Multiple Choice Momentum Past Paper Questions

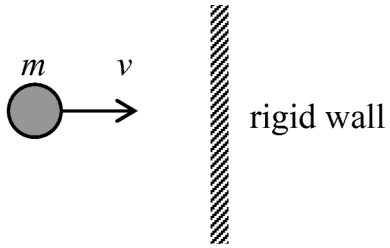
Specimen—Jan 2013 (2009 spec)

1 For the two physical quantities, impulse and force, which one of the following is correct?

Specimen

A Impulse is a scalar and force is a scalar.
B Impulse is a scalar and force is a vector.
C Impulse is a vector and force is a scalar.
D impulse is a vector and force is a vector.

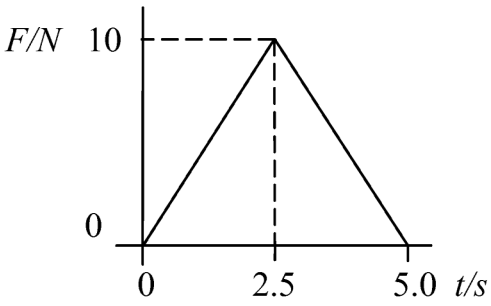
2 A particle of mass *m* strikes a rigid wall perpendicularly from the left with velocity *v*.



If the collision is perfectly elastic, the change in momentum of the particle which occurs as a result of the collision is

A 2*mv* to the right.
B 2*mv* to the left.
C *mv* to the left.
D zero.

3



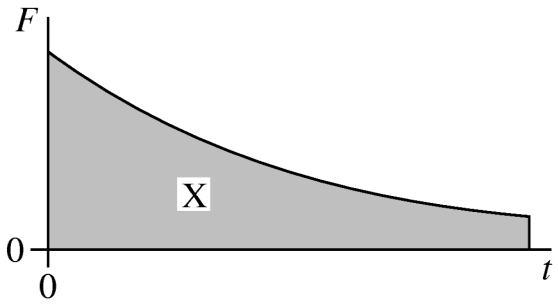
A force, *F*, varies with time, *t*, as shown by the graph and is applied to a body initially at rest on a smooth surface. What is the momentum of the body after 5.0 s?

A zero.
B 12.5 N s.
C 25 N s.
D 50 N s.

4 The rate of change of momentum of a body falling freely under gravity is equal to its

A weight.
B power.
C kinetic energy.
D potential energy.

1 The graph shows the variation with time, t, of the force, F, acting on a body.



Jan 2010

What physical quantity does the area X represent?

A the displacement of the body
B the acceleration of the body
C the change in momentum of the body
D the change in kinetic energy of the body

2 Water of density $1000\,\text{kg}\,\text{m}^{-3}$ flows out of a garden hose of cross-sectional area $7.2 \times 10^{-4}\,\text{m}^2$ at a rate of $2.0 \times 10^{-4}\,\text{m}^3$ per second. How much momentum is carried by the water leaving the hose per second?

A $5.6 \times 10^{-5}\,\text{N s}$
B $5.6 \times 10^{-2}\,\text{N s}$
C $0.20\,\text{N s}$
D $0.72\,\text{N s}$

3 Which row, **A** to **D**, in the table correctly shows the quantities conserved in an inelastic collision?

	mass	**momentum**	**kinetic energy**	**total energy**
A	conserved	not conserved	conserved	conserved
B	not conserved	conserved	conserved	not conserved
C	conserved	conserved	conserved	conserved
D	conserved	conserved	not conserved	conserved

