CHAPTER

06

Centre of Mass

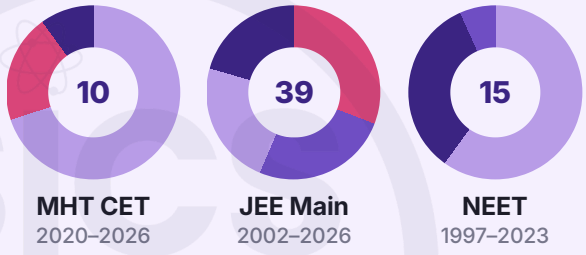
MHT CET · JEE · NEET Physics

PHYSICS CIRCLE

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EXAM WEIGHTAGE



	CET	JEE	NEET
Centre of Mass of Discrete Particles	7 (70%)	9 (23%)	9 (60%)
Composite & Cut-Out Bodies	2 (20%)	12 (31%)	0 (0%)
Motion of Centre of Mass	1 (10%)	8 (21%)	5 (33%)
Continuous Bodies: Standard Results & Variable Density	0 (0%)	10 (26%)	1 (7%)

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01 CONCEPT Centre of Mass of Discrete Particles

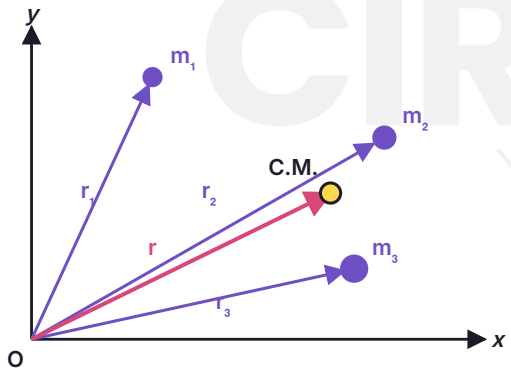
IN ONE LINE

The centre of mass is the point where the whole mass of a system can be taken to be concentrated and where all external forces can be taken to act.

6.1.1 System and forces

- **Rigid body**: particles held so firmly that their relative positions do not change.
- **System**: a group of interacting particles that we choose to study.
- **Internal forces**: forces the particles of the system exert on each other. They occur in equal and opposite pairs.
- **External forces**: forces applied on the system from outside.

6.1.2 What the centre of mass is



Position vector of the C.M. is the weighted mean of r_1, r_2, r_3

- Its position does **not** depend on the coordinate system chosen.
- It depends on the **shape** of the body and its **mass distribution**.
- It depends only on masses and positions, **not on forces**.
- It may lie outside the material: disc inside, ring outside.
- Rotation about an axis through the C.M. does not change its position.
- C.M. and centre of gravity coincide only when g is uniform over the body.

6.1.3 System of two particles

$$r_{cm} = \frac{m_1 r_1 + m_2 r_2}{m_1 + m_2}$$

- The C.M. lies **on the line joining** the two particles, nearer the heavier one.
- Equal masses: it is at the mid-point.

$$r_{cm} = \frac{r_1 + r_2}{2}$$

- Distances from the C.M. are in the inverse ratio of masses. For separation d:



Heavier mass is nearer to C

$$m_1 r_1 = m_2 r_2$$

$$r_1 = \frac{m_2 d}{m_1 + m_2} \cdot r_2 = \frac{m_1 d}{m_1 + m_2}$$

6.1.4 Moving a particle, C.M. fixed



C stays where it was

Both move towards C (or both away from it)

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$$m_1 d_1 = m_2 d_2$$

- If m_1 moves towards C, m_2 must also move **towards C**.
- If the C.M. is allowed to move, its shift is:

$$\Delta x_{cm} = \frac{m_1 \Delta x_1 + m_2 \Delta x_2}{m_1 + m_2}$$

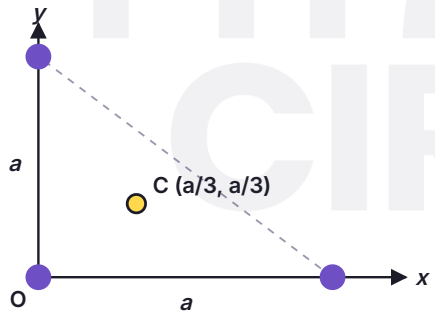
6.1.5 System of n particles

$$r_{cm} = \frac{m_1 r_1 + m_2 r_2 + \ldots + m_n r_n}{m_1 + m_2 + \ldots + m_n}$$

$$x_{cm} = \frac{\Sigma m_i x_i}{\Sigma m_i} \cdot y_{cm} = \frac{\Sigma m_i y_i}{\Sigma m_i}$$

