PHYSICS

BOOKS - NTA MOCK TESTS

NTA JEE MOCK TEST 77

Physics

1. For sodium light, the two yellow lines occur at λ_1 and λ_2 wavelengths. If the mean of these two is 6000Å and $|\lambda_2 - \lambda_1| = 6\text{Å}$, then the approximate energy difference between the two levels corresponding to λ_1 and λ_2 is

A. $2 \times 10^{-3} eV$

B. $2eV$

C. $2000eV$

D. $2 \times 10^{-6} eV$

Answer: A

Watch Video Solution

2. A particle moves in the x-y plane under the action of a force $\vec{F}$ such that the value of its linear momentum $\vec{P}$ at any time t is $P_x = 2$ cost and $p_y = 2 \sin t$. What is the angle θ between $\vec{F}$ and P at a given time t?

A. 90°

B. 0°

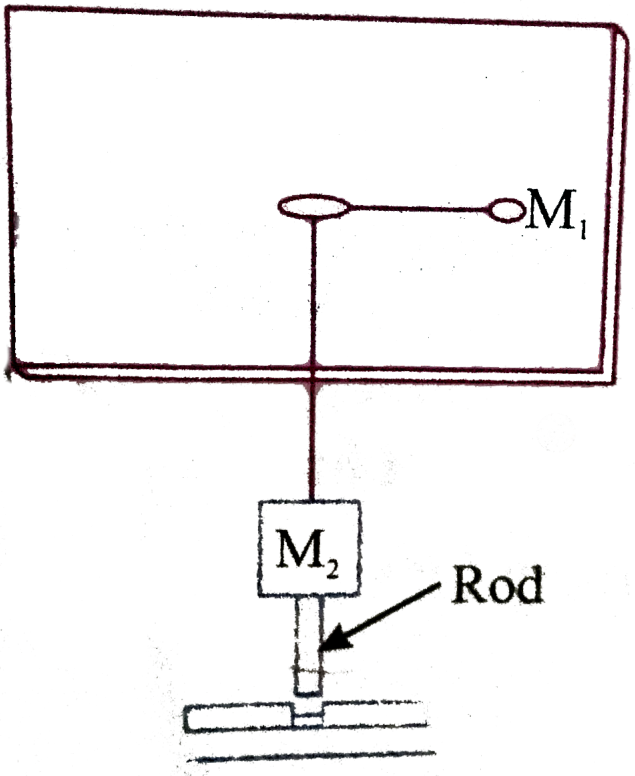
C. 180°

D. 30°

Answer: A

Watch Video Solution

3. For the arrangement in the Figure, the particle M_1 attached to one end of string which moves on a horizantal table in a circle of radius $\frac{l}{2}$ (where l is the length of the string) with constant angular speed ω. The other end of the string attached to to mass M_2 which rest on a vertical rod. When the rod collapse, the acceleration of mass M_2 at that instant



A. g

B. $\frac{\omega^2 l}{2}$

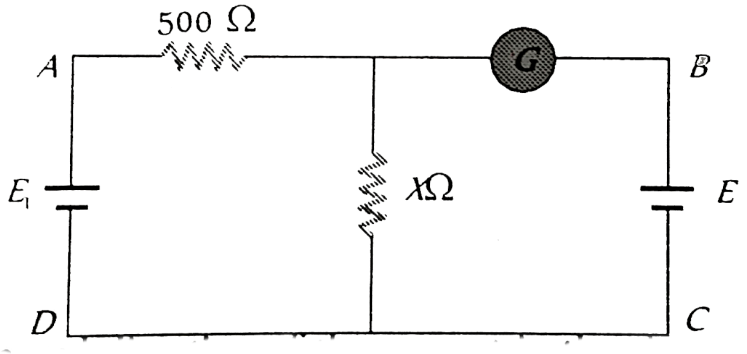
C. $\frac{2M_2g - M_1l\omega^2}{2(M_1 + M_2)}$

D. $\frac{M_2g + M_1l\omega^2}{M_1 + M_2}$

Answer: C

Watch Video Solution

4. In the adjoining circuit, the battery E_1 has an e.m.f me of 12 volt and zero internal resistance while the battery E has an e.m.f me of 2volt . If the galvanometer G reads zero, then the value of the resistance X in ohm is