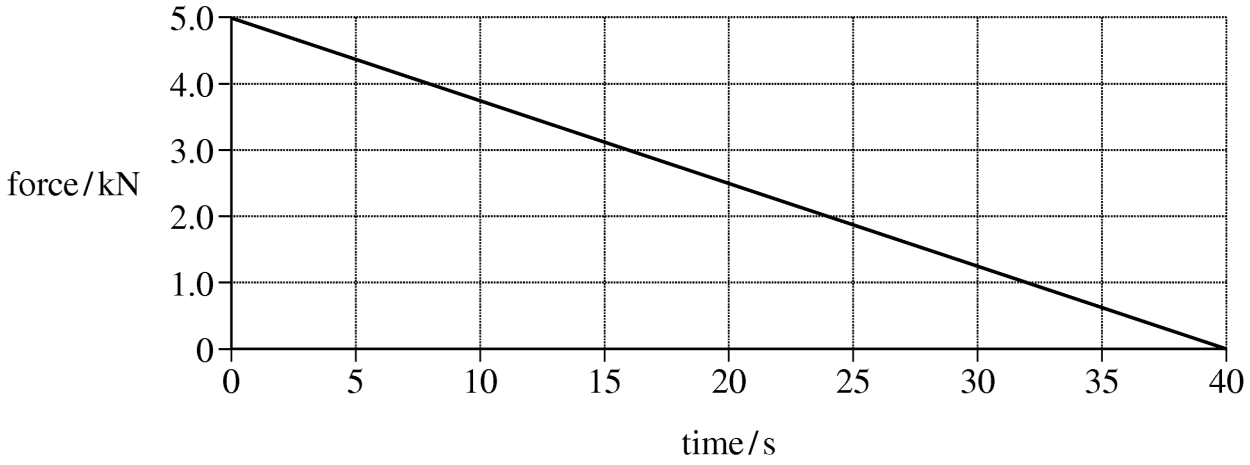
Jun 2010

1 Which one of the following statements is correct?

The force acting on an object is equivalent to

A its change of momentum.
B the impulse it receives per second.
C the energy it gains per second.
D its acceleration per metre.

2 The graph shows how the force on a glider of mass 2000 kg changes with time as it is launched from a level track using a catapult.



Assuming the glider starts at rest what is its velocity after 40 s?

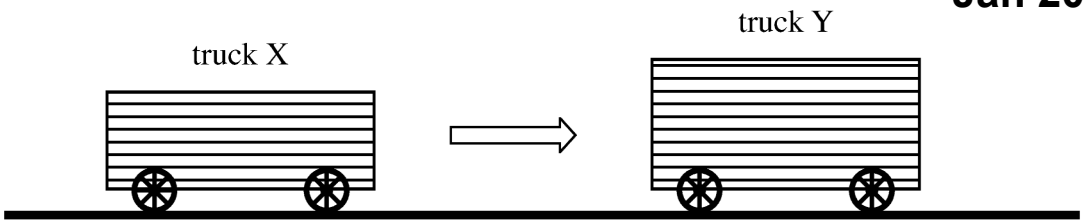
A $2.5\ \text{m s}^{-1}$
B $10\ \text{m s}^{-1}$
C $50\ \text{m s}^{-1}$
D $100\ \text{m s}^{-1}$

3 A gas molecule of mass m in a container moves with velocity v. If it makes an elastic collision at right angles to the walls of the container, what is the change in momentum of the molecule?

A zero
B $\frac{1}{2}mv$
C mv
D $2mv$

1 A rail truck X travels along a level track and collides with a stationary truck Y. The two trucks move together at the same velocity after the collision.

Jan 2011



Which line, **A** to **D**, in the table states how the total momentum and the total kinetic energy of the trucks change as a result of the impact.

