

19 The momentum of a car of mass m increases from p_1 to p_2 .

What is the increase in the kinetic energy of the car?

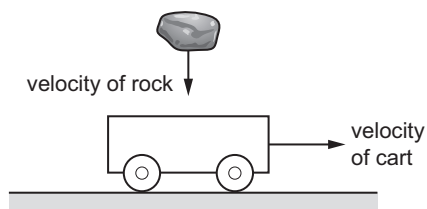
- A $\frac{(p_2^2 - p_1^2)}{2m}$ B $\frac{(p_2 - p_1)^2}{2m}$ C $\frac{p_2 - p_1}{2m}$ D $\frac{p_1 - p_2}{2m}$

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13 An empty cart is moving along a horizontal track at a constant velocity.

Resistive forces acting on the cart are negligible.

A heavy rock is dropped vertically into the cart.



The cart continues to move horizontally with the rock inside.

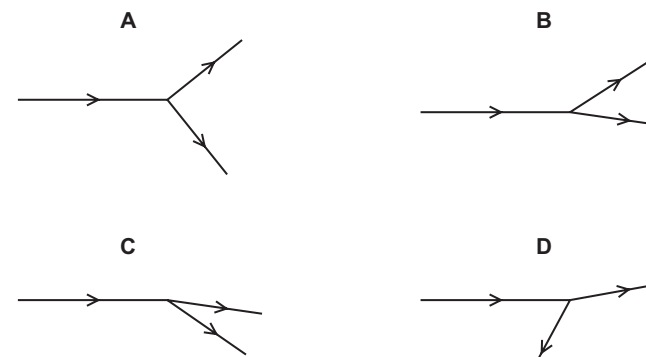
How does the momentum and kinetic energy of the cart with the rock inside compare with the momentum and kinetic energy of the empty cart?

- A The cart with the rock inside has a smaller momentum and a smaller kinetic energy.
 B The cart with the rock inside has a smaller momentum and the same kinetic energy.
 C The cart with the rock inside has the same momentum and a smaller kinetic energy.
 D The cart with the rock inside has the same momentum and the same kinetic energy.

11 A nucleus collides with a stationary nucleus in a vacuum. The diagrams show the paths of the nuclei before and after the collision.

No other particles are involved in the collision.

Which diagram is **not** possible?



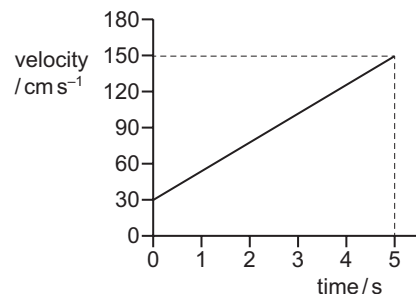
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7 Which word equation is **not** correct?

- A force = change of momentum
 B force = mass $\times$ acceleration
 C force = $\frac{\text{moment}}{\text{perpendicular distance from the pivot}}$
 D force = $\frac{\text{work done}}{\text{displacement in the direction of the force}}$

- 3 A car is accelerated by a constant resultant force of 300 N for 5.0 s.

The variation with time of the velocity, in cm s^{-1} , of the car is shown.



What is the mass of the car?

- A** 13 kg **B** 1000 kg **C** 1300 kg **D** 10 000 kg
- 5 An object is fired upwards from horizontal ground. The object has an initial velocity of 20 m s^{-1} at an angle of 45° to the horizontal. Air resistance is negligible.

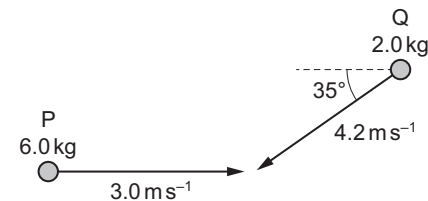
Which statement describes the speed of the object after it is fired until immediately before it reaches the ground again?

- A** Its speed decreases to a value greater than zero, then increases to 20 m s^{-1} .
B Its speed decreases to a value greater than zero, then increases to a value greater than 20 m s^{-1} .
C Its speed decreases to zero, then increases to 20 m s^{-1} .
D Its speed decreases to zero, then increases to a value less than 20 m s^{-1} .

- 7 Objects P and Q form an isolated system.

Object P has mass 6.0 kg and is moving at a speed of 3.0 m s^{-1} .

Object Q has mass 2.0 kg and is moving at a speed of 4.2 m s^{-1} at an angle of 35° to the path of P.



Objects P and Q collide and stick together.

What is the magnitude of the component of the final momentum of the combined objects in the original direction of P?

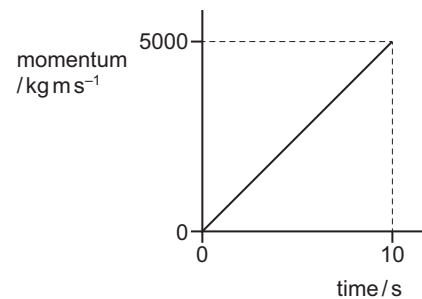
- A** 9.6 kg m s^{-1} **B** 11 kg m s^{-1} **C** 13 kg m s^{-1} **D** 25 kg m s^{-1}
- 38 A stationary nucleus has nucleon number A .

The nucleus decays by emitting a proton with speed v to form a new nucleus with speed u . The new nucleus and the proton move away from one another in opposite directions.

Which equation gives v in terms of A and u ?

- A** $v = \left(\frac{A}{4} - 1\right)u$
B $v = (A - 1)u$
C $v = Au$
D $v = (A + 1)u$

- 11 The graph shows how the momentum of a motorcycle changes with time.



What is the resultant force on the motorcycle?

- A** 500 N **B** 5000 N **C** 25 000 N **D** 50 000 N
- 12 A rocket has a weight of W and an initial acceleration of a as the rocket leaves the ground vertically. The acceleration of free fall is g .

Which expression gives the initial upward force exerted on the rocket due to the engine?

- A** $\frac{Wa}{g} + W$ **B** $\frac{Wa}{g}$ **C** $\frac{Wa}{g} - W$ **D** $Wa + W$