A. 200

B. 500

C. 100

D. 10

Answer: C

Watch Video Solution

5. If a small sphere of mass m and charge q is hanged from a silk thread at an angle θ with the surface of a vectical charged conductinb plate, then for equilibrium of sphere the surface charge density of the plate -

A. $\frac{\varepsilon_0 mg\tan\theta}{q}$

B. $(2\varepsilon_0 mg\tan\theta)$/q

C. $\varepsilon_0 mgq\tan\theta$

D. $\frac{\varepsilon_0 mg\tan\theta}{3q}$

Answer: B

Watch Video Solution

6. Two thin wire rings each having a radius R are placed at a distance d apart with their axes coiciding. The charges on the two rings are $+q$ and $-q$. The potential difference between the centres of the two rings is

A. $\frac{qR}{4\pi\varepsilon_0 d^2}$

B. $\frac{q}{2\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$

C. zero

D. $\frac{q}{4\pi\varepsilon_0}\left[\frac{1}{R}-\frac{1}{\sqrt{R^2+d^2}}\right]$

Answer: B

Watch Video Solution

7. Given below are the equations of motion of four particles A, B, C and D

$x_A = 6t - 3, x_B = 4t^2 - 2t + 3, x_C = 3t^3 - 2t^2 + t - 7, x_D = 7\cos 60^\circ -$

The particle moving with constant acceleration is

A. A

B. B

C. C

D. D

Answer: B

Watch Video Solution

8. Imagine a light planet revolving around a very massive star in a circular orbit of radius R with a period of revolution T. if the gravitational force of attraction between the planet and the star is proportational to $R^{-5/2}$, then

(a) T^2 is proportional to R^2

(b) T^2 is proportional to $R^{7/2}$

(c) T^2 is proportional to $R^{3/3}$

(d) T^2 is proportional to $R^{3.75}$.

A. $r^{3/2}$

B. $r^{5/3}$

C. $r^{7/4}$

D. r^3

Answer: C

Watch Video Solution

9. A cylindrical rod with one end in a steam chamber and the other end in ice results in melting of 0.1 g of ice per second. If the rod is replaced by another with half the length and double the radius of the first and if the thermal conductivity of material of second rod is 1/4 that of first, the rate at which ice melts in g/s will be

A. 3.2

B. 1.6

C. 0.2

D. 0.1

Answer: C

Watch Video Solution

10. An ideal gas heat engine operates in a Carnot's cycle between $227^\circ C$ and $127^\circ C$. It absorbs $6 \times 10^4 J$ at high temperature. The amount of heat converted into work is

A. $1.6 \times 10^4 J$

B. $1.2 \times 10^4 J$

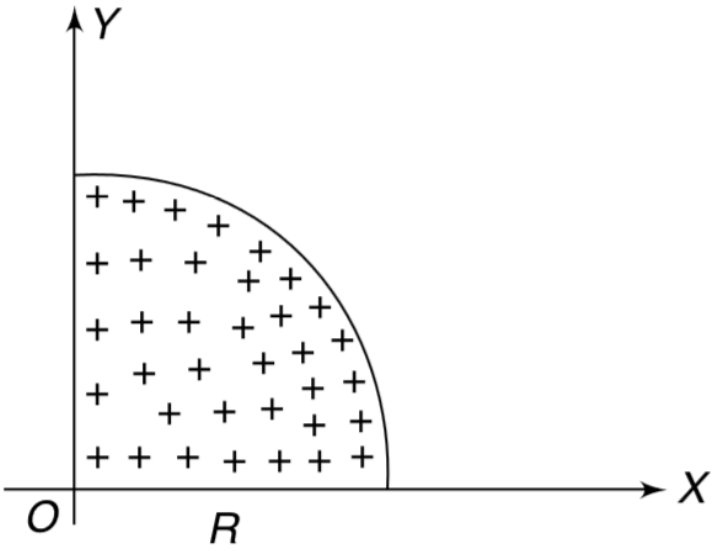
C. $4.8 \times 10^4 J$

D. $3.5 \times 10^4 J$

Answer: B

Watch Video Solution

11.



The quarter disc of radius R (see figure) has a uniform surface charge density σ.

