# PHYSICS

# BOOKS - NTA MOCK TESTS

# NTA JEE MOCK TEST 54

## Physics

**1.** A bullet is fired from a gun. The force on the bullet is given by $F = 600 - 2 \times 10^5$ t, where F is in newtons and t in seconds. The force on

the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?

A. 1.8 N s

B. 18 N s

C. 9 N s

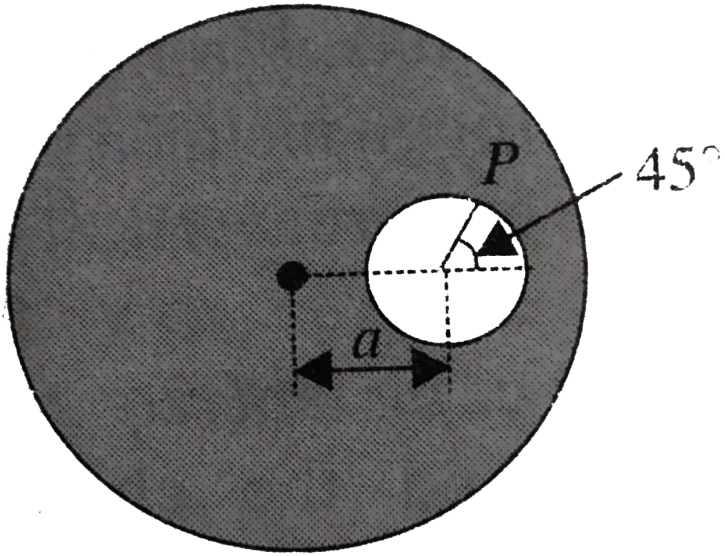
D. 0.9 N s

**Answer: D**

 Watch Video Solution

**2.** A cavity of radius r is made inside a solid sphere. The volume charge density of the remaining sphere is $\rho$. An electron (charge e, mass m) is released inside the cavity from point P as shown in figure. The centre of sphere and center of cavity are separated by a distance a. The time after which the electron

again touches the sphere is




A. $\sqrt{\frac{6\sqrt{2}r\varepsilon_0 m}{e\rho a}}$

B. $\sqrt{\frac{6\sqrt{2}\varepsilon_0 m}{6\rho a}}$

C. $\sqrt{\frac{6r\varepsilon_0 m}{e\rho a}}$

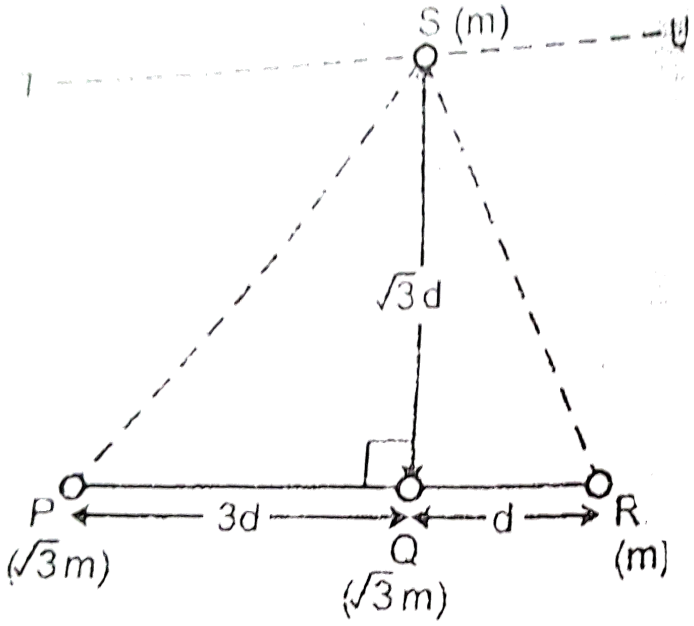
D. $\sqrt{\frac{r\varepsilon_0 m}{e\rho a}}$

