

# 2.4 Momentum & Impulse

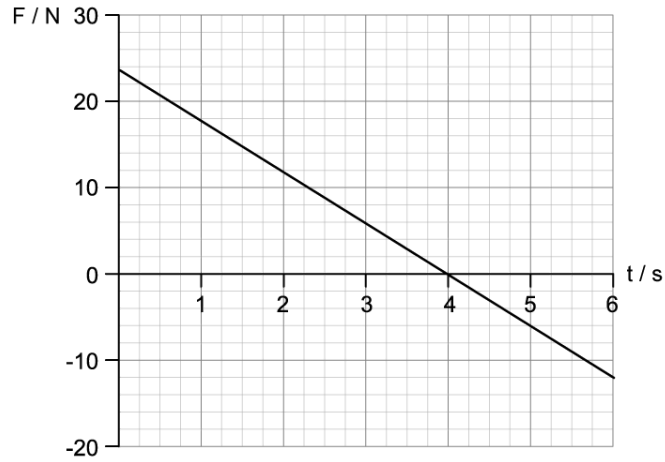
## Question Paper

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

**Time allowed:** 20  
**Score:** /10  
**Percentage:** /100

### Question 1

A 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  $2 \text{ m s}^{-2}$ ?

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

[1 mark]

### Question 2

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

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

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

[1 mark]

### Question 3

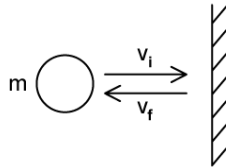
Which of the following is an elastic collision?

- 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  $v_i \text{ ms}^{-1}$ . It then rebounds horizontally at speed  $v_f \text{ ms}^{-1}$ . The ball is in contact with the wall for time  $\Delta t$ .



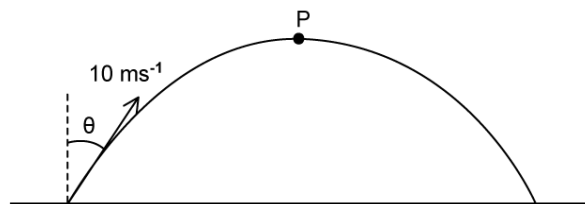
What is if the ball rebounds after an impulse of magnitude  $I$ ?

- 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  $0.5 \text{ kg}$  is thrown with an initial speed of  $10 \text{ m s}^{-1}$  at an angle  $\theta$  to the vertical. P is the highest point of the motion and air resistance is negligible.



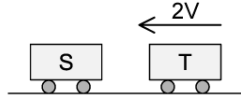
What is the momentum of the stone at P?

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

[1 mark]

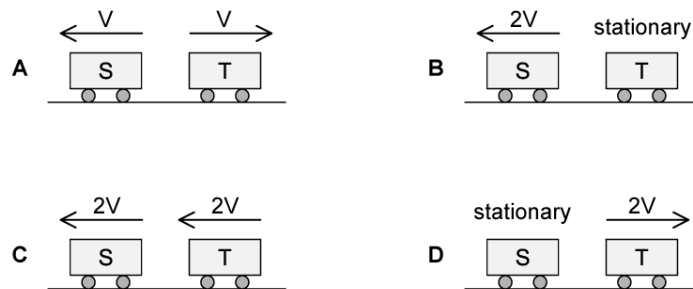
### Question 6

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



T strikes S with speed  $2v$ .

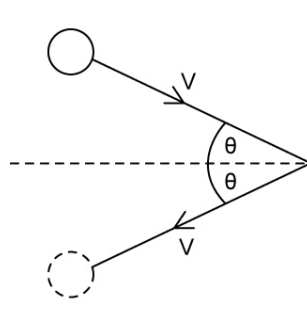
What is a possible outcome of the collision?



[1 mark]

### Question 7

A ball of mass  $m$  strikes a vertical wall with a speed  $v$  at an angle of  $\theta$  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?

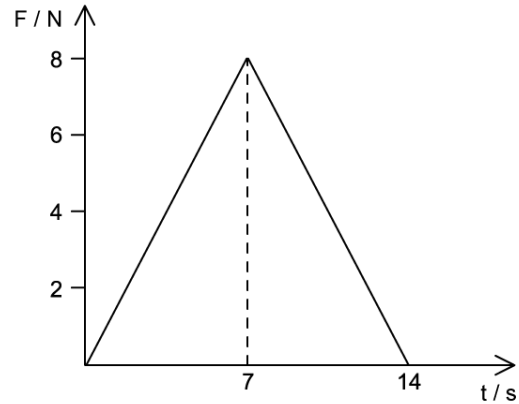


- A. zero
- B.  $2mv$
- C.  $2mv \sin \theta$
- D.  $2mv \cos \theta$

[1 mark]

### Question 8

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



What is the velocity of the ball after  $14 \text{ s}$ ?

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

[1 mark]

### Question 9

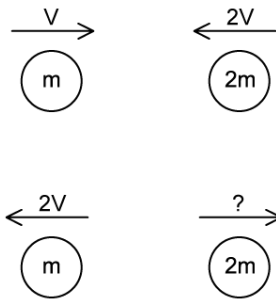
Which of the following is true for momentum and impulse?

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

[1 mark]