C. $g\sqrt{1+\sin^2\theta}$

D. $g\sqrt{1+3\sin^2\theta}$

Answer: A

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6. The surface of a metal is illuminated with the light of 400nm. The kinetic energy of the ejected photoelectrons was found to be $1.68eV$. The work function of the metal is $(hc = 1240eVnm)$

A. 1.51 eV

B. 1. 42 eV

C. 3.0 eV

D. 1.68 eV

Answer: B

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7. The cylindrical tube of a spray pump has a cross-section of $8cm^2$ one end of which has 40 fine holes each of area If the liquid flows inside the tube with a speed of $0.15mmin^{-1}$, the speed with which the liquid is ejected through the holes is x m/s. Find x.

A. $50ms^{-1}$

B. $5ms^{-1}$

C. $0.05ms^{-1}$

D. $0.5ms^{-1}$

Answer: B

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8. There are two waves having wavelength 100 cm and 101 cm and same velocity $303ms^{-1}$. The beat frequency is

A. 4 Hz

B. 1 Hz

C. 3 Hz

D. 2 Hz

Answer: C

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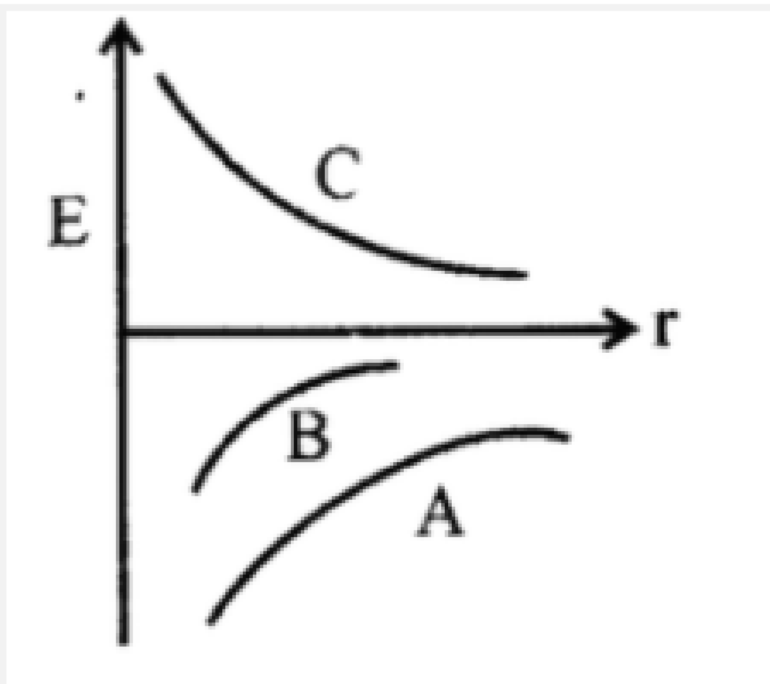
9. An artificial satellite is made to move in circular orbits of different radii around the earth. The variations of its K.E., P.E. and total energy (E) in different orbits is shown in the figure by different curves. Then for the satellites