(a) Find electric potential at a point (O,O,Z)

(b). Find the Z component of electrif field at (O,O,Z)

A. $\frac{\sigma}{8\varepsilon_0}\left[1-\frac{Z}{\sqrt{R^2+Z^2}}\right]$

B. $\frac{\sigma}{4\varepsilon_0}\left[\left(\sqrt{R^2+Z^2}\right)+Z\right]$

C. $\frac{\sigma}{8\varepsilon_0}\left[\sqrt{R^2+Z^2}-Z\right]$

D. $\frac{\sigma}{8\varepsilon_0}\left[\frac{Z}{\sqrt{R^2+Z^2}}\right]$

Answer: C

Watch Video Solution

12. The trajectory of a projectile in a vertical plane is $y = ax - bx^2$, where a and b are constant and x and y are, respectively, horizontal and vertical distances of the projectile from the point of projection. The maximum height attained by the particle and the angle of projectile from the horizontal are.

A. $\frac{a^2}{4b}, \tan^{-1}(b)$

B. $\frac{a^2}{b}, \tan^{-1}(2b)$

C. $\frac{a^2}{4b}, \tan^{-1}(a)$

D. $\frac{2a^2}{b}, \tan^{-1}(a)$

Answer: C

Watch Video Solution

13. A radioactive sample of half life 10 days contains 1000X nuclei. Number of original nuclei present after 5 days is

A. 707 x

B. 750 x

C. 500 x

D. 250 x

Answer: A

Watch Video Solution

14. A uniform wire of length L, diameter D and density ρ is stretched under a tension T. The correct relation between its fundamental frequency f, the length L and the diameter D is

A. $f \propto \frac{1}{LD^2}$

B. $f \propto \frac{1}{D^2}$

C. $f \propto \frac{1}{LD}$

D. $f \propto \frac{1}{L\sqrt{D}}$

Answer: C

Watch Video Solution

15. The work done in increasing the radius of a soap bubble from R to 3 R is

A. $64\pi SR^2$

B. $\frac{18\pi SR^2}{3}$

C. $8\pi SR^2$

D. $16\pi SR^2$

Answer: A

Watch Video Solution

16. The eye can be regarded as a single refracting surface is equal to that of cornea (7.8 mm). This surface separates two media of refractive indices 1 and 1.34. Calculate the distance from the refracting surface at which a parallel beam of light will come to focus.

A. 4.0 cm

B. 1 cm

C. 2 cm

D. 3.07 cm

Answer: D

Watch Video Solution

17. A uniform, thin cylindrical shell and solid cylinder roll horizontally without slipping. The speed of the cylindrical shell is v. The solid cylinder and the hollow cylinder encounter an incline that they climb without

slipping. If the maximum height they reach is the same, find the intial speed v' of the solid cylinder.

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

B. $\sqrt{\frac{3}{4}}v$

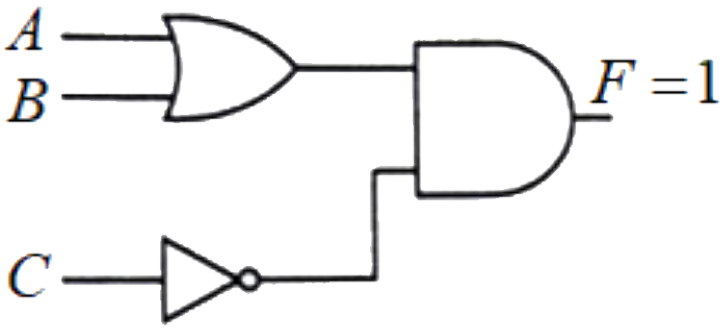
C. $\sqrt{\frac{3}{5}}v$

D. $\sqrt{\frac{5}{3}}v$

Answer: A

Watch Video Solution

18. For given logic diagram, outupt F = 1, then inputs are



A. A = 0, B = 0, C = 0

B. A = 0, B = 1, C = 0

C. A = 0, B = 1, C = 1

D. A = 0, B= 0, C = 1

Answer: B

Watch Video Solution

19. If unit of length, mass and time each be doubled, the new unit of work done is _____ times the old unit of work

A. 4

B. 6

C. 8

D. 2

Answer: D

Watch Video Solution

20. Two identical piano strings of length 0.750 m are each, tuned exactly to 500 Hz. The tension in one of the strings is then increased by $21\ \%$. If they are now struck, what is the beat frequency between the fundamental mode of the two strings?

