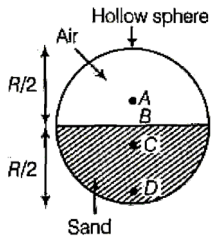
PHYSICS

Section A

1. For which of the following does the centre of mass lie outside the body?
   (1) A pencil (2) A shotput
   (3) A dice (4) A bangle

2. Which of the following point is the likely position of centre of mass of the system shown in figure?



   (1) A (2) B
   (3) C (4) D

3. A shell following a parabolic path explodes somewhere in its flight. The centre of mass of fragments will move in
   (1) vertical direction
   (2) any direction
   (3) horizontal direction
   (4) same parabolic path

4. The moment of inertia of a body depends on
   (1) the mass of the body
   (2) the distribution of the mass in the body
   (3) the axis of rotation of the body
   (4) all of these

5. Three identical spheres each of radius R are placed touching each other on a horizontal table. The centre of mass of the system is located
   (1) at one of the centres of the spheres
   (2) at the midpoint joining the centres of any two spheres
   (3) at the point of intersection of the medians of the triangle formed by the centres of the three spheres
   (4) at the midpoint of a median of the triangle formed by the centres of the three spheres

6. When an external force is applied at the centre of mass of a system of particles, then it undergoes
   (1) only translatory motion
   (2) only rotatory motion
   (3) both translatory and rotatory motion
   (4) an oscillatory motion

7. Two persons of masses 75 kg and 50 kg respectively, are at the opposite ends of a boat. The length of the boat is 4 m and weighs 200 kg. The 75 kg man walks up to the 50 kg man and sits with him. If the boat is in still water the centre of mass of the system shifts by
   (1) 3 m (2) 2.3 m
   (3) zero (4) 0.75 m

8. Two bodies of masses 1 kg and 3 kg have position vectors $\hat{i}+2\hat{j}+\hat{k}$ and $-3\hat{i}-2\hat{j}+\hat{k}$, respectively. The centre of mass of this system has a position vector
   (1) $-2\hat{i}+2\hat{k}$ (2) $-2\hat{i}-\hat{j}+\hat{k}$
   (2) $2\hat{i}-\hat{j}-2\hat{k}$ (4) $-\hat{i}+\hat{j}+\hat{k}$

9. The ratio of the radii of gyration of a circular disc to that of a circular ring, each of same mass and radius, around their respective axes is
   (1) $\sqrt{3}:\sqrt{2}$ (2) $1:\sqrt{2}$
   (3) $\sqrt{2}:1$ (4) $\sqrt{2}:\sqrt{3}$

10. Consider a two particle system with particles having masses m_1 and m_2. If the first particle is pushed towards the centre of mass through a distance d, by what distance should the second particle is moved, so as to keep the centre of mass at the same position?
    (1) $\frac{m_2}{m_1}d$ (2) $\frac{m_1}{m_1+m_2}d$
    (3) $\frac{m_1}{m_2}d$ (4) d