- Choose the origin at one of the masses: its term drops out.
- Work out x and y separately.
- With the origin at the C.M.:

$$\Sigma m_i r_i = 0$$



Three equal masses: C is at the centroid

- Identical spheres: replace each by a point mass at its centre.
- Three equal masses at the corners of a triangle: C.M. at the **intersection of the medians**.
- Equal masses in a straight line: C.M. at the mean of their positions.

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Solved Examples 01 Centre of Mass of Discrete Particles

SOLVED 1 MHT CET 2024 · 16 May · Shift 1

In case of system of two-particles of different masses, the centre of mass lies

(a) at the mid-point of line joining the two particles.
(b) on the line joining the two particles.
(c) at one end of the line joining the two particles.
(d) on the line perpendicular to the line joining the two particles.

STEP 1 $r_{cm} = \frac{m_1 r_1 + m_2 r_2}{m_1 + m_2}$ is a weighted mean of the two positions
STEP 2 Different masses ⇒ not the mid-point, nearer the heavier one
STEP 3 It lies **on the line joining the two particles**

Answer: **(b)**

SOLVED 2 MHT CET 2024 · 9 May · Shift 2

A metal rod of weight W is supported by two parallel knife-edges A and B. The rod is in equilibrium in horizontal position. The distance between the two knife-edges is r. The centre of mass of the rod is at a distance x from A. The normal reaction on A is

(a) $\frac{W \cdot r}{x}$
(b) $\frac{W \cdot x}{r}$
(c) $\frac{W(r - x)}{x}$
(d) $\frac{W(r - x)}{r}$

STEP 1 The whole weight W acts at the centre of mass, at distance (r − x) from B
STEP 2 Torques about B balance: $N_A \times r = W(r - x)$
STEP 3 $N_A = \frac{W(r - x)}{r}$

Answer: **(d)**

SOLVED 3 MHT CET 2026 · 19 Apr · Shift 2

Two particles of masses 2 g and 4 g are situated at the opposite ends, A and B of a wooden bar respectively. Let l(AB) = 9 cm. The center of mass of the system will be

(a) 6 cm from B.
(b) 3 cm from A.
(c) 2 cm from B.
(d) 6 cm from A.

STEP 1 Take A as origin: 2 g at 0, 4 g at 9 cm
STEP 2 $x = \frac{2 \times 0 + 4 \times 9}{2 + 4} = \frac{36}{6}$
STEP 3 x = **6 cm from A**

Answer: **(d)**

SOLVED 4 AIPMT 2009

Two bodies of mass 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 center of mass of this system has a position vector

(a) $-2\hat{i} - \hat{j} + \hat{k}$
(b) $2\hat{i} - \hat{j} - 2\hat{k}$
(c) $-\hat{i} + \hat{j} + \hat{k}$
(d) $-2\hat{i} + 2\hat{k}$

STEP 1 $r_{cm} = \frac{1 \times r_1 + 3 \times r_2}{1 + 3}$
STEP 2 $= \frac{(\hat{i} + 2\hat{j} + \hat{k}) + (-9\hat{i} - 6\hat{j} + 3\hat{k})}{4} = \frac{-8\hat{i} - 4\hat{j} + 4\hat{k}}{4}$
STEP 3 $r_{cm} = \mathbf{-2\hat{i} - \hat{j} + \hat{k}}$

Answer: **(a)**

SOLVED 5 NEET 2020 · Phase 1

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

(a) 50 cm
(b) 67 cm
(c) 80 cm
(d) 33 cm

STEP 1 Take the 5 kg particle as origin
STEP 2 $x = \frac{10 \times 1}{5 + 10} = \frac{2}{3}$ m
STEP 3 x ≈ **67 cm**

Answer: **(b)**

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Solved Examples 01 Centre of Mass of Discrete Particles (contd.)

SOLVED 6 MHT CET 2024 · 9 May · Shift 1

In the system of two particles of masses m_1 and m_2, the first particle is moved by a distance d towards the centre of mass. To keep the centre of mass unchanged, the second particle will have to be moved by a distance

(a) $\frac{m_2}{m_1}$ d, towards the centre of mass.

