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2.4 Momentum & Impulse

Medium



PHYSICS

IB HL

2.4 Momentum & Impulse

Question Paper

Course	DPIB Physics
Section	2. Mechanics
Topic	2.4 Momentum & Impulse
Difficulty	Medium

Time allowed: 20

Score: /10

Percentage: /100



Question 1

A body of mass $3M$ at rest explodes into two pieces of mass $2M$ and M .

What is the ratio $\frac{\text{kinetic energy of } 2M}{\text{kinetic energy of } M}$ and $\frac{\text{momentum of } 2M}{\text{momentum of } M}$?

	$\frac{\text{kinetic energy of } 2M}{\text{kinetic energy of } M}$	$\frac{\text{momentum of } 2M}{\text{momentum of } M}$
A.	$\frac{1}{2}$	-1
B.	1	-1
C.	$\frac{1}{4}$	2
D.	$\frac{1}{2}$	-2

[1 mark]

Question 2

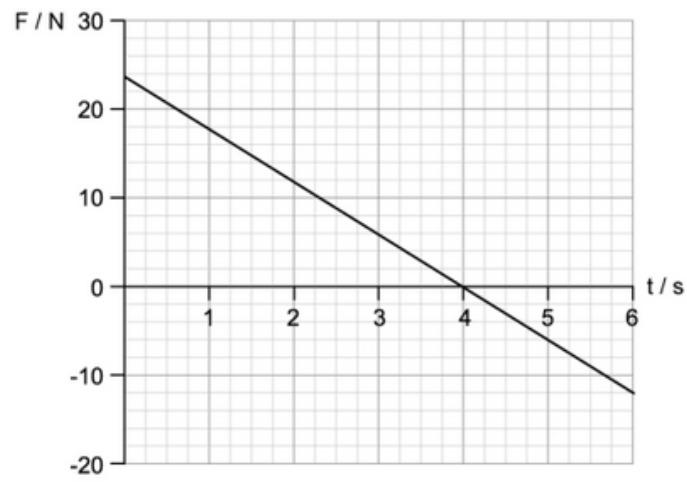
Which of the following is an elastic collision?

- A. A ball dropped from a height and bouncing up to a lower height
- B. Two railway trucks colliding and they link together
- C. Two gas molecules collide and a bond is formed between them
- D. Two gas molecules collide and then travel perpendicular to each other

[1 mark]

Question 3

A force acts on a mass of 5.0 kg and it is initially at rest.



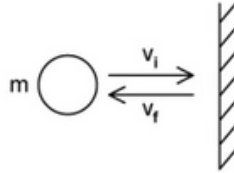
What is the time taken for the mass to reach an acceleration of 2 m s^{-2} ?

- A. 2.50 s
- B. 2.20 s
- C. 2.25 s
- D. 2.00 s



Question 4

A ball of mass m travels horizontally and strikes a vertical wall with a speed of $v_i \text{ ms}^{-1}$. It then rebounds horizontally at speed $v_f \text{ ms}^{-1}$. The ball is in contact with the wall for time Δt .



What is if the ball rebounds after an impulse of magnitude I ?

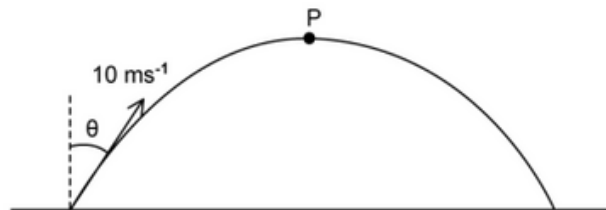
- A. $v_{\text{final}} = \frac{I + v_{\text{initial}}}{m}$
- B. $v_{\text{final}} = \frac{I + mv_{\text{initial}}}{m}$
- C. $v_{\text{final}} = \frac{I - mv_{\text{initial}}}{m}$
- D. $v_{\text{final}} = \frac{I - v_{\text{initial}}}{m}$



[1 mark]

Question 5

A stone of mass 0.5 kg is thrown with an initial speed of 10 m s^{-1} at an angle θ to the vertical. P is the highest point of the motion and air resistance is negligible.



