Physics Honors: Momentum and Impulse

Momentum

Momentum is the product of an object's mass and velocity

$$p = m* v$$

p = momentum (kg*m/s OR Ns)

m = mass (kg)

v = velocity (m/s)

Momentum Practice

A car with a mass of 725 kg is moving 22 m/s to the east. Find the magnitude and direction of the momentum of the car.

If a second car with a mass of 2175 kg has the same momentum, what is its velocity?

Momentum Practice

1. A 15 kg object is moving at 3 m/s. What is its momentum?

1. Two object are moving at 25 m/s. One object weighs 10 kg. If each object has the same momentum, what is the mass of the second object?

Impulse

An object’s change in momentum is called impulse.

If you wanted to change the momentum of an object, what would you need?

Impulse Equation (impulse-momentum theorem)

$$F\Delta t = m\Delta v = \Delta p$$

- Greek letter Delta. This means “The change in” and it calculated (final - initial)

All three of these expressions represent Impulse.

Impulse Practice

The driver of a car sees an object in the roadway. They slam on their breaks for 2 seconds. As a result, a 5000 N force is exerted on the car to slow it down. What is the impulse?

If the car weighs 1,000 kg and the driver was able to make a complete stop, how fast were they going before they started breaking?

Impulse Practice

1. A 1,500 kg car going 10 m/s can be stopped by gently applying the breaks for 15 seconds. It can be stopped in 3.8 seconds if the driver slams on the breaks. If a car hits a wall, it will stop in 0.5 seconds.

Calculate the force associated with each of the stopping times