**Answer: A**

Watch Video Solution

**3.** Three particales $P, Q$ and $R$ are placedd as per given Masses of $P, Q$ and $R$ are $\sqrt{3}m\sqrt{3}m$ and m respectively The gravitational force on a fourth particle 'S' of

mass m is equal to




A. $\frac{\sqrt{3}Gm^2}{2d^2}$ is ST direction only

B. $\frac{\sqrt{3}Gm^2}{2d^2}$ in SQ directon and $\frac{\sqrt{3}Gm^2}{2d^2}$ in SU direction

C. $\frac{\sqrt{3}Gm^2}{2d^2}$ in SQ direction only

D. $\frac{\sqrt{3}Gm^2}{2d^2}$ in SQ direction and $\frac{\sqrt{3}Gm^2}{2d^2}$ in ST direction

**Answer: C**

Watch Video Solution

**4.** A liquid of density $0.85g/cm^3$ flows through a calorimeter at the rate of $8.0cm^2/s$. Heat is added by means of a 250 W electric heating coil and a temperature difference of $15^\circ C$ is established in steady state conditions

between the inflow and the outflow points of the liquid. The specific heat for the liquid will be

A. $0.6\ \text{kcal kg}^{-1}K^{-1}$

B. $0.3\ \text{kcal kg}^{-1}K^{-1}$

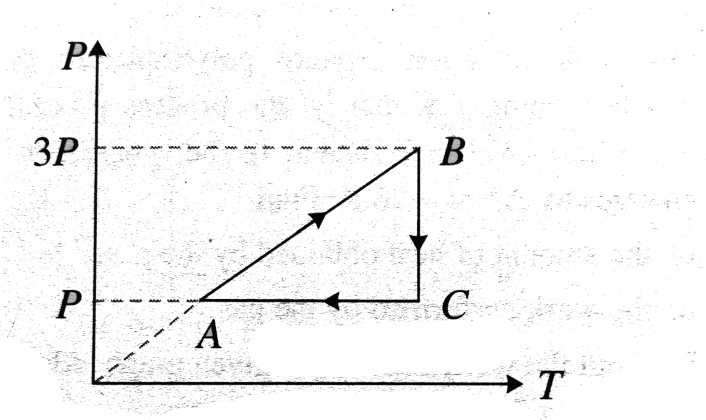
C. $0.5\ \text{kcal kg}^{-1}K^{-1}$

D. $0.4\ \text{kcal kg}^{-1}K^{-1}$

**Answer: A**

Watch Video Solution

**5.** A fixed mass of oxygen gas performs a cyclic process ABCA as shown. Find the efficiency of the process.




A. $\dfrac{3\ln(3)-2}{5+3\ln(3)}$

B. $\dfrac{(3\ln(4)-2)}{4+5\ln(3)}$

C. $\dfrac{3\ln(3)-1}{5+3\ln(4)}$

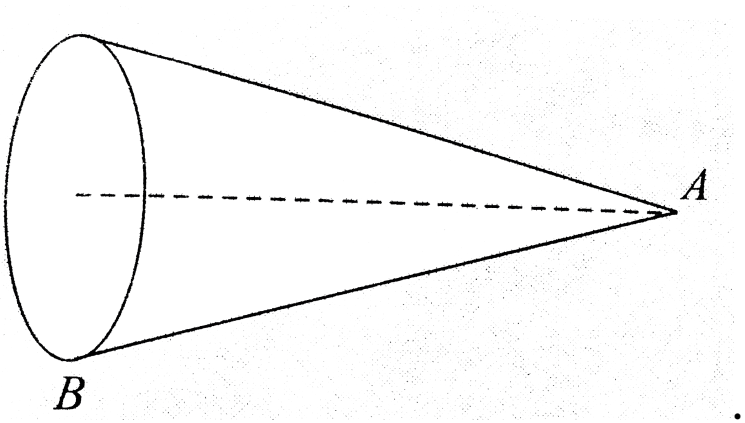
D. $\dfrac{3\ln(3)-1}{6+3\ln(4)}$

**Answer: A**

 Watch Video Solution

**6.** A cone made of insulating material has a total charge Q spread uniformly over its sloping surface. Calculate the energy required to take a test charge q from infinity to apex A

of cone. The slant length is L.




