21. A thin uniform wire of mass m and length L is bent into a circle. The moment of inertia of the wire about an axis passing through its one end and perpendicular to the plane of the circle is

(1) $\frac{2mL^2}{\pi^2}$ (2) $\frac{mL^2}{3\pi^2}$

(3) $\frac{mL^2}{2\pi^2}$ (4) $\frac{mL^2}{3\pi^2}$

22. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass. The centre of mass of the system from the 5 kg particle is nearly at a distance of

(1) 50 cm (2) 67 cm

(3) 80 cm (4) 33 cm

23. Where will be the centre of mass on combining two masses m and M (M > m)

(1) Towards m (2) Towards M

(3) Between m and M (4) Anywhere

24. Two objects of masses 200 gm and 500gm possess velocities $10\hat{i}$ m/s and $3\hat{i}+5\hat{j}$ m/s respectively. The velocity of their centre of mass in m/s is

(1) $5\hat{i}-25\hat{j}$ (2) $\frac{5}{7}\hat{i}-25\hat{j}$

(3) $5\hat{i}+\frac{25}{7}\hat{j}$ (4) $25\hat{i}-\frac{5}{7}\hat{j}$

25. Four identical spheres each of mass m are placed at the corners of square of side 2 metre. Taking the point of intersection of the diagonals as the origin, the co-ordinates of the centre of mass are

(1) (0, 0) (2) (1, 1)

(3) (–1, 1) (4) (1, –1)

26. Two-point masses m and M are separated by a distance L. The distance of the centre of mass of the system from m is

(1) L(m / M) (2) L(M / m)

(3) $L\left(\frac{M}{m+M}\right)$ (4) $L\left(\frac{m}{m+M}\right)$

27. Two particles of masses 1 kg and 3 kg move towards each other under their mutual force of attraction. No other force acts on them. When the relative velocity of approach of the two particles is 2 m/s, their centre of mass has a velocity of 0.5 m/s. When the relative velocity of approach becomes 3 m/s, the velocity of the centre of mass is

(1) 0.5 m/s (2) 0.75 m/s

(3) 1.25 m/s (4) Zero

28. Moment of inertia of a disc about its own axis is I. Its moment of inertia about a tangential axis in its plane is

(1) $\frac{5}{2}$I (2) 3 I

(3) $\frac{3}{2}$I (4) 2 I

29. A wheel of mass 10 kg has a moment of inertia of 160 kg–$m^2$ about its own axis, the radius of gyration will be

(1) 10 m (2) 8 m

(3) 6 m (4) 4 m

30. Four particles each of mass m are placed at the corners of a square of side length l. The radius of gyration of the system about an axis perpendicular to the square and passing through its centre is

(1) $\frac{l}{\sqrt{2}}$ (2) $\frac{l}{2}$

(3) l (4) $(\sqrt{2})l$