A. A represents the K.E., B & C the P.E. and C the total energy

B. A represents the P.E., B & C the K.E. and C the total energy

C. A represents the P.E., B the total energy and C the K.E.

D. A represents the total energy, B the K.E. and C the P.E.

Answer: C

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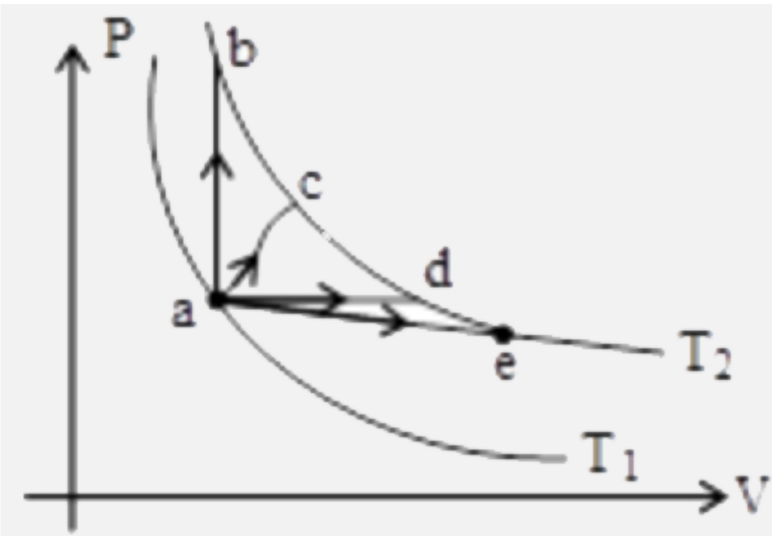
10. The figure shows two isotherms at temperatures T_1 and T_2. A gas is taken from one isotherm to another isotherm through different processes. Then change in internal energy ΔU has a relation -



A. $\Delta U_{ab} > \Delta U_{ac} > \Delta U_{ad} > \Delta U_{ae}$

B. $\Delta U_{ab} = \Delta U_{ac} > \Delta U_{ad} > \Delta U_{ae}$

C. $\Delta U_{ab} = \Delta U_{ac} = \Delta U_{ad} = \Delta U_{ae}$

D. $\Delta U_{ab} < \Delta U_{ac} < \Delta U_{ad} < \Delta U_{ae}$

Answer: C

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11. A uniform solid cylindrical roller of mass 'm' is being pulled on a horizontal surface with force F parallel to the surface and applied at its centre. If the acceleration of the cylinder is 'a' and it is rolling without slipping, then the value of 'F' is : —

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

B. 2ma

C. $\frac{5}{3}ma$

D. ma

Answer: A

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12. Two spherical black bodies of radii r_1 and r_2 and with surface temperatures T_1 and T_2 respectively radius the same power . Then, $\frac{r_1}{r_2}$ must be equal to

A. $\frac{T_1}{T_2}$

B. $\frac{T_1}{T_2}$

C. $\left(\frac{T_1}{T_2}\right)^2$

D. $\left(\frac{T_2}{T_1}\right)^2$

Answer: C

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13. A particle moves in space along the path $z = ax^3 + by^2$ in such a way that $\frac{dx}{dt} = c = \frac{dy}{dt}$ where a, b and c are constants. The acceleration of the particle is

A. $\left(6ac^2x + 2bc^2\right)\hat{k}$

B. $\left(2ax^2 + 6by^2\right)\hat{k}$

C. $\left(4bc^2x + 3ac^2\right)\hat{k}$

D. $\left(bc^2x + 2by\right)\hat{k}$

Answer: A

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14. The radius of the Earth is 6400 km. If the height of an antenna is 500 m, then its range is

A. 800 km

B. 100 km

C. 80 km

D. 10 km

Answer: C

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15. The deceleration exerienced by a moving motor blat, after its engine is cut-off is given by $dv/dt = -kv^3$, where k is constant. If v_0 is the magnitude of the velocity at cut-off, the magnitude of the velocity at a time t after the cut-off is.

A. $\dfrac{v_0}{2ktv_0^2}$

B. $\dfrac{v_0}{1+2ktv_0^2}$

C. $\dfrac{v_0}{\sqrt{1 - 2kv_0^2}}$

D. $\dfrac{v_0}{\sqrt{1 + 2ktv_0^2}}$

Answer: D

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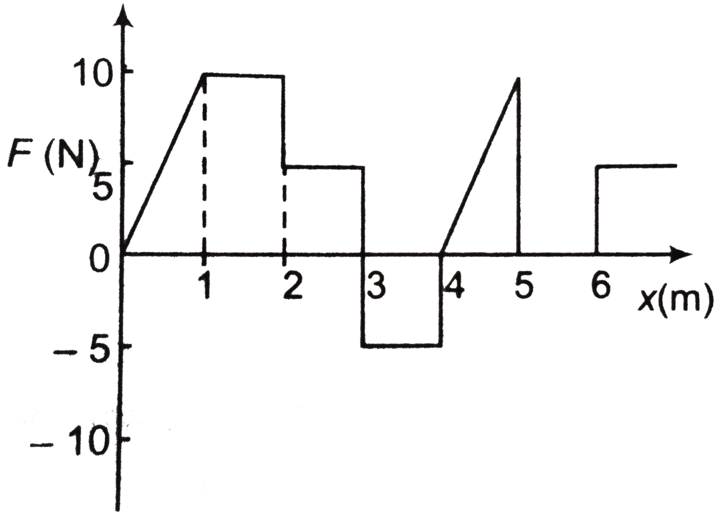
16. The relationship between the force F and position x of body is as shown in figure. The work done in displacing the body in displacing the body from ($x = 1m$ to $x = 5m$) will be