A. $\frac{Qq}{2\pi\varepsilon_0 L}$

B. $\frac{Qq}{4\pi\varepsilon_0 L}$

C. $-\frac{Qq}{3\pi\varepsilon_0 L}$

D. $\frac{Qq}{8\pi\varepsilon_0 L}$

**Answer: A**

Watch Video Solution

**7.** Rain, driven by the wind, falls on a railway compartment with a velocity of $20ms^{-1}$, at an angle of $30^{\circ}$ to the vertical. The train moves, along the direction of wind flow, at a speed of $108kmh^{-1}$. Determine the apparent velocity of rain for a person sitting in the train.

A. $20\sqrt{7}ms^{-1}$

B. $10\sqrt{7}ms^{-1}$

C. $15\sqrt{7}ms^{-1}$

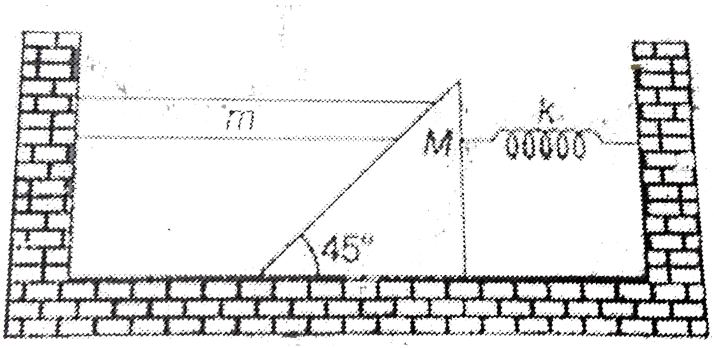
D. $10\sqrt{7}kmh^{-1}$

**Answer: B**

Watch Video Solution

**8.** All surfaces shown in figure are smooth system is released with the spring unstretched In equilibrium, compression in the spring will

be




A. $\frac{mg}{\sqrt{2}k}$

B. $\frac{2mg}{k}$

C. $\frac{(M+m)g}{\sqrt{2}k}$

D. $\frac{mg}{k}$

**Answer: D**

Watch Video Solution

**9.** Half-life of radioactive sample, when activity of material initially was 8 counts and after 3 hours it becomes 1 count is

A. 2 h

B. 1 h

C. 3 h

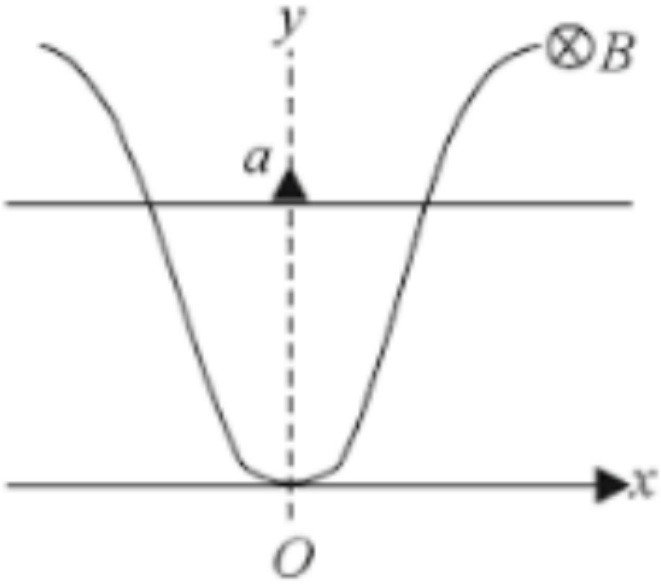
D. 4 h

**Answer: B**

Watch Video Solution

**10.** A wire bent as a parabola $y = kx^2$ is located in a uniform magnetic field of induction B, the vector B being perpendicular to the plane $xy$. At $t = 0$, the sliding wire starts sliding from the vertex O with a constant acceleration a linearly as shown in

Fig. Find the emf induced in the loop -




A. $By\sqrt{(2a)k}$

B. $By\sqrt{\frac{4a}{k}}$

C. $By\sqrt{\frac{8a}{k}}$

D. $By\sqrt{\frac{a}{k}}$

**Answer: C**

Watch Video Solution

**11.** The radiation emitted when an electron jumps from $n = 3 \rightarrow n = 2$ orbit in a hydrogen atom falls on a metal to produce photoelectron. The electron from the metal surface with maximum kinetic energy are made to move perpendicular to a magnetic field of $(1/320)T$ in a radius of $10^{-3}m$. Find (a) the kinetic energy of the electrons, (b)

Work function of the metal , and (c) wavelength of radiation.

