

1

In a test a 500 kg car travelling at 10 m s^{-1} hits a wall. The front 0.30 m of the car crumples as the car is brought to rest.

What is the average force on the car during the impact?

[1 mark]

A 830 N

☐

B 7500 N

☐

C 8300 N

☐

D 83 000 N

☐☐

2

Two bodies of different masses undergo an elastic collision in the absence of any external force.

Which row gives the effect on the total kinetic energy of the masses and the magnitudes of the forces exerted on the masses during the collision?

[1 mark]

	Total kinetic energy	Magnitudes of forces	
A	remains unchanged	same on both masses	☐
B	remains unchanged	greater on the smaller mass	☐
C	decreases	same on both masses	☐
D	decreases	greater on the smaller mass	☐

3 A car of mass 580 kg collides with the rear of a stationary van of mass 1200 kg.

Following the collision, the van moves with a velocity of 6.20 m s^{-1} and the car recoils in the opposite direction with a velocity of 1.60 m s^{-1} .

What is the initial speed of the car?

[1 mark]

A 5.43 m s^{-1}

B 11.2 m s^{-1}

C 12.8 m s^{-1}

D 14.4 m s^{-1}

☐☐☐☐☐

- 4 A railway truck of mass 2000 kg travelling horizontally at 1.5 m s^{-1} collides with a stationary truck of mass 3000 kg.
After the collision they move together.

Which row is correct?

[1 mark]

	Speed of the trucks immediately after collision / m s^{-1}	Effect of collision on total kinetic energy
A	0.6	no change
B	0.6	decrease
C	1.0	no change
D	1.0	decrease

☐☐☐☐☐

5

Which row is true for an elastic collision between two objects in an isolated system?

[1 mark]

	Kinetic energy	Momentum
A	conserved	conserved
B	not conserved	conserved
C	conserved	not conserved
D	not conserved	not conserved

☐☐☐☐☐

6

A pellet with velocity 200 m s^{-1} and mass 5.0 g is fired vertically upwards into a stationary block of mass 95.0 g . The pellet remains in the block. The impact causes the block to move vertically upwards.

What is the maximum vertical displacement of the block?

[1 mark]

A 5.1 m

☐

B 10 m

☐

C 51 m

☐

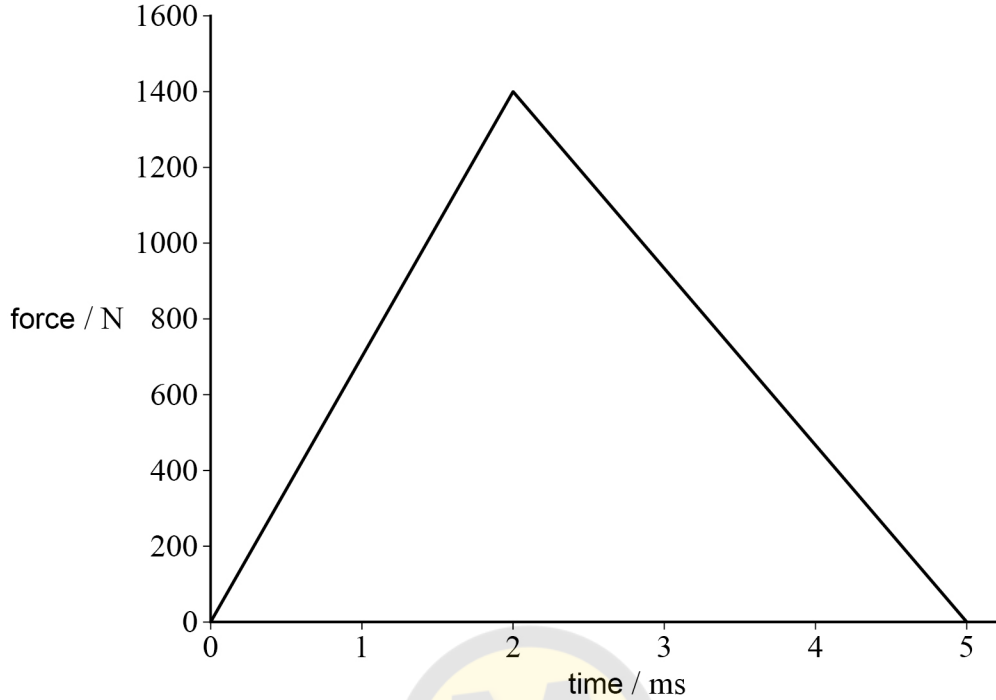
D 100 m

☐

7

A stationary ball is free to move. The ball is hit with a bat.