(b) $\frac{m_1}{m_2}$ d, away from the centre of mass.

(c) $\frac{m_1}{m_2}$ d, towards the centre of mass.

(d) $\frac{m_2}{m_1}$ d, away from the centre of mass.

STEP 1 C stays fixed $\Rightarrow m_1 d_1 = m_2 d_2$

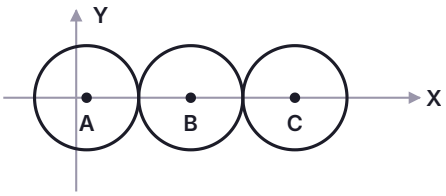
STEP 2 $d_2 = \frac{m_1}{m_2} d$

STEP 3 The second particle also moves **towards the centre of mass by** $\frac{m_1}{m_2}$ **d**

Answer: **(c)**

SOLVED 7 MHT CET 2026 · 17 Apr · Shift 1

Three identical spheres, each of mass m kg, are kept as shown in the figure, touching each other, with their centers on a straight line. If their centers are marked as A, B, C respectively, the distance of center of mass of the system from A is



(a) $\frac{AB + BC}{3}$ (b) $\frac{AB + AC}{3}$

(c) $\frac{AC + BC}{2}$ (d) $\frac{AB + BC + AC}{3}$

STEP 1 Take A as origin: centres at 0, AB and AC

STEP 2 $x = \frac{m(0 + AB + AC)}{3m}$

STEP 3 $x = \frac{AB + AC}{3}$

Answer: **(b)**

SOLVED 8 MHT CET 2024 · 16 May · Shift 2

Three identical metal balls each of radius r are placed such that an equilateral triangle is formed when centres of three balls are joined. The centre of mass of the system is located at

(a) centre of one of the balls.

(b) point of intersection of medians.

(c) line joining centres of any two balls.

(d) on the circumference of any one of the balls.

STEP 1 Each ball acts like a point mass at its centre

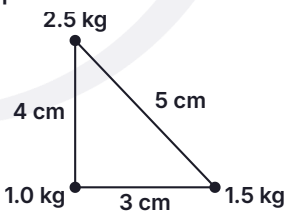
STEP 2 Three equal masses at the vertices of a triangle: the mean of the vertices is the centroid

STEP 3 C is at the **point of intersection of medians**

Answer: **(b)**

SOLVED 9 JEE Main 2020 · 7 Jan · Shift 1

Three point particles of masses 1.0 kg, 1.5 kg and 2.5 kg are placed at three corners of a right angle triangle of sides 4.0 cm, 3.0 cm and 5.0 cm as shown in the figure. The center of mass of the system is at a point:



(a) 2.0 cm right and 0.9 cm above 1 kg mass

(b) 0.9 cm right and 2.0 cm above 1 kg mass

(c) 0.6 cm right and 2.0 cm above 1 kg mass

(d) 1.5 cm right and 1.2 cm above 1 kg mass

STEP 1 Origin at 1 kg: 1.5 kg at (3, 0), 2.5 kg at (0, 4)

STEP 2 $x_{cm} = \frac{1.5 \times 3}{5} = 0.9$ cm; $y_{cm} = \frac{2.5 \times 4}{5} = 2$ cm

STEP 3 **0.9 cm right and 2.0 cm above** the 1 kg mass

Answer: **(b)**

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CONCEPT

02 Continuous Bodies: Standard Results & Variable Density

IN ONE LINE

For a continuous body, the sum over particles becomes an integral. For uniform symmetric bodies you can write the answer straight from the standard results.

6.2.1 Continuous mass distribution

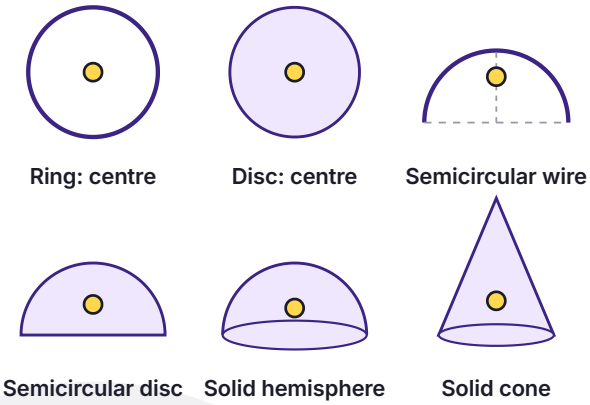
$$r_{cm} = \frac{\int r\, dm}{\int dm}$$

- Split the body into small elements of mass dm and add them up.
- Uniform symmetric body: C.M. is at the **geometric centre**.
- Any axis or plane of symmetry contains the C.M., which saves one integral.

