

# NEW STANDARD ACADEMY

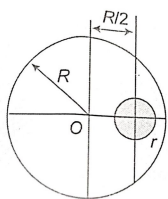
Date : 25-08-25

CLASS : 11<sup>TH</sup> JEE

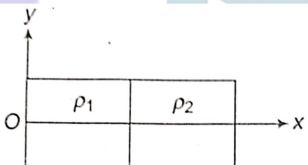
Marks: 60  
Time: 3 hours.

## PHYSICS

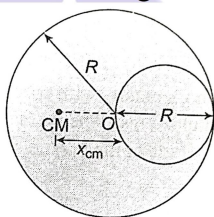
- Find the position of centre of mass of a uniform disc of radius  $R$  from which a hole of radius  $r$  is cut out. The centre of the hole is at a distance  $R/2$  from the centre of the disc.



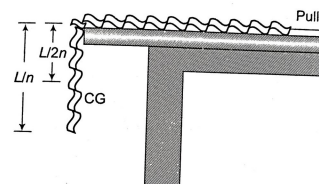
- Half of the rectangular plate shown in figure is made of a material of density  $\rho_1$  and the other half of density  $\rho_2$ . The length of the plate is  $L$ . The centre of mass of the system from  $O$  is



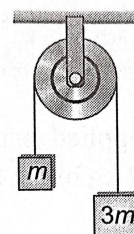
- A circular disc of radius  $R$  has a uniform thickness. A circular hole of diameter equal to the radius of the disc has been cut out as shown in the figure. Find the centre of mass of the remaining disc.



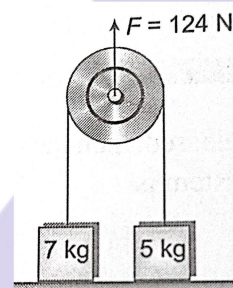
- Give the location of the centre of mass of (i) sphere, (ii) cylinder, (iii) ring and (iv) cube, each of the uniform mass density.
- A chain of mass  $M$  is placed on a smooth table with  $\frac{1}{n}$  of its length  $L$  hanging over the edge. The work done in pulling the hanging portion of the chain back to the surface of the table is



- If the system is released, then the acceleration of the centre of mass of the system is

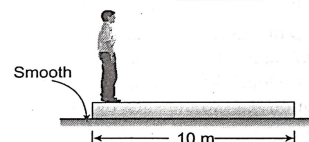


- Two blocks are resting on ground with masses 5 kg and 7 kg. A string connects them which goes over a mass less pulley A. There is no friction between pulley and string.

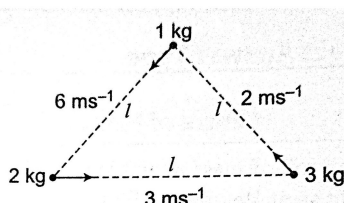


A force  $F = 124\text{ N}$  is applied on pulley A. The acceleration of centre of mass of 7 kg block and 5 kg block in vertical direction is

- A wooden plank of mass 20 kg is resting on a smooth horizontal floor. A man of mass 60 kg starts moving from one end of the plank to the other end. The length of the plank is 10 m. Find the displacement of the plank over the floor when the man reaches the other end of the plank.



9. Three particles of masses 1 kg, 2 kg and 3 kg are situated at the corners of an equilateral triangle move at speed  $6\text{ms}^{-1}$ ,  $3\text{ms}^{-1}$  and  $2\text{ms}^{-1}$  respectively. Each particle maintains a direction towards the particle at the next corner symmetrically. Find velocity of CM of the system at this instant



10. Two particles of masses 5g and 3g are separated by a distance of 40 cm. The centre of mass of the system of these two particles are?

### CHEMISTRY

1. A system absorbs 100 J of heat and 100 J work is done on the system. Calculate the change in internal energy.
2. A system gives out energy equal to 20 J work done on the surrounding is 40 joule. Calculate the change in internal energy.
3. Work done on the system is 200 J and heat given out by the system is 500 J. Calculate the change in internal energy of the system.
4. Increase in internal energy of a system is 350 J. It does work of 700 J on the surroundings. How much heat the system needs ?
5. A gas absorbs 200 J of heat and expands against the constant external pressure of 1.5 atm. The initial and final volume of the gas is 0.5 L and one litre. Calculate the change in internal energy
6. Define system & surrounding
7. Define the following
  - (i) Isolated system
  - (ii) Closed system
8. Define reversible and Irreversible process
9. What are the state & path functions
10. Define first law of thermodynamics

### MATHS

1. Find a, b and n in the expansion of  $(a+b)^n$  if the first three term of the expansion are 729, 7290 and 30375, respectively.
2. Find the coefficient of  $x^4$  in the expansion of  $(2-x+3x^2)^6$ .

3. Find n, if the ratio of the fifth term from the beginning to the fifth term from the end in the expansion of  $(\sqrt[4]{2} + \frac{1}{\sqrt[4]{3}})^n$  is  $\sqrt{16}:1$ .
4. If  $(1-2x+5x^2-10x^3)(1+x)^n = 1+a_1x+a_2x^2+\dots$  such that  $a_1^2 = 2a_2$  then find the value of n.
5. Expand  $(a+b)^6 - (a-b)^6$ . Hence find the value of  $(\sqrt{3} + \sqrt{2})^6 - (\sqrt{3} - \sqrt{2})^6$
6. Using binomial theorem, find the values of
  - (i)  $(99)^4$
  - (ii)  $(1.02)^6$  correct to 5 decimal places
7. In the binomial expansion of  $(a-b)^n$ ,  $n \geq 5$ , the sum of the 5<sup>th</sup> and 6<sup>th</sup> terms is zero. Find the value of  $\frac{a}{b}$ .
8. Find the middle term in
  - (i)  $(\frac{2x^2}{3} - \frac{3}{2x})^{12}$
  - (ii)  $(2x - \frac{x^2}{4})^9$
9. Find the coefficient of
  - (i)  $x^5$  in the expansion of  $(x+3)^8$
  - (ii)  $x^{15}$  in the expansion of  $(x-x^2)^{10}$
10. If the middle in the expansion of  $(x^2 + \frac{1}{x})^{2n}$  is  $184756 x^{10}$ , then the value of n is