The graph shows how the force of the bat on the ball changes with time.



The ball has a mass of 0.044 kg.

What is the speed of the ball immediately after being hit?

[1 mark]

A 13 m s⁻¹

☐

B 60 m s⁻¹

☐

C 80 m s⁻¹

☐
☐

D 160 m s⁻¹

☐

8

A tennis ball has a mass of 58 g.

The ball is dropped from rest from a height of 1.8 m above the ground and falls vertically.

The ball rebounds vertically to a height of 1.1 m.

The effect of air resistance is negligible.

What is the change in momentum of the ball during its collision with the ground?

[1 mark]

A 0.040 N s

☐

B 0.075 N s

☐

C 0.215 N s

☐

D 0.614 N s

☐

9

What is true for an inelastic collision between two isolated objects?

[1 mark]

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A Both total momentum and total kinetic energy are conserved.

☐

B Neither total momentum nor total kinetic energy is conserved.

☐

C Only total kinetic energy is conserved.

☐☐

D Only total momentum is conserved.

☐

10

Object **P** has a mass of 7500 kg and travels at 12 m s^{-1} .

Object **Q** has a mass of 2500 kg and travels at 20 m s^{-1} in the same direction as **P**.

P and **Q** collide and remain together after the collision.

What is the total kinetic energy of **P** and **Q** immediately after the collision?

[1 mark]

A 70 kJ

☐

B 140 kJ

☐

C 980 kJ

☐

D 2.0 MJ

☐☐

- 11 An object of mass 0.20 kg moves with an initial velocity u . It collides with a stationary object of mass 0.30 kg .

The objects stick together when they collide.
No external forces act on the objects.

What is the final velocity of the two objects after the collision?

[1 mark]

A $0.40u$



B $0.67u$



C $1.5u$



D $2.5u$



12

A pellet of mass 25 g travelling horizontally at 40 m s^{-1} enters a fixed wooden block. The pellet stops after travelling a horizontal distance of 2.5 cm in the block.

What is the average resistive force acting on the pellet?

[1 mark]

A 20 N



B 800 N



C 1600 N



D 8000 N



13

A cricket ball of mass 0.16 kg travels at a speed of 35 m s^{-1} towards a bat. When the ball is hit, it is in contact with the bat for 52 ms . As a result, the ball travels in the opposite direction with a speed of 30 m s^{-1} .

What is the average force on the ball from the bat?

[1 mark]

A 0.015 N

☐

B 0.20 N

☐

C 15 N

☐☐

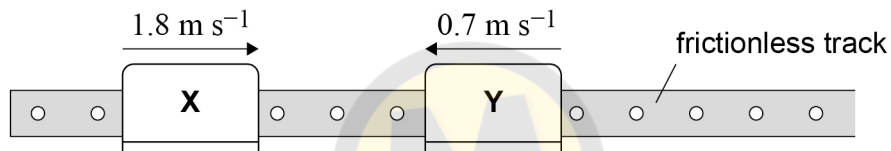
D 200 N

☐

14

Glider **X** of mass 400 g travels at 1.8 m s^{-1} to the right on a horizontal, frictionless track.

Glider **Y** of mass 300 g travels towards **X** at 0.7 m s^{-1} .



X and **Y** collide.

Immediately after the collision, **Y** travels to the right at a speed of 0.9 m s^{-1} .

What are the speed and direction of movement of **X** immediately after the collision?

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[1 mark]

A 0.6 m s^{-1} to the left

☐

B 0.6 m s^{-1} to the right

☐

C 1.7 m s^{-1} to the left

☐

D 1.7 m s^{-1} to the right

☐☐