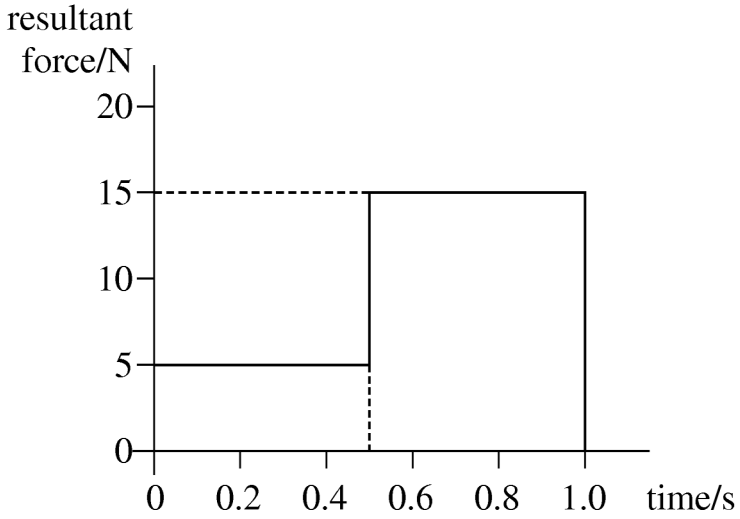
	total momentum	**total kinetic energy**
A	unchanged	unchanged
B	unchanged	decreases
C	decreases	decreases
D	decreases	unchanged

1 Which line, **A** to **D**, in the table shows correctly whether the moment of a force, and momentum, are scalar or vector quantities?

Jun 2011

	moment of force	**momentum**
A	scalar	scalar
B	scalar	vector
C	vector	scalar
D	vector	vector

2 The graph shows how the resultant force applied to an object of mass 2.0 kg, initially at rest, varies with time.



What is the speed of the object after 1.0 s?

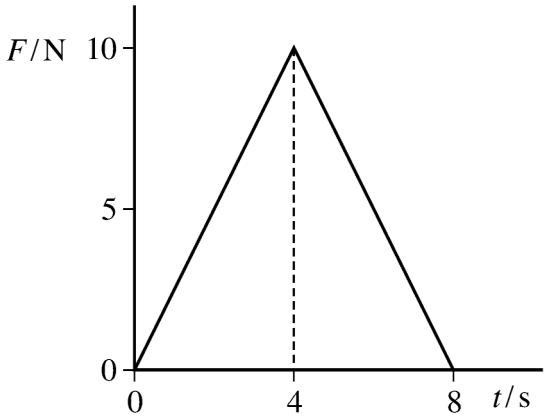
A $2.5\,m\,s^{-1}$
B $5.0\,m\,s^{-1}$
C $7.5\,m\,s^{-1}$
D $10\,m\,s^{-1}$

3 Which of the following is a possible unit for rate of change of momentum?

A N s
B $N\,s^{-1}$
C $kg\,m\,s^{-1}$
D $kg\,m\,s^{-2}$

Jan 2012

1 A ball of mass 2.0 kg, initially at rest, is acted on by a force F which varies with time t as shown by the graph.



What is the velocity of the ball after 8.0 s?

A $20\,\text{m s}^{-1}$

B $40\,\text{m s}^{-1}$

C $80\,\text{m s}^{-1}$

D $160\,\text{m s}^{-1}$

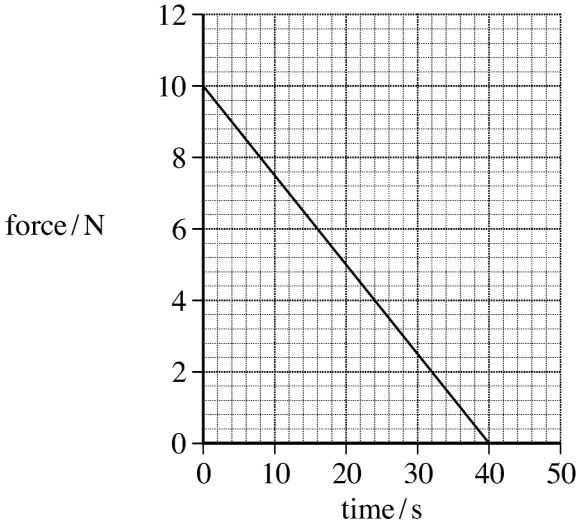
2 A body X moving with a velocity v makes an elastic collision with a stationary body Y of equal mass on a smooth horizontal surface.

