



# PHYSICS

## BOOKS - NTA MOCK TESTS

### NTA JEE MOCK TEST 81

#### Physics

1. An unbanked circular highway curve on the level ground makes a turn of  $90^\circ$ . The highway carries traffic at  $108 \text{ km h}^{-1}$ , and the

centripetal force on a vehicle is not to exceed  $\frac{1}{10}$  of its weight. What is the approximate minimum length of the curve, in km?

- A. 1.41 km
- B. 1 km
- C. 0.6 km
- D. None of these

**Answer: A**



**Watch Video Solution**

2. A transformer with efficiency 80% works at  $4\text{kW}$  and  $100\text{V}$ . If the secondary voltage is  $200\text{V}$ , then the primary and secondary currents are respectively

A. 40 A and 16 A

B. 16 A and 40 A

C. 20 A and 90 A

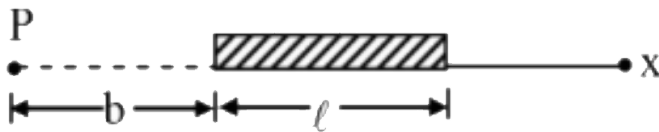
D. 40 A and 20 A

**Answer: A**



**Watch Video Solution**

3. A rod of length  $l$  is placed along  $x$  - axis. One of its ends is at the origin. The rod has a non-uniform charge density  $\lambda = \frac{a}{x}$ ,  $a$  being a positive constant. The electric potential at the point P (origin) as shown in the figure is



A.  $V = \frac{a}{4\pi\epsilon_0} \left( \frac{l}{b(b+l)} \right)$

B.  $V = \frac{a}{4\pi\epsilon_0} \left( \frac{b}{l(b+l)} \right)$

C.  $V = \frac{a}{4\pi\epsilon_0} \left( \frac{b}{l} \right)$

$$D. V = \frac{a}{4\pi\epsilon_0} \left( \frac{l}{b} \right)$$

**Answer: A**



**Watch Video Solution**

4. The deceleration experienced by a moving motor boat, 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.  $v_0$

B.  $\frac{v_0}{2}$

C.  $v_0 e^{-kt}$

D.  $\frac{v_0}{\sqrt{2v_0^2 kt + 1}}$

**Answer: D**



**Watch Video Solution**

5. If a satellite is revolving around a planet of mass  $M$  in an elliptical orbit of semi-major axis

a. Show that the orbital speed of the satellite when it is a distance  $r$  from the focus will be given by

$$v^2 = GM \left[ \frac{2}{r} - \frac{1}{a} \right]$$

A.  $v^2 = GM \left[ \frac{2}{r} - \frac{1}{a} \right]$

B.  $v^2 = GM \left[ \frac{2}{r^2} - \frac{1}{a} \right]$

C.  $v^2 = GM \left[ \frac{2}{r^2} - \frac{1}{a^2} \right]$

D.  $v^2 = G \left[ \frac{2}{r} - \frac{1}{a} \right]$

**Answer: A**



**Watch Video Solution**

6. The sphere of radii 8 cm and 2 cm are cooling. Their temperatures are  $127^{\circ}C$  and  $527^{\circ}C$  respectively . Find the ratio of energy radiated by them in the same time

A. 0.06

B. 0.5

C. 1

D. 2

**Answer: C**





7. A car A is moving with speed  $40 \text{ km h}^{-1}$  along a straight line  $30^\circ$  north of east and another car B is moving with same speed along a straight line  $30^\circ$  south of east. The relative velocity of car A as observed from the car B is

A.  $40 \text{ km h}^{-1}$  north - east

B.  $40 \text{ km h}^{-1}$  south

C.  $40 \text{ km h}^{-1}$  north

D.  $40 \text{ km h}^{-1}$  south - east

**Answer: C**



**Watch Video Solution**

**8.** A cylindrical plastic bottle of negligible mass is filled with 310 ml of water and left floating in a pond with still water. If pressed downward slightly and released, it starts performing simple harmonic motion angular frequency  $\omega$ .