6.2.2 Centre of mass of uniform bodies

Body	Position of C.M.
Hollow or solid sphere	centre of the sphere
Circular ring or disc	centre
Rod	mid-point
Square, rectangle, parallelogram	intersection of diagonals
Triangular lamina	intersection of medians
Cube or cuboid	intersection of diagonals
Hollow or solid cylinder	mid-point of the axis
Solid cone or pyramid	on the axis, $\frac{3h}{4}$ from the vertex

6.2.3 Results to learn by heart



C is marked in yellow

Body	Distance of C.M.
Semicircular wire	$\frac{2R}{\pi}$ from centre
Semicircular disc	$\frac{4R}{3\pi}$ from centre
Quarter disc	$\frac{4R}{3\pi}$ from each straight edge
Solid hemisphere	$\frac{3R}{8}$ from flat face
Hollow hemisphere	$\frac{R}{2}$ from flat face
Solid cone	$\frac{h}{4}$ from base
Triangular lamina	$\frac{h}{3}$ from base

- Always read which point the question measures from: vertex or base, centre or edge.

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CENTRE OF MASS

LEVEL 1 · EASY

Topic-wise Previous Year Questions

MHT CET · NEET · JEE Main

32	9	4
questions	concepts	topics

CONTENTS

01	Centre of Mass of Discrete Particles	Q 1–21	21 Qs
02	Continuous Bodies: Standard Results & Variable Density	Q 22–24	3 Qs
03	Composite & Cut-Out Bodies	Q 25–25	1 Qs
04	Motion of Centre of Mass	Q 26–32	7 Qs
	Answer key		

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TOPIC 01

Centre of Mass of Discrete Particles

21 PYQs · Easy 21 · Medium 0 · Difficult 0 | MHT CET 6 · NEET 8 · JEE 7

Concepts covered: Meaning of centre of mass (2) · Two-particle system (5) · Shifting a particle (6) · Many-particle system (8)

LEVEL 1 · EASY 21 questions

◆ Meaning of centre of mass 2 Qs

1. In case of system of two-particles of different masses, the centre of mass lies

MHT CET 2024 · 16 MAY · SHIFT 1

(a) at the mid-point of line joining the two particles.
(b) on the line joining the two particles.
(c) at one end of the line joining the two particles.
(d) on the line perpendicular to the line joining the two particles.

2. The centre of mass of system of particles does not depend on

AIPMT 1997

(a) position of the particles
(b) relative distances between the particles
(c) masses of the particles
(d) forces acting on the particle

◆ Two-particle system 5 Qs

3. Two particles of masses 2 g and 4 g are situated at the opposite ends, A and B of a wooden bar respectively. Let $l(AB) = 9$ cm. The center of mass of the system will be

MHT CET 2026 · 19 APR · SHIFT 2

(a) 6 cm from B. (b) 3 cm from A.
(c) 2 cm from B. (d) 6 cm from A.

4. Two objects of mass 10 kg and 20 kg respectively are connected to the two ends of a rigid rod of length 10 m with negligible mass. The distance of the center of mass of the system from the 10 kg mass is:

NEET 2022 · PHASE 1

(a) $\frac{10}{3}$ m (b) $\frac{20}{3}$ m (c) 10 m (d) 5 m

5. 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:

NEET 2020 · PHASE 1

(a) 50 cm (b) 67 cm (c) 80 cm (d) 33 cm

6. Two bodies of mass 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 center of mass of this system has a position vector:

AIPMT 2009

(a) $-2\hat{i}-\hat{j}+\hat{k}$ (b) $2\hat{i}-\hat{j}-2\hat{k}$
(c) $-\hat{i}+\hat{j}+\hat{k}$ (d) $-2\hat{i}+2\hat{k}$

7. Two bodies of mass 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 magnitude of position vector of centre of mass of this system will be similar to the magnitude of vector:

JEE MAIN 2022 · 29 JUL · SHIFT 1

(a) $\hat{i}+2\hat{j}+\hat{k}$ (b) $-3\hat{i}-2\hat{j}+\hat{k}$
(c) $-2\hat{i}+2\hat{k}$ (d) $2\hat{i}-\hat{j}+2\hat{k}$

◆ Shifting a particle 6 Qs

8. In the system of two particles of masses ' m_1 ' and ' m_2 ', the first particle is moved by a distance 'd' towards the centre of mass. To keep the centre of mass unchanged, the second particle will have to be moved by a distance

MHT CET 2024 · 9 MAY · SHIFT 1

(a) $\frac{m_2}{m_1}$ d, towards the centre of mass.
(b) $\frac{m_1}{m_2}$ d, away from the centre of mass.
(c) $\frac{m_1}{m_2}$ d, towards the centre of mass.
(d) $\frac{m_2}{m_1}$ d, away from the centre of mass.

9. In system of two particles of masses m_1 and m_2, the first particle is moved by a distance d towards the centre of mass. To keep the centre of mass unchanged, the second particle will have to be moved by a distance

MHT CET 2020 · 19 OCT · SHIFT 2

(a) $\frac{m_2}{m_1}d$, towards the centre of mass
(b) $\frac{m_1}{m_2}d$, away from the centre of mass
(c) $\frac{m_1}{m_2}d$, towards the centre of mass
(d) $\frac{m_2}{m_1}d$, away from the centre of mass

10. Consider a system of two particles having masses m1 and m2. If the particle of mass m1 is pushed towards the mass centre of particles through a distance d. by what distance would be particle of mass m2 move so as to keep the mass centre of particles at the original position?

AIPMT 2004

(a) $\frac{m_1}{m_1+m_2}$ d (b) $\frac{m_1}{m_2}$ d (c) d (d) $\frac{m_2}{m_1}$ d

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11. Two blocks of masses 10 kg and 30 kg are placed on the same straight line with coordinates (0, 0) cm and (x, 0) cm respectively. The block of 10 kg is moved on the same line through a distance of 6 cm towards the other block. The distance through which the block of 30 kg must be moved to keep the position of centre of mass of the system unchanged is:

JEE MAIN 2022 · 27 JUN · SHIFT 1

(a) 4 cm towards the 10 kg block
(b) 2 cm away from the 10 kg block
(c) 2 cm towards the 10 kg block
(d) 4 cm away from the 10 kg block

12. Consider a two particle system with particles having masses m_1 and m_2. If the first particle is pushed towards the center of mass through a distance d, by what distance should the second particle is moved, so as to keep the center of mass at the same position?

AIEEE 2006

(a) $\frac{m_2}{m_1}\ d$ (b) $\frac{m_1}{m_1+m_2}d$ (c) $\frac{m_1}{m_2}d$ (d) d

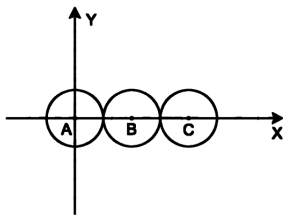
13. In a system two particles of masses $m_1 = 3\,\text{kg}$ and $m_2 = 2\,\text{kg}$ are placed at certain distance from each other. The particle of mass m_1 is moved towards the center of mass of the system through a distance $2\,\text{cm}$. In order to keep the center of mass of the system at the original position, the particle of mass m_2 should move towards the center of mass by the distance _____ cm.

JEE MAIN 2024 · 4 APR · SHIFT 2 *(Numerical)*

◆ Many-particle system 8 Qs

14. Three identical spheres, each of mass 'm' kg, are kept as shown in the figure, touching each other, with their centers on a straight line. If their centers are marked as A, B, C respectively, the distance of center of mass of the system from A is

MHT CET 2026 · 17 APR · SHIFT 1



(a) $\frac{AB+BC}{3}$ (b) $\frac{AB+AC}{3}$
(c) $\frac{AC+BC}{2}$ (d) $\frac{AB+BC+AC}{3}$

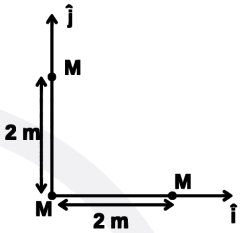
15. Three identical metal balls each of radius ' r ' are placed such that an equilateral triangle is formed when centres of three ball are joined. The centre of mass of the system is located at

MHT CET 2024 · 16 MAY · SHIFT 2

(a) centre of one of the balls.
(b) point of intersection of medians.
(c) line joining centres of any two balls.
(d) on the circumference of any one of the balls.