A. 30 J

B. 15 J

C. 25 J

D. 20 J

Answer: D

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17. Let $\lambda_{\propto}\lambda_{\beta}\text{and}\lambda_{\alpha}$ denote the wavelength of the X-rays of the $K_{\propto}K_{\beta}\text{and}L_{\alpha}$ lines in the characteristic X-rays for a metal

A. $\frac{1}{\lambda_{\beta}}=\frac{1}{\lambda_{\alpha}}+\frac{1}{\lambda'_{\alpha}}$

B. $\frac{1}{\lambda'_{\alpha}}=\frac{1}{\lambda_{\alpha}}+\frac{1}{\lambda_{\beta}}$

C. $\frac{1}{\lambda_{\alpha}}=\frac{1}{\lambda_{\beta}}+\frac{1}{\lambda'_{\alpha}}$

D. $\lambda_{\alpha}=\lambda_{\beta}+\lambda'_{\alpha}$

Answer: A

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18. The values of two resistors are $R_1 = (6 \pm 0.3)k\Omega$ and $R_2 = (10 \pm 0.2)k\Omega$. The percentage error in the equivalent resistance when they are connected in parallel is

A. 2%

B. `3.125%

C. 7%

D. $10.125\ \%$

Answer: D

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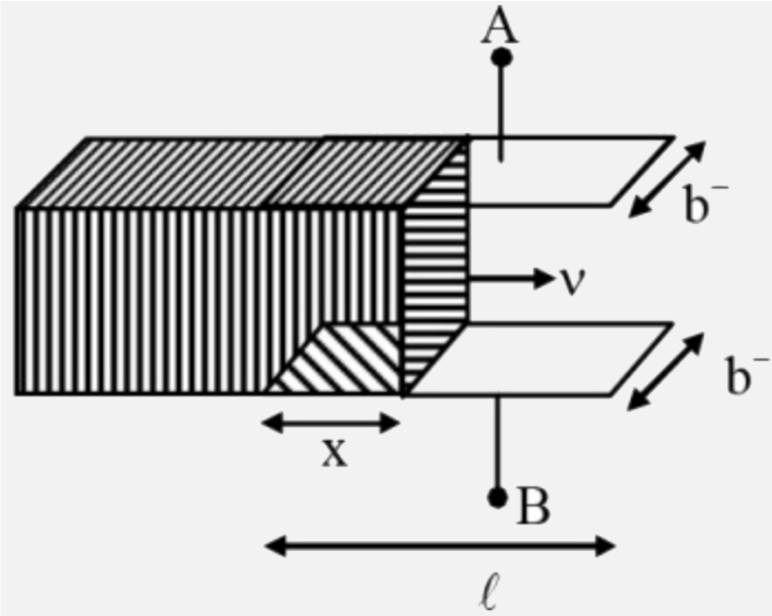
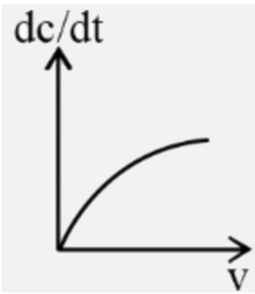
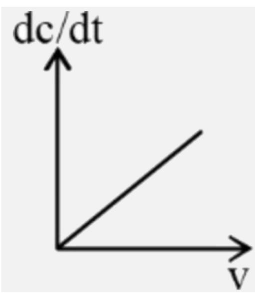
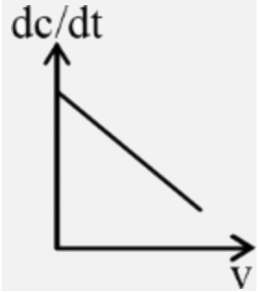
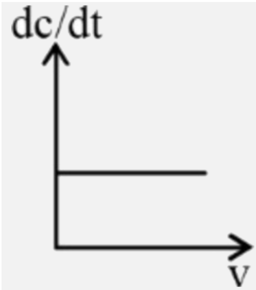
19. If the slab is brought inside the parallel plate capacitor with a speed v. Then the variation of with respect to v is = Rate change of capacitance) -



A. 