If the radius of the bottle is 2.5 cm then  $\omega$  is close to: (density of water =  $10^3 \text{ kg/m}^3$ )

A.  $3.75 \text{ s}^{-1}$

B.  $1.25 \text{ s}^{-1}$

C.  $2.75 \text{ s}^{-1}$

D.  $3.00 \text{ s}^{-1}$

**Answer: B**



**Watch Video Solution**

9. The magnetic field associated with a light wave is given, at the origin, by

$$B = B_0 [\sin(3.14 \times 10^7)ct + \sin(6.28 \times 10^7)ct].$$

If this light falls on a silver plate having a work function of 4.7 eV, what will be the maximum kinetic energy of the photo electrons?

$$(c = 3 \times 10^8 \text{ m s}^{-1}, h = 6.6 \times 10^{-34} \text{ J - s})$$

A. 6.82 eV

B. 7.72 eV

C. 12.5 eV

D. 8.52 eV

**Answer: B**



**Watch Video Solution**

**10.** A water drop is divided into eight equal droplets. The pressure difference between inner and outer sides of big drop is

- A. same as for smaller droplet
- B.  $1/2$  of that for smaller droplet
- C.  $1/4$  of that for smaller droplet
- D. Twice that for smaller droplet

**Answer: B**



**Watch Video Solution**

**11.** A thin plano-convex lens acts like a concave mirror of focal length 0.2m when silvered from its plane surface. The refractive index of the material of the lens is 1.5. the radius of curvature of the convex surface of the lens will be :

A. 0.1 m

B. 0.2 m

C. 0.4 m

D. 0.8 m

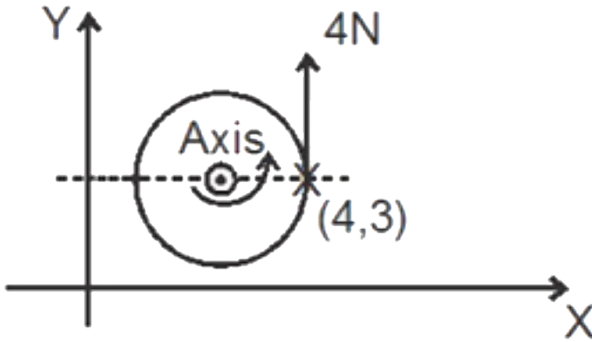
**Answer: B**



**Watch Video Solution**

**12.** Consider a uniform disc in the  $x - y$  plane free to rotate about an axis parallel to the  $Z$  - axis as shown (passing through the centre). A force of 4N applied at  $(4, 3)$  along  $y$  - axis, as

shown produces an angular acceleration of  $2\text{s}^{-1}$ . Locate the centre of mass of the disc if the mass of the disc is 2 kg.



- A. (1, 3)
- B. (2, 3)
- C. (0, 3)
- D. (4, 3)



**Answer: B**



**Watch Video Solution**

**13.** A working transistor with its three legs marked  $P$ ,  $Q$  and  $R$  is tested using a multimeter. No conduction is found between  $P$ ,  $Q$  by connecting the common (negative) terminal of the multimeter to  $R$  and the other (positive) terminal to or  $Q$  some resistance is seen on the multimeter. Which of the following is true for the transistor ?

- A. It is an n - p - n transistor with R as base
- B. It is an p - n - p transistor with R as collector
- C. It is an p - n - p transistor with R as emitter
- D. It is an n - p - n transistor with R as collector

**Answer: A**



**Watch Video Solution**

**14.** Consider a brass rod and a steel rod (80 cm longer than brass rod) at  $0^\circ C$ . It is observed that on increasing temperatures of the two rods by same amount difference in lengths of the two rods does not change. Given that the thermal coefficient of linear expansion for steel and brass are  $11 \times 10^{-6} .^\circ C^{-1}$  and  $19 \times 10^{-6} .^\circ C^{-1}$  respectively. The sum of lengths of the two rods at  $0^\circ C$  is