A. 1.03 eV

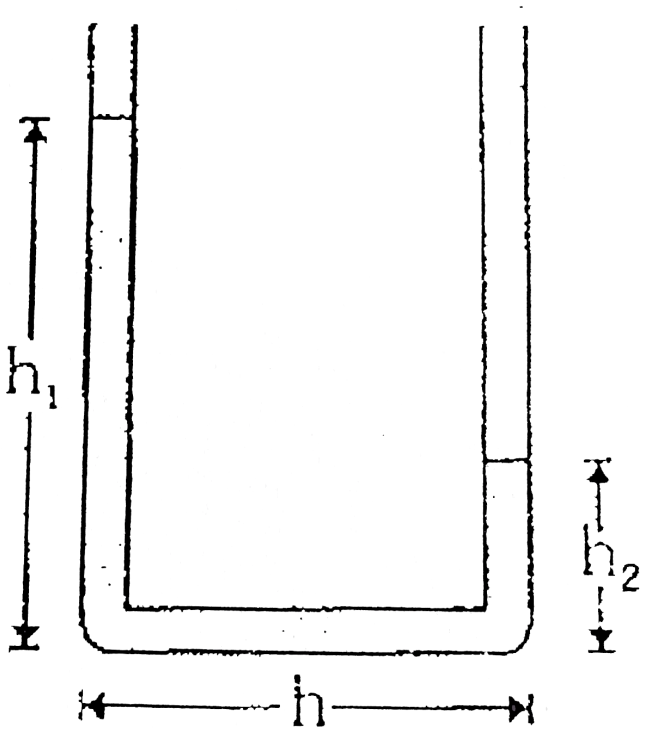
B. 1.89 eV

C. 0.86 eV

D. 2.03 eV

**Answer: A**

Watch Video Solution




**12.**

The U-tube shown has uniform cross-section A liquid is filled in the two arms up to height $h_1$ and $h_2$ and then the liquid is allowed to move neglect viscosity and surface tension. When

the levels equalize in the two arms, the liquid will

A. Be at rest

B. Be moving with an acceleration of $\left(\frac{h_1 - h_2}{h_1 + h_2 + h}\right)$

C. Be moving with a velocity of $(h_1 - h_2)\sqrt{\frac{g}{2(h_1 + h_2 + h)}}$

D. Exert a net force to the right on the tube.

**Answer: C**

Watch Video Solution

**13.** A ray of light is incident on a surface of glass slab at an angle $45^\circ$. If the lateral shift produced per unit thickness is $1/\sqrt{3}$, the angle of refraction produced is

