2.4 Momentum & Impulse

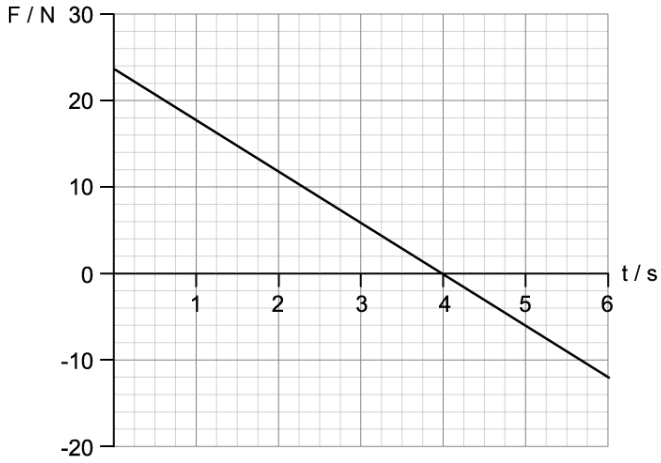
Question Paper

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

To be used by all students preparing for DP IB Physics HL
Students of other boards may also find this useful

Question 1

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

[1 mark]

Question 2

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

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

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

[1 mark]

Question 3

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

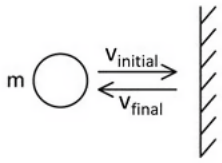
C. Two gas molecules collide and a bond is formed between them

D. Two gas molecules collide and then travel perpendicular to each other

[1 mark]

Question 4

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



What is v_{final} if the ball rebounds after an impulse of magnitude I?

A. $v_{final} = \frac{I + v_{initial}}{m}$

B. $v_{final} = \frac{I + mv_{initial}}{m}$

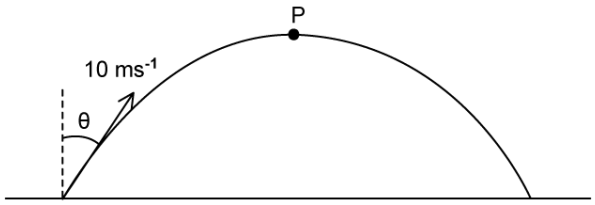
C. $v_{final} = \frac{I - mv_{initial}}{m}$

D. $v_{final} = \frac{I - v_{initial}}{m}$

[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 θ

B. 5

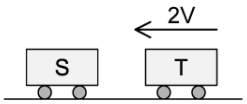
C. 5 cos θ

D. 0

[1 mark]

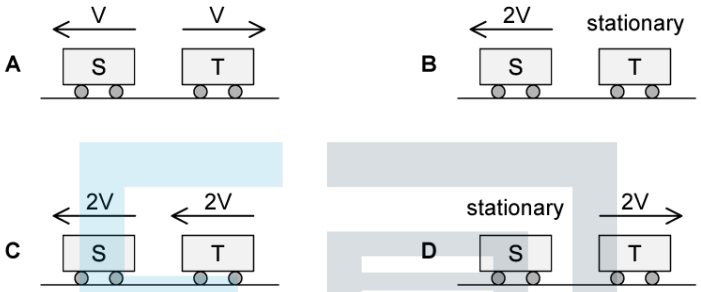
Question 6

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



T strikes S with speed 2*v*.

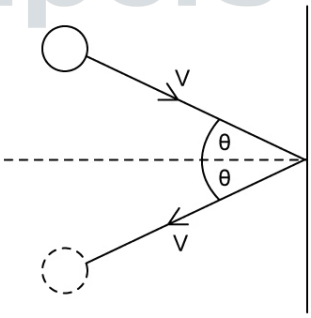
What is a possible outcome of the collision?



[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. $2mv$

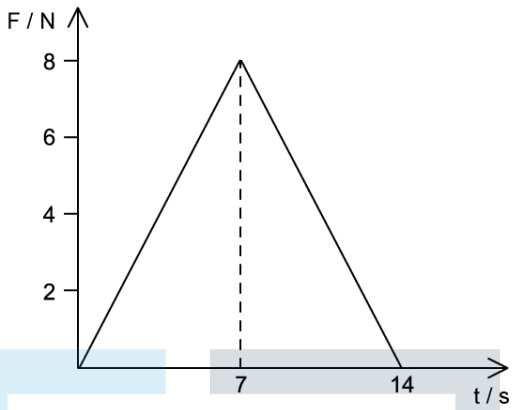
C. $2mv \sin \theta$

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

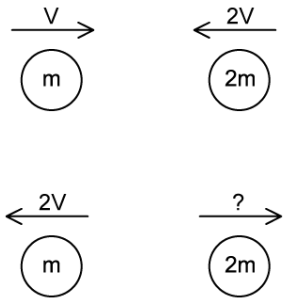
C. The direction in which an object is travelling in doesn't affect its impulse

D. A heavier object always experiences a greater impulse than a lighter one

[1 mark]

Question 10

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



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

A. $\sqrt{\frac{5}{2}}v$

B. $\frac{5}{2}v$

C. $\sqrt{\frac{1}{2}}v$

D. $\frac{1}{2}v$

[1 mark]