

Conservation of momentum

Transcript

The principle of conservation of momentum can be used to investigate a system which involves collisions between two particles.

An air track minimises the effects of friction so it is very useful for investigating motion.

The momentum of a glider on an air track can be calculated using the equation $p = mv$.

The mass of the glider is measured.

A light gate and data logger are used to measure the velocity.

Now we are going to consider elastic collisions. These are collisions where kinetic energy is conserved.

A glider is placed between the light gates.

Another glider is placed at one end of the track.

Both gliders have the same mass in this example.

Glider 1 is set in motion towards glider 2.

The data logger shows that the velocity of glider 1 is approximately the same as that of glider 2.

Momentum and kinetic energy are transferred from glider 1 to glider 2.

A collision between two moving objects is now considered.

Both gliders are set in motion so that they collide at the center of the air track.

The total momentum is calculated before and after the collision.

The total momentum before the collision is equal to the total momentum after the collision. Momentum is conserved in elastic collisions.

We can also check that kinetic energy is conserved during the collision.

The total kinetic energy before the collision is equal to the total kinetic energy after the collision.

Now we are going to consider inelastic collisions. These are collisions where kinetic energy is not conserved.

In an inelastic collision, the gliders stick together when they collide.

In the same way as before, the total momentum is calculated before and after the collision.

The total momentum before the collision is equal to the total momentum after the collision. Momentum is conserved in inelastic collisions.

Once again the change in kinetic energy is also calculated.

In this case, the total kinetic energy before the collision is not equal to the total kinetic energy after the collision. Kinetic energy has not been conserved.

This demonstration has covered just a few examples of elastic and inelastic collisions. However, the same rules apply for all collisions.

In a closed system, momentum is always conserved. This applies to all types of collisions.

Kinetic energy is conserved in elastic collisions but it is not conserved in inelastic collisions.

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