St. Lawrence High School

A Jesuit Christian Minority Institution

Term : 1st

Work Sheet – 25

Class – XI | Subject – Physics | Date – 20.07.20

Chapter – System of particle and rigid dynamics | Topic – Centre of mass

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Choose the correct option for the following questions. $1 \times 15 = 15$

1. Three identical spheres, each of mass 1kg, are placed touching each other with their centres on a straight line. Their centres are marked P, Q and R respectively. The distance of centre of mass from P is –
   a. $\frac{PQ+PR+QR}{3}$
   b. $\frac{PQ+PR}{3}$
   c. $\frac{PQ+QR}{3}$
   d. $\frac{PR+QR}{3}$
2. A uniform metal disc of radius r is taken and out of it a disc of diameter r/2 is cut off from the end. The centre of mass of the remaining part will be –
   a. r/10 from the centre
   b. r/15 from the centre
   c. r/5 from the centre
   d. r/20 from the centre
3. the centre of mass of a system of particle does not depend on –
   a. masses of the particle
   b. internal forces of the particle
   c. position of the particle
   d. relative distances between the particle
4. The centre of mass of a system of two particles divides the distance between them –
   a. In inverse ratio of square of masses of particles
   b. In direct ratio of square of masses of particles
   c. In inverse ratio of masses of particles
   d. In direct ratio of masses of particles
5. The centre of mass of a body –
   a. Lies always outside the body
   b. May lie within or outside the body .
   c. Lies always inside the body
   d. Lies always on the surface of the body
6. Three identical balls, each of radius r, are placed touching each other on horizontal surface such that an equilateral triangle is formed when the centres of the three balls are joined. The centre of mass of the system is located at –
   a. Horizontal surface
   b. Centre of one of the balls
   c. Line joining centres of any two
   d. Point of intersection of their medians
7. A system consists of mass M and m (M>>m). the centre of mass of the system is –
   a. At the middle
   b. Nearer to M
   c. Nearer to m

d. At the position of larger mass M.

8. The law of conservation of momentum is based on Newton's –
   a. First law
   b. Second law
   c. Third law
   d. Law of gravitation
9. A person of mass m is standing on one end of a plank of mass M and length L and floating in water. The person moves from one end to another and stops. The displacement of the plank is –
   a. $\frac{Lm}{m+M}$
   b. $Lm(m+M)$
   c. $\frac{m+M}{Lm}$
   d. $\frac{LM}{m+M}$
10. Bullets of mass 40g each are fired from a machine gun with velocity 1000m/s. if the person firing, experiences average force of 200 N, then the number of bullets fired per minute will be –
   a. 300
   b. 600
   c. 150
   d. 75
11. Initially stable two particles x and y start moving towards each other under the mutual attraction. If at one time the velocities of x and y are v and 2v respectively, then what will be the velocity of centre of mass of the system?
   a. V
   b. v/3
   c. v/5
   d. zero
12. a 2kg body and a 3kg body are moving along the x- axis. At an instant the 2kg mass has a velocity 3m/s and 3kg mass has the velocity 2m/s. the velocity of centre of mass at that instant will be –
   a. 5m/s
   b. 1m/s.
   c. 0
   d. 12/5 m/s
13. A bomb of mass 9kg explodes into two pieces of mass 3kg and 6 kg. the velocity of 3kg piece is 16m/s. the kinetic energy of 6kg piece is –
   a. 768J
   b. 786J
   c. 192J
   d. 687J
14. A metal ball does not rebound when struck on a wall. Whereas a rubber ball of same mass when thrown with same velocity on the wall, rebounds. From this, it is inferred that –
   a. Change in momentum is same for both
   b. Change in momentum in rubber ball is more
   c. Change in momentum in metal ball is more
   d. None of these.
15. A bomb of mass 1kg thrown vertically upwards with a speed 100m/s explodes into two parts after 5 sec. a fragment of mass 400g moves down with speed 25m/s, then speed of the other fragment will be –
   a. 40m/s downwards
   b. 40m/s upwards
   c. 60m/s upwards
   d. 100m/s upwards

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