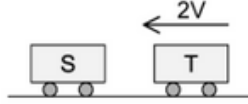
What is the momentum of the stone at P?

- A. $5 \sin \theta$
- B. 5
- C. $5 \cos \theta$
- D. 0

[1 mark]

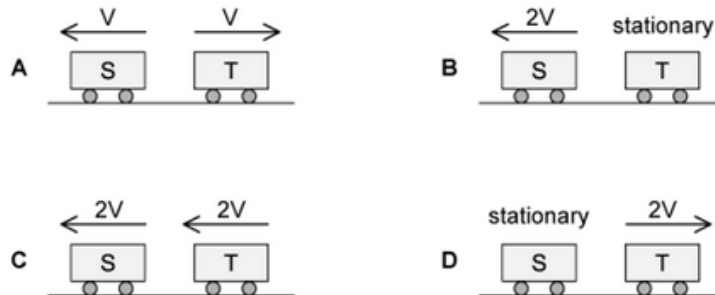
Question 6

A truck T moving horizontally collides with an identical truck S that is at rest.



T strikes S with speed $2v$.

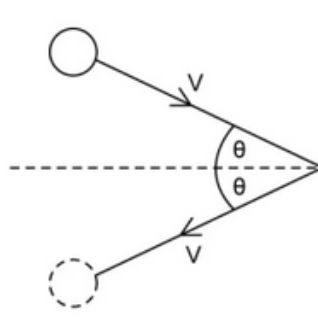
What is a possible outcome of the collision?



[1 mark]

Question 7

A ball of mass m strikes a vertical wall with a speed v at an angle of θ to the wall. The ball rebounds at the same speed and angle in time t . What is the magnitude of the impulse on the wall?

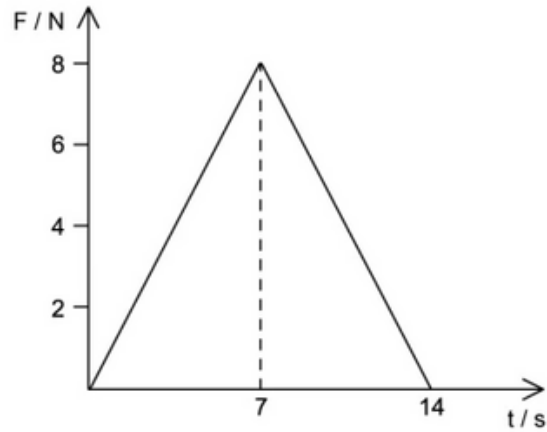


- A. zero
- B. $2mv$
- C. $2mv \sin \theta$
- D. $2mv \cos \theta$

[1 mark]

Question 8

A ball of mass 4.0 kg , initially at rest, is acted on by a force F which varies with t .



What is the velocity of the ball after 14 s ?

- A. 7 m s^{-1}
- B. 56 m s^{-1}
- C. 14 m s^{-1}
- D. 28 m s^{-1}



[1 mark]

Question 9

Which of the following is true for momentum and impulse?

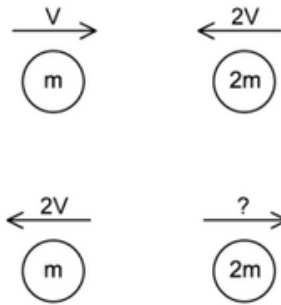
- A. Momentum is conserved in an inelastic collision
- B. Impulse is the momentum
- C. The direction in which an object is travelling in doesn't affect its impulse
- D. A heavier object always experiences a greater impulse than a lighter one

[1 mark]



Question 10

Two balls m and $2m$ collide elastically with speeds v and $2v$ respectively. After the collision, they both move in opposite directions.



What speed does the $2m$ ball move with after the collision?

- A. $\sqrt{\frac{5}{2}}v$
- B. $\frac{5}{2}v$
- C. $\sqrt{\frac{1}{2}}v$
- D. $\frac{1}{2}v$