A. 2 m

B. 4 m

C. 3 m

D. 1.5 m

**Answer: C**



**Watch Video Solution**

15. The dimension of  $\frac{B^2}{2\mu_0}$ , where B is magnetic field and  $\mu_0$  is the magnetic permeability of vacuum, is :

A.  $MLT^{-2}$

B.  $ML^2T^{-1}$

C.  $ML^2T^{-2}$

D.  $ML^{-1}T^{-2}$

**Answer: D**



**Watch Video Solution**

**16.** White light reflected at normal incidence from a soap film has minima at  $6500\text{\AA}$  and maxima at  $7500\text{\AA}$  in the visible region without

minimum in between. If  $\mu$  is  $\frac{5}{3}$  for the thin film, thickness of the film is

A.  $7.40 \times 10^{-7} m$

B.  $9.75 \times 10^{-5} mm$

C.  $9.40 \times 10^{-7} cm$

D.  $9.75 \times 10^{-4} mm$

**Answer: A**



**Watch Video Solution**

17. A tuning fork vibrates with a frequency of 256. If the speed of sound is  $345.6\text{ms}^{-1}$ , Find the wavelength and the distance, which the sound travels during the time, the fork makes 60 vibrations.

A. 1.35 m, 81 m

B. 1.40 m, 84 m

C. 1.45 m, 87 m

D. 1.55 m, 93 m

**Answer: A**

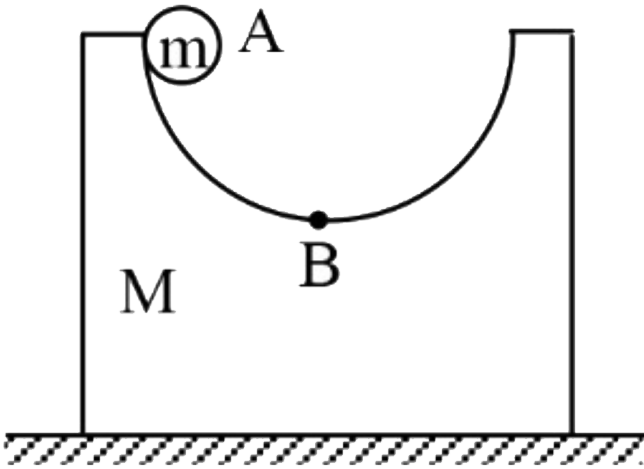


Watch Video Solution

**18.** A block of mass  $M = 2 \text{ kg}$  with a semicircular track of radius  $R = 1.1 \text{ m}$  rests on a horizontal frictionless surface. A uniform cylinder of radius  $r = 10 \text{ cm}$  and mass  $= 1.0 \text{ kg}$  is released from rest from the top point A. The cylinder slips on the semicircular frictionless track. The speed of the block when the cylinder reaches



the bottom of the track at B is ( $g = 10ms^{-2}$ )



A.  $\sqrt{\frac{10}{3}}ms^{-1}$

B.  $\sqrt{\frac{4}{3}}ms^{-1}$

C.  $\sqrt{\frac{5}{2}}ms^{-1}$

D.  $\sqrt{10}ms^{-1}$

**Answer: A**



**Watch Video Solution**

**19.** Two ideal Carnot engines operate in cascade (all heat given up by one engine is used by the other engine to produce work) between temperatures,  $T_1$  and  $T_2$ . The temperature of the hot reservoir of the first engine is  $T_1$  and the temperature of the cold reservoir of the second engine is  $T_2$ .  $T$  is temperature of the sink of first engine which is

also the source for the second engine. How is  $T$  related to  $T_1$  and  $T_2$ , if both the engines perform equal amount of work?