16. Three identical spheres, each of mass M, are placed at the corners of a right angle triangle with mutually perpendicular sides equal to 2 m (see figure). Taking the point of intersection of the two mutually perpendicular sides as the origin, find the position vector of centre of mass.

NEET 2020 · PHASE 2



(a) $\frac{4}{3}\left(\hat{i}+\hat{j}\right)$ (b) $2\left(\hat{i}+\hat{j}\right)$
(c) $\left(\hat{i}+\hat{j}\right)$ (d) $\frac{2}{3}\left(\hat{i}+\hat{j}\right)$

17. Three masses are placed on the x-axis: 300 g at origin, 500 g at x = 40 cm and 400 g at x = 70cm. The distance of the centre of mass from the orgin is:

AIPMT 2012 · MAINS

(a) 40 cm (b) 45 cm (c) 50 cm (d) 30 cm

18. Three identical metal balls each of radius r are placed touching each other on a horizontal surface such that an equilateral triangle is formed with centres of three balls joined. The centre of mass of the system is located at

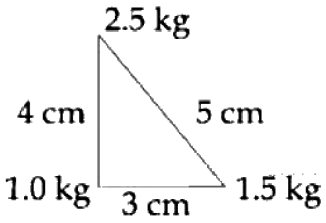
AIPMT 1999

(a) horizontal surface
(b) centre of one of the balls
(c) line joining the centres of any two balls
(d) point of intersection of the medians

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19. Three point particles of masses 1.0 kg, 1.5 kg and 2.5 kg are placed at three corners of a right angle triangle of sides 4.0 cm, 3.0 cm and 5.0 cm as shown in the figure. The center of mass of the system is at a point:

JEE MAIN 2020 · 7 JAN · SHIFT 1



(a) 2.0 cm right and 0.9 cm above 1 kg mass
(b) 0.9 cm right and 2.0 cm above 1 kg mass
(c) 0.6 cm right and 2.0 cm above 1 kg mass
(d) 1.5 cm right and 1.2 cm above 1 kg mass

20. Three identical spheres each of mass 2M are placed at the corners of a right angled triangle with mutually perpendicular sides equal to $4\ \mathrm{m}$ each. Taking point of intersection of these two sides as origin, the magnitude of position vector of the centre of mass of the system is $\frac{4\sqrt{2}}{x}$, where the value of x is _____.

JEE MAIN 2024 · 1 FEB · SHIFT 1 *(Numerical)*

21. Three identical spheres each of mass M are placed at the corners of a right angled triangle with mutually perpendicular sides equal to 3 m each. Taking point of intersection of mutually perpendicular sides as origin, the magnitude of position vector of centre of mass of the system will be $\sqrt{x}$ m. The value of x is _____.

JEE MAIN 2022 · 25 JUL · SHIFT 2 *(Numerical)*

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TOPIC 02

Continuous Bodies: Standard Results & Variable Density

3 PYQs · Easy 3 · Medium 0 · Difficult 0 | MHT CET 0 · NEET 0 · JEE 3

Concepts covered: Uniform bodies: standard results (3)

LEVEL 1 · EASY 3 questions

22. Distance of the center of mass of a solid uniform cone from its vertex is z_0. If the radius of its base is R and its height is h then z_0 is equal to:

JEE MAIN 2015

(a) $\frac{5h}{8}$ (b) $\frac{3h^2}{8R}$ (c) $\frac{h^2}{4R}$ (d) $\frac{3h}{4}$

23. The position of the centre of mass of a uniform semi-circular wire of radius 'R' placed in x-y plane with its centre at the origin and the line joining its ends as x-axis is given by $\left(0, \frac{xR}{\pi}\right)$. Then, the value of | x | is _____.

JEE MAIN 2021 · 22 JUL · SHIFT 2 *(Numerical)*

24. The centre of mass of solid hemisphere of radius 8 cm is x from the centre of the flat surface. Then value of x is _____.