B. 

C. 

D. 

Answer: B

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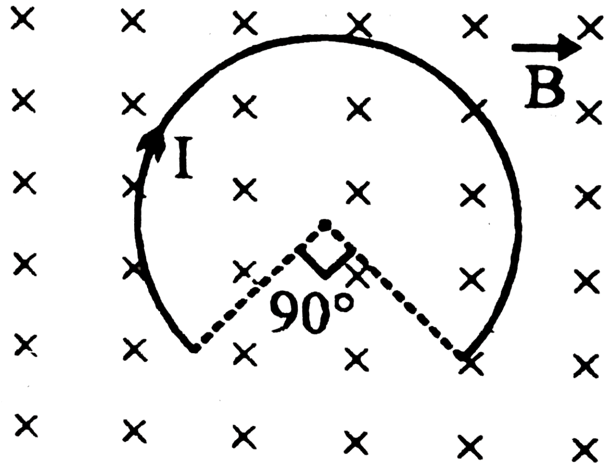
20. An arc of a circular loop of radius R is kept in the horizontal plane and a constant magnetic field B is applied in the vertical direction as shown in the figure . If the arc carries current I then find the force on the arc



A. IRB

B. $\frac{IRB}{4}$

C. $\sqrt{2}IRB$

D. $\frac{IRB}{\sqrt{2}}$

Answer: C

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21. Two blocks of masses $10kg$ and $4kg$ are connected by a spring of negligible mass and placed on a frictionless horizontal surface. An impulse gives a velocity of $14m/s$ to the heavier block in the direction of the lighter block. The velocity of the centre of mass is

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22. Two wires that are made up of two different materials whose specific resistances are in the ratio 2 : 3 length 3 : 4 and area 4 : 5 The ratio of their resistance is -

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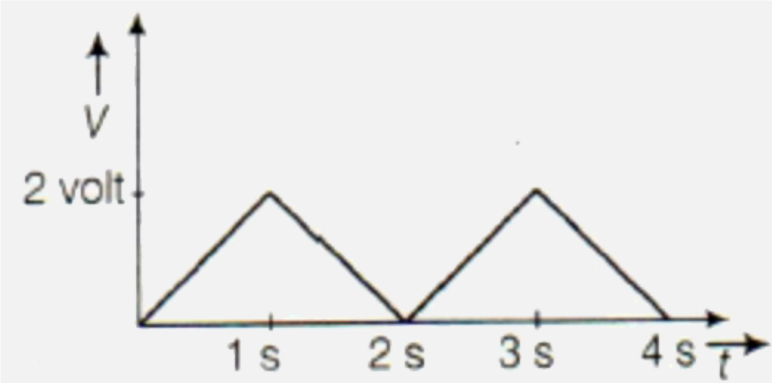
23. If the rms value of the voltage of the waveform shown below is $\sqrt{\frac{p}{q}V}$, then what is the value of $(p+q)$? (p and q are the smallest positive integers.)



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24. In a meter-bridge experiment with a resistance R_1 in left gap and a resistance X in a right gap. null point is obtained at $40cm$ from the left emf. With a resistance R_2 in the left gap, the null point is obtainned at $50cm$

from left hand. Find the position of the left gap is containing R_1 and R_2 (i) in series and (ii) in parallel.

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25. Cobalt-57 is radioactive, emitting $\beta -$ particles.The half-life for this is 270 days. If 100 mg of this is kept in an open container, then what mass (in mg) of Cobalt-57 will remain after 540 days ?

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