A.  $T = \frac{2T_1T_2}{T_1 + T_2}$

B.  $T = \frac{T_1 + T_2}{2}$

C.  $T = \sqrt{T_1T_2}$

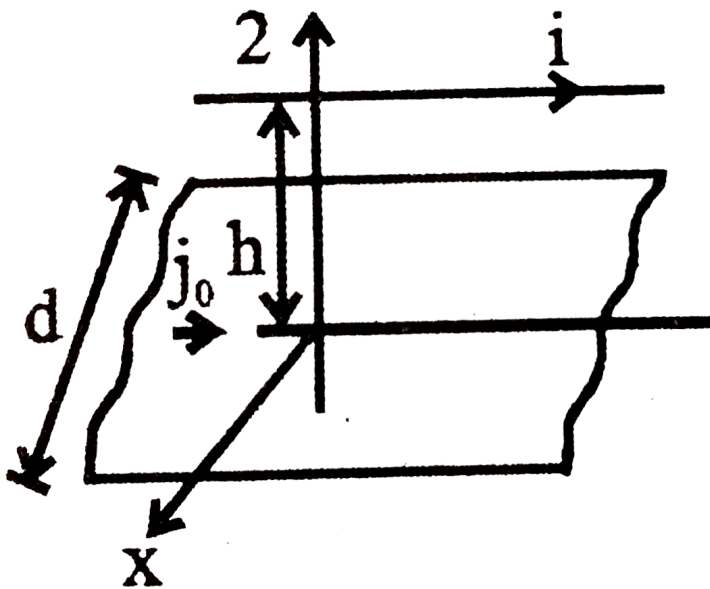
D.  $T = 0$

**Answer: B**



**Watch Video Solution**

20. A conductor carrying current  $I$  is placed parallel to a current per unit width  $j_0$  and width  $d$ , as shown in the diagram. Find the force per unit length on the conductor.



A.  $\frac{\mu_0 j_0 I}{\pi} \tan^{-1} \left( \frac{d}{2h} \right) (-\hat{k})$

B.  $\frac{\mu_0 j_0 I}{\pi} \left( \frac{2h}{d} \right) (-\hat{k})$

C.  $\frac{j_0 i}{\mu_0 \pi} \tan^{-1} \left( \frac{2h}{d} \right) (-\hat{k})$

D.  $\frac{j_0 i}{\mu_0 \pi} \tan^{-1} \left( \frac{d}{2h} \right) (-\hat{k})$

**Answer: A**



**Watch Video Solution**

**21.** A small spherical ball (obeying Stoke's law for viscous force) is thrown up vertically with a speed  $20ms^{-1}$  and is received back by the thrower at the point of projection with a speed  $10ms^{-1}$ . Neglecting the buoyant force

on the ball, assuming the speed of the ball during its flight to be never equal to its terminal speed and taking the acceleration due to gravity  $g = 10ms^{-2}$ , find the time of flight of the ball in seconds.



[Watch Video Solution](#)

**22.** A radioactive sample contains two different types of radioactive nuclei. A-with half-time 5 days and B with half life 30 days. Initially the decay rate of a type nuclei is in 64 times that

of B type of nuclei . Their decay rates will be equal when time a  $9n$  days. Find the value of  $n$ .



[Watch Video Solution](#)

**23.** In the Coolidge tube experiment, if the applied voltage is increased to three times, the short wavelength limit of continuous X- ray spectrum shift by 20 pm. What is the intial voltage (in kV) applied to the tube?



[Watch Video Solution](#)

**24.** A projectile is fired with velocity  $v_0$  at angle  $60^\circ$  with horizontal. At top of its trajectory it explodes into three fragments of equal masses. First fragment retraces the path, second moves vertically upwards with speed  $\frac{3v_0}{2}$ . Speed of the third fragment is



**Watch Video Solution**

**25.** A  $4\mu F$  capacitor, a resistance of  $2.5M\Omega$  is in series with  $12V$  battery. Find the time after which the potential difference across the



capacitor is 3 times the potential difference across the resistor. [ Given  $\ln(2) = 0.693$  ]



**Watch Video Solution**