JEE MAIN 2020 · 6 SEP · SHIFT 2 *(Numerical)*

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TOPIC 03

Composite & Cut-Out Bodies

1 PYQs · Easy 1 · Medium 0 · Difficult 0 | MHT CET 0 · NEET 0 · JEE 1

Concepts covered: Cut-out bodies (1)

LEVEL 1 · EASY 1 questions

25. A circular disc of radius R is removed from a bigger circular disc of radius $2R$ such that the circumferences of the discs coincide. The center of mass of the new disc is αR from the center of the bigger disc. The value of α is

AIEEE 2007

(a) $1/4$ (b) $1/3$ (c) $1/2$ (d) $1/6$

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TOPIC 04

Motion of Centre of Mass

7 PYQs · Easy 7 · Medium 0 · Difficult 0 | MHT CET 0 · NEET 4 · JEE 3

Concepts covered: Velocity and acceleration of COM (2) · Internal forces: COM stays put (3) · Explosion in flight (2)

LEVEL 1 · EASY 7 questions

◆ Velocity and acceleration of COM 2 Qs

26. Given below are two statements:

Statement I: For a mechanical system of many particles total kinetic energy is the sum of kinetic energies of all the particles.

Statement II: The total kinetic energy can be the sum of kinetic energy of the center of mass w.r.t. the origin and the kinetic energy of all the particles w.r.t. the center of mass as the reference. In the light of the above statements, choose the correct answer from the options given below:

JEE MAIN 2026 · 22 JAN · SHIFT 2

(a) Both Statement I and Statement II are false
(b) Statement I is false but Statement II is true
(c) Statement I is true but Statement II is false
(d) Both Statement I and Statement II are true

27. Two identical particles move towards each other with velocity $2v$ and v respectively. The velocity of center of mass is

AIEEE 2002

(a) v (b) $v/3$ (c) $v/2$ (d) zero

◆ Internal forces: COM stays put 3 Qs

28. Two particles A and B initially at rest, move towards each other under mutual force of attraction. At an instance when the speed of A is v and speed of B is 3v, the speed of centre of mass is:

NEET 2023

(a) 2v (b) zero (c) v (d) 4v

29. Two persons of masses 55 kg and 65 kg respectively, are at the opposite ends of a boat. The length of the boat is 3.0 m and weights 100 kg. The 55 kg man walks up to the 65 kg man and sits with him. If the boat is in still water the centre of mass of the system shifts by:

AIPMT 2012 · PRELIMS

(a) 3.0 m (b) 2.3 m (c) zero (d) 0.75 m

30. Two particles which are initially at rest, move towards each other under the action of their internal attraction. If their speeds are v and 2v at any instant, then the speed of centre of mass of the system will be:

AIPMT 2010 · PRELIMS

(a) 2v (b) zero (c) 1.5 v (d) v

◆ Explosion in flight 2 Qs

31. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).

Assertion (A): When a fire cracker (rocket) explodes in mid air, its fragments fly in such a way that they continue moving in the same path, which the fire cracker would have followed, had it not exploded.

Reason (R): Explosion of cracker (rocket) occurs due to internal force only and no external force acts for this explosion.

In the light of the above statements, choose the most appropriate answer from the options given below

NEET 2022 · PHASE 2

(a) (A) is not correct but (R) is correct
(b) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(c) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(d) (A) is correct but (R) is not correct

32. A body A of mass M while falling vertically downwards under gravity breaks into two-parts; a body B of mass $\frac{1}{3}M$ and a body C of mass $\frac{2}{3}M$. The center of mass of bodies B and C taken together shifts compared to that of body A towards

AIEEE 2005

(a) does not shift
(b) depends on height of breaking
(c) body B
(d) body C

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ANSWER KEY

Shaded by level: **Easy**

01 Centre of Mass of Discrete Particles

1. (b)	2. (d)	3. (d)	4. (b)	5. (b)	6. (a)	7. (a)	8. (c)	9. (c)	10. (b)
11. (c)	12. (c)	13. 3	14. (b)	15. (b)	16. (d)	17. (a)	18. (d)	19. (b)	20. 3
21. 2									

02 Continuous Bodies: Standard Results & Variable Density

22. (d)	23. 2	24. 3							

03 Composite & Cut-Out Bodies

25. (b)									

04 Motion of Centre of Mass

26. (d)	27. (c)	28. (b)	29. (c)	30. (b)	31. (a)	32. (a)			

Note: *"Bonus" = no option is correct as the question is printed (dropped in the official key). Numerical questions show the numerical answer.*

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