

Collisions: Physics of Collisions

Suggested Responses

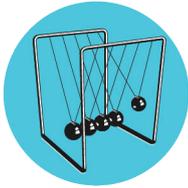
Comprehension Questions

1. Numerous examples of collisions from the clip are shown, including car crash, rocket crash, crash centre test, and tennis ball bouncing.
2. Their speed can change, and their direction of motion can change.
3. When a rocket launches, gas is ejected out of the bottom of the rocket. These gases bounce off the ground and push back up on the rocket, applying a large force and causing it to accelerate into the air.
4. The force that the swimmer exerts on the water and the force that the water exerts back on the swimmer are equal and opposite. However, the swimmer will accelerate through the water if the force that they exert on the water is greater than all of the resistive forces acting on them - even if the force exerted by him is balanced by the force of the water pushing back on his arms.
5. Energy cannot be created or destroyed - it can only be transferred from one type of energy store to others.
6. See table below.

Example	Useful energy	Wasted form
a) a lightbulb being switched on	electrical energy transferred to light energy	electrical energy transferred to heat/thermal energy
b) a football being kicked into the air	chemical energy from food eaten to kinetic energy (fuelling the person kicking the ball) kinetic energy from foot transferred to the gravitational potential energy of the ball in the air	kinetic energy from foot to sound and heat/thermal energy when kicking the ball
c) a child bouncing on a trampoline	kinetic energy to gravitational potential energy, and back again, constantly elastic potential energy in the trampoline springs and sheet into kinetic energy as the person is propelled back into the air	kinetic energy and gravitational potential energy transferred to heat/thermal and sound energy

7. In an elastic collision, kinetic energy is conserved, whereas in an inelastic collision, kinetic energy is not conserved. (In reality though, there is no such thing as an elastic collision - kinetic energy is always lost when two bodies collide.)





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8. See table below:

Scalar	Vector
distance	velocity
speed	acceleration
time	displacement

9. a) The forward force of thrust is greater than the drag and air resistance forces acting on the car, so there is a resultant force in the direction of the car's motion.

b) Having jumped up in the air due to the force from the trampoline, the only force acting on the person is the force of gravity pulling them back downwards and causing them to decelerate as they move upwards, and accelerate as they fall back downwards.

c) A feather falling on Earth will experience the force of gravity acting downwards in it and a force of air resistance acting up on it as it collides with air molecules on its journey downwards.

d) The only force acting on the feather when it falls on the moon is that of gravity, so it accelerates straight downwards and feels no air resistance acting upon it.

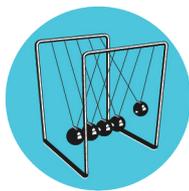
10. a) a feather will experience air resistance on Earth, but not on the moon, so will fall faster on the moon than on Earth.

b) Heavy objects on the Earth will fall faster as they are not affected by air resistance and will reach the ground quicker due to the acceleration due to gravity being on Earth than it is on the moon.

Matching Cards - (see next page)

Transcript - for teacher and student use





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Matching Cards

Car crashes, rocket crashes, crash test dummies and bouncing tennis balls are all examples of types of collisions.
The conservation of energy states that energy cannot be created or destroyed but it is transferred from one form to another.
When a light bulb is turned on electrical energy is transferred to electromagnetic waves which we call light waves.
When a rock falls from a high cliff top onto a beach gravitational potential energy is transferred to kinetic energy.
An elastic collision is when there is no loss of kinetic energy during the collision.
Inelastic collisions occur when kinetic energy is transferred to other forms of energy such as heat.
Velocity, displacement and acceleration are vector quantities because they have a magnitude and a direction associated with them.
When a person jumps up and down on a trampoline elastic potential energy is transformed to kinetic energy and gravitational potential energy.
Speed and distance are examples of scalar quantities, as they have a magnitude but no direction associated with them.
A feather and a hammer will hit the surface of the moon at the same time when dropped but the air resistance on Earth, due to its atmosphere, means the hammer will land before the feather.