Which line, **A** to **D**, in the table gives the velocities of the two bodies after the collision?

	velocity of X	**velocity of Y**
A	$\frac{v}{2}$	$-\frac{v}{2}$
B	$-\frac{v}{2}$	$\frac{v}{2}$
C	v	0
D	0	v

Jun 2012

1 The graph shows how the force acting on a body changes with time.



The body has a mass of 0.25 kg and is initially at rest. What is the speed of the body after 40 s assuming no other forces are acting?

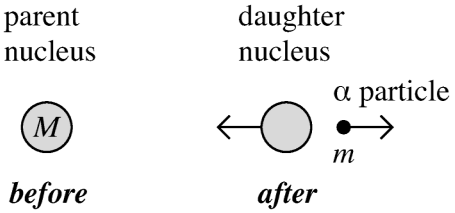
A 200 m s^{-1}

B 400 m s^{-1}

C 800 m s^{-1}

D 1600 m s^{-1}

2 A stationary unstable nucleus of mass M emits an α particle of mass m with kinetic energy E.



What is the speed of recoil of the daughter nucleus?

A $\dfrac{\sqrt{2mE}}{(M-m)}$

B $\dfrac{\sqrt{2mE}}{M}$

C $\dfrac{(M-m)}{\sqrt{2mE}}$

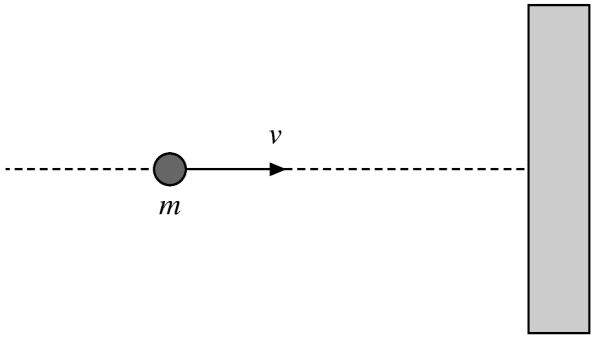
D $\dfrac{2mE}{(M-m)^2}$

3 Two ice skaters, initially at rest and in contact, push apart from each other.
Which line, **A** to **D**, in the table states correctly the change in the total momentum and the total kinetic energy of the two skaters?

	total momentum	**total kinetic energy**
A	unchanged	increases
B	unchanged	unchanged
C	increases	increases
D	increases	unchanged

Jan 2013

1 A ball of mass m travelling at velocity v collides normally with a smooth wall, as shown in the diagram, and rebounds elastically.



Which line, **A** to **D**, in the table, gives the correct expressions for the magnitude of the change of momentum, and the change of kinetic energy, of the ball?

	magnitude of change of momentum	**change of kinetic energy**
A	$2mv$	0
B	$2mv$	mv^2
C	0	0
D	0	mv^2

2 A cricket ball of mass 0.16 kg travelling at a speed of 35 m s^{-1} is hit by a bat and, as a result of the impact, leaves the bat in the opposite direction at 30 m s^{-1}. If the duration of the impact is 52 ms, what is the magnitude of the average force on the ball?

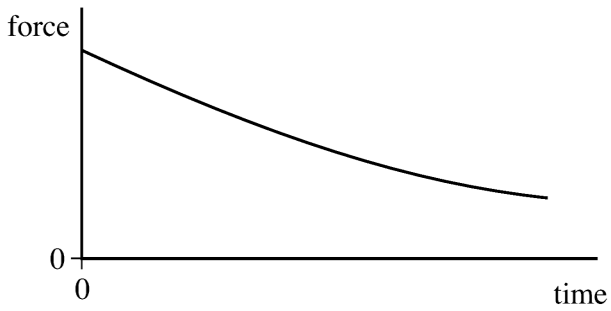
A 0.015 N

B 0.20 N

C 15 N

D 200 N

3 A ball is released so that it falls vertically. The graph shows how the resultant force acting on the ball changes with time.



Which one of the following is represented by the area under the graph?

A distance travelled

B gain in kinetic energy

C acceleration

D impulse