A. 45

B. 50

C. 60

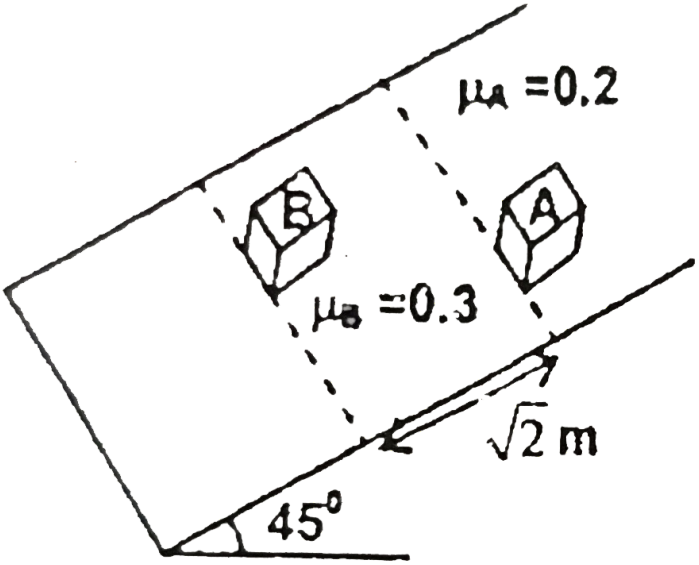
D. 40

Answer: B

Watch Video Solution

21. Two identical blocks A and B are placed on a rough inclined plane of inclination 45°. The coefficient of friction between block A and incline is

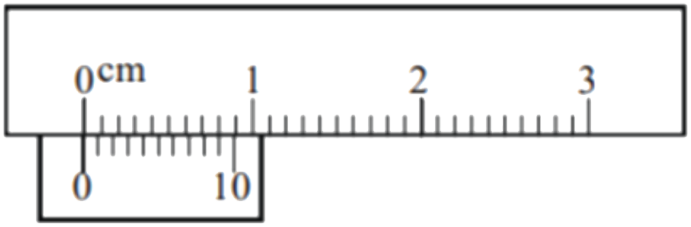
0.2 and that of between B and incline is 0.3. The initial separation between the two blocks is $\sqrt{2}m$. The two blocks are released from rest, then find the time (in sec) after which front faces of both blocks come in same line.



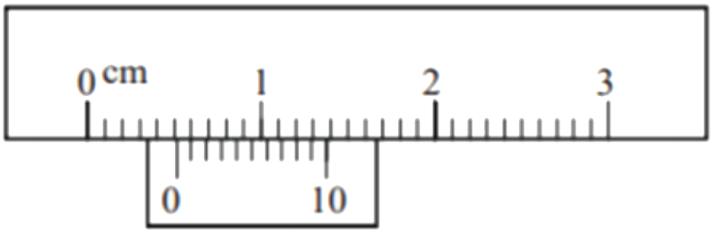
Watch Video Solution

22. The man scale of a Vernier Callipers reads in millimeter and its vernier is divided into 10 divisions which coincides with 9 divisions of the main scale. The length of the object for situation is found to be mm. Find the

value of x.



When not in use



When in use

Watch Video Solution

23. The radiation emitted by the surface of the Sun emits maximum power at a wavelength of about 500 nm. Assuming the Sun to be a blackbody emitter. If its surface temperature (K) is given by $\alpha . B\eta \times 10^{\gamma}$ then fill the value of $(\alpha + \beta + \gamma)$. (Wien's constant is given by 2.898mm K)

Watch Video Solution

24. In Young's double slit experiment, how many maxima can be obtained on a screen (including central maxima). If $d = \frac{5\lambda}{2}$ (where λ is the wavelength of light)?

Watch Video Solution

25. A small object of mass of 100 g moves in a circular path. At a given instant velocity of the object is $10\hat{i}m/s$ and acceleration is $\left(20\hat{i} + 10\hat{j}\right)m/s^2$. At this instant of time, rate of change of kinetic energy (in $\mathrm{kg\,m^2}s^{-3}$) of the object is

Watch Video Solution