A. $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

B. $\tan^{-1}\left(1-\sqrt{\frac{2}{3}}\right)$

C. $\sin^{-1}\left(1-\sqrt{\frac{2}{3}}\right)$

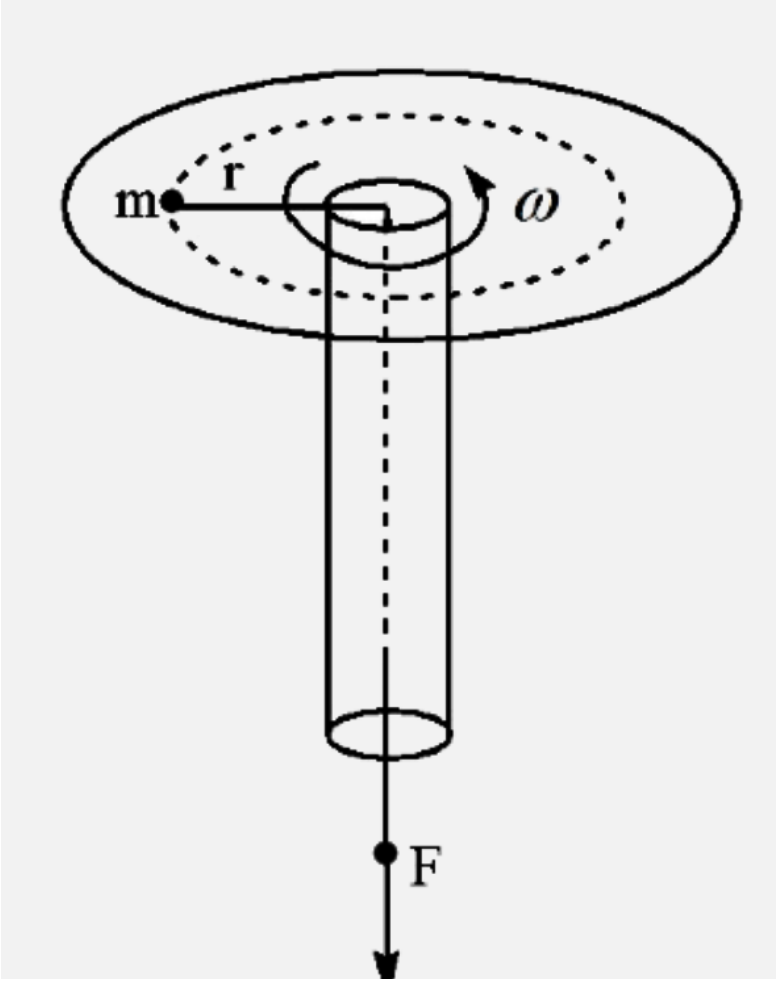
D. $\tan^{-1}\left(\sqrt{\frac{2}{\sqrt{3}-1}}\right)$

**Answer: B**

Watch Video Solution

**14.** A small particle of mass m and its retaining cord is spinning with angular velocity $\omega$ on the horizontal suface of a smooth disc. As force F is slightly relaxed, r increases and $\omega$ changes. Determine the rate of change of $\omega$ with

respect to r




A. $+\frac{\omega}{r}$

B. $-\frac{\omega}{r}$

C. $-\frac{2\omega}{r}$

D. $+\frac{2\omega}{r}$

**Answer: C**

Watch Video Solution

**15.** The carrier frequency generated by a tank circuit containing $1nF$ capacitor and $10\mu H$ inductor is

A. 1592 Hz

B. 1592 kHz

C. 159.2 Hz

D. 15.92 kHz

**Answer: B**

 Watch Video Solution

**16.** A ideal gas $(\gamma = 1.5)$ is expanded adiabatically. How many times has the gas to be expanded to reduce the root mean square velocity of molecules $2.0$ times

A. 4 times

B. 16 times

C. 8 times

D. 2 times

**Answer: B**

Watch Video Solution

**17.** The quantities $A$ and $B$ are related by the relation $A/B = m$, where $m$ is the linear

mass density and $A$ is the force , the dimensions of $B$ will be

A. Same as that of latent heat

B. Same as that of pressure

C. Same as that of work

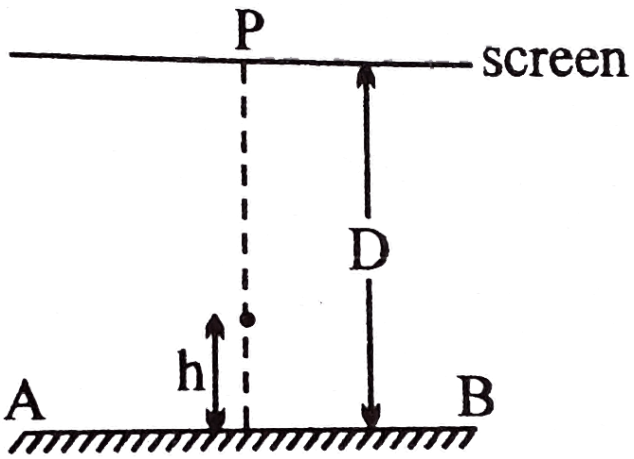
D. Same as that of momentum

**Answer: A**

Watch Video Solution

**18.** A point sources $S$ emitting light of wavelength $600nm$ is placed at a very small height $h$ above the flat reflecting surface $AB$ (see figure).The intensity of the reflected light is$36\ \%$ of the intensity.interference firnges are observed on a screen placed parallel to the reflecting surface a very large distance $D$ from it.

