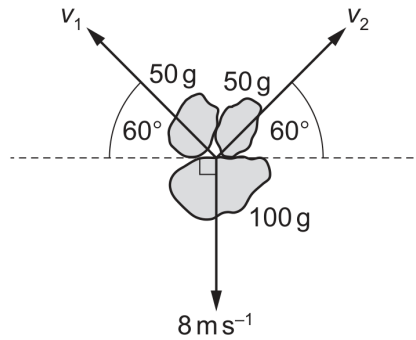


Unit 3: Dynamics:

Subunit 3.3: Linear momentum and its conservation:

Topical Question No: 1

- 10 A stationary firework explodes into three pieces. The masses and the velocities of the three pieces immediately after the explosion are shown.

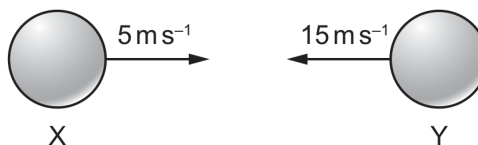


What are speed v_1 and speed v_2 ?

	v_1/ms^{-1}	v_2/ms^{-1}
A	4.0	4.0
B	9.2	9.2
C	14	14
D	16	16

Topical Question No: 2

- 8 Two balls X and Y are moving towards each other with speeds of 5 ms^{-1} and 15 ms^{-1} respectively.



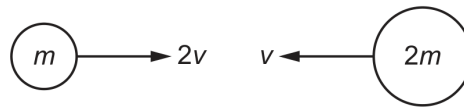
They make a perfectly elastic head-on collision and ball Y moves to the right with a speed of 7 ms^{-1} .

What is the speed and direction of ball X after the collision?

- A** 3 ms^{-1} to the left
- B** 13 ms^{-1} to the left
- C** 3 ms^{-1} to the right
- D** 13 ms^{-1} to the right

Topical Question No: 3

- 10 Two balls, of masses m and $2m$, travelling in a vacuum with initial velocities $2v$ and v respectively, collide with each other head-on, as shown.



After the collision, the ball of mass m rebounds to the left with velocity v .

What is the loss of kinetic energy in the collision?

- A $\frac{3}{4}mv^2$ B $\frac{3}{2}mv^2$ C $\frac{9}{4}mv^2$ D $\frac{9}{2}mv^2$

Topical Question No: 4

- 10 Two equal masses travel towards each other on a frictionless air track at speeds of 60 cm s^{-1} and 40 cm s^{-1} . They stick together on impact.

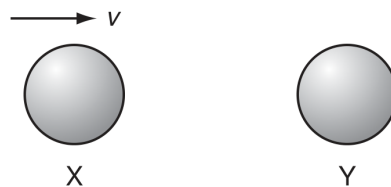


What is the speed of the masses after impact?

- A 10 cm s^{-1} B 20 cm s^{-1} C 40 cm s^{-1} D 50 cm s^{-1}

Topical Question No: 5

- 12 The diagram shows two identical spheres X and Y.



Initially, X moves with speed v directly towards Y. Y is stationary. The spheres collide elastically.

What happens?

	X	Y
A	moves with speed $\frac{1}{2}v$ to the right	moves with speed $\frac{1}{2}v$ to the right
B	moves with speed v to the left	remains stationary
C	moves with speed $\frac{1}{2}v$ to the left	moves with speed $\frac{1}{2}v$ to the right
D	stops	moves with speed v to the right

Topical Question No: 6

- 9 A body of mass m , moving at velocity v , collides with a stationary body of the same mass and sticks to it.

Which row describes the momentum and kinetic energy of the two bodies after the collision?

	momentum	kinetic energy
A	mv	$\frac{1}{4}mv^2$
B	mv	$\frac{1}{8}mv^2$
C	$2mv$	$\frac{1}{2}mv^2$
D	$2mv$	mv^2

Space for working

Topical Question No: 7

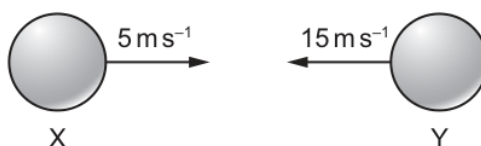
- 10 A molecule of mass m travelling horizontally with velocity u hits a vertical wall at right-angles to its velocity. It then rebounds horizontally with the same speed.

What is its change in momentum?

- A** zero **B** mu **C** $-mu$ **D** $-2mu$

Topical Question No: 8

- 10 Two balls X and Y are moving towards each other with speeds of 5 m s^{-1} and 15 m s^{-1} respectively.



They make a perfectly elastic head-on collision and ball Y moves to the right with a speed of 7 m s^{-1} .

What is the speed and direction of ball X after the collision?

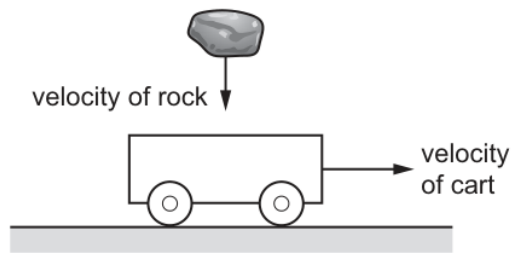
- A** 3 m s^{-1} to the left
B 13 m s^{-1} to the left
C 3 m s^{-1} to the right
D 13 m s^{-1} to the right

Topical Question No: 9

- 13** An empty cart is moving along a horizontal track at a constant velocity.

Resistive forces acting on the cart are negligible.

A heavy rock is dropped vertically into the cart.



The cart continues to move horizontally with the rock inside.

How does the momentum and kinetic energy of the cart with the rock inside compare with the momentum and kinetic energy of the empty cart?

- A** The cart with the rock inside has a smaller momentum and a smaller kinetic energy.
- B** The cart with the rock inside has a smaller momentum and the same kinetic energy.
- C** The cart with the rock inside has the same momentum and a smaller kinetic energy.
- D** The cart with the rock inside has the same momentum and the same kinetic energy.

Answer Key

1. N/A
2. N/A
3. N/A
4. N/A
5. N/A
6. N/A
7. N/A
8. B
9. C