(A)What is the shape of the interference fringes on the screen?




(B)Calculate the ratio of the minimum to the maximum to the maximum intensities in the interference fringes fromed near the point $P$ (shown in the figure) (c) if the intenstities at point $P$ corresponds to a maximum,calculate the minimum distance through which the reflecting surface $AB$ should be shifted so

that the intensity at $P$ again becomes maximum.

A. 300 nm

B. 200 nm

C. 400 nm

D. None of these

**Answer: A**

Watch Video Solution

**19.** A string of mass per unit length $\mu$ is clamped at both ends such that one end of the string is at x = 0 and the other is at $x = l$. When string vibrates in fundamental mode, amplitude of the midpoint O of the string is a, tension in a, tension in the string is T and amplitude of vibration is A. Find the total oscillation energy stored in the string.

A. $\frac{\pi^2 a^2 T}{4L}$

B. $\frac{\pi a T}{2L}$

C. $-\frac{\pi_2 a_2 T}{3L}$

D. $\frac{\pi^2 aT}{6L}$

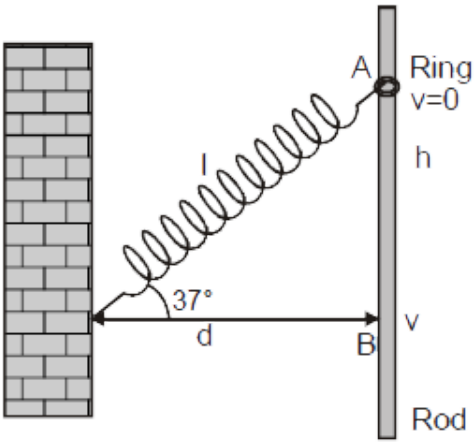
**Answer: A**

Watch Video Solution

**20.** One end of a light spring of natural length d and spring constant k is fixed on a rigid wall and the other is attached to a smooth ring of mass m which can slide without friction on a vertical rod fixed at a distance d from the wall. Initially the spring makes an angle of $37^\circ$ with

the horizontal as shown in fig. When the system is released from rest, find the speed of the ring when the spring becomes horizontal.

[ sin $37^\circ$ = 3/5]




A. $dqrt\left(\frac{3g}{2d}+\frac{k}{16m}\right)$

B. $d\sqrt{\frac{2g}{3d}-\frac{k}{21m}}$

C. $d\sqrt{-\frac{4g}{2d}+\frac{k}{12m}}$

D. $d\sqrt{-\frac{8g}{4d}+\frac{k}{28m}}$

**Answer: A**

Watch Video Solution

**21.** Which state of the triply ionized Beryllium $\left(Be^{3+}\right)$ has the same orbit radius as that of the ground state of hydrogen atom?

Watch Video Solution

**22.** IN a rotor, a hollow vertical cylindrical structure rotates about its axis and a person rests against he inner wall. At a particular speed of the rotor, the floor below the person is removed and the person hangs resting against the wall without any floor. If the radius of the rotor is 2m and the coefficient of static friction between the wall and the person is 0.2, find the minimum speed at which the floor may be removed Take $g = 10\frac{m}{s^2}$.

Watch Video Solution

**23.** The distance advanced by the screw of a screw gauge is 2 mm in 4 rotations. Its cap is divided into 50 divisions. There is no zero error. If the screw reads 3 divisions on the main scale and 32 divisions of the cap, then the diameter (in mm ) of the wire is

Watch Video Solution

**24.** The deflection in galvanometer falls to $\left(\frac{1}{4}\right)^{th}$ when it is shunted by $3\Omega$. If additional

shunt of $2\Omega$is connected to earlier shunt in parallel, the deflection in galvanometer falls to

Watch Video Solution

**25.** An object of mass 8 kg starts to move from rest under the action of a variable force $F = 3xN$ where x is the distance (in m) covered by the object. If initially, the position of the object is x = 2 m, then find its speed $\left(\text{in m s}^{-1}\right)$ when it crosses x = 10 m.

Watch Video Solution