

Chapter 7

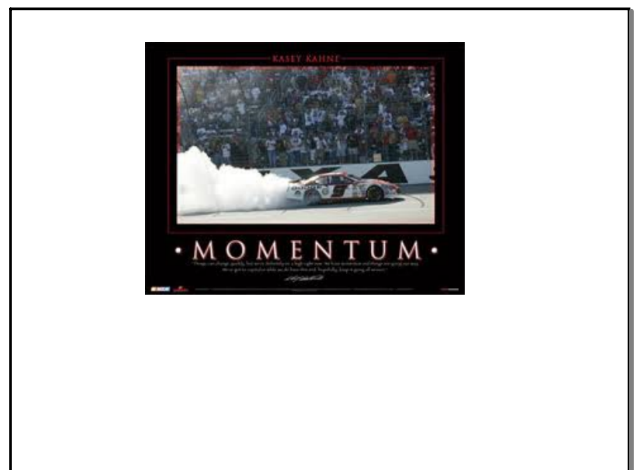
The physics of ...



Oct 25-7:11 PM



Oct 25-7:14 PM



Oct 15-8:35 PM

In a collision or an explosion, things happen so rapidly that you can't measure the forces involved. (They change very quickly!)

How can you predict what will happen?

(Use idealized cases)

Oct 25-8:06 PM

Chapter 7

Momentum = mass * Velocity

$$\vec{p} = m \vec{v}$$

$m=1 \text{ kg}$



$m=1000\text{kg}$



Both moving at same speed.
Which has more momentum?

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$m=1 \text{ kg}$



$m=1000\text{kg}$



Could they have the same momentum?

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Well, so what?

In a collision or an explosion, things happen so rapidly that you can't measure the forces involved. (They change very quickly!)

How can you predict what will happen?

Answer: Use Momentum!

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Because of Newton's Third Law, we know that INTERNAL forces are balanced (Action = Reaction)

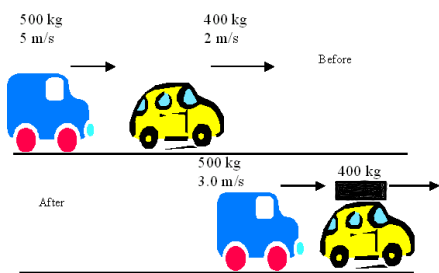
Therefore, if no EXTERNAL forces act, the TOTAL (VECTOR) MOMENTUM of the SYSTEM is conserved!

Conserved = stays the same

If no outside force acts then momentum is conserved.

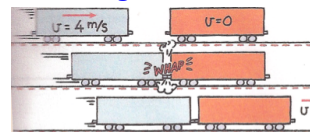
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Here is a problem

$m=2000\text{kg}$ $m=2000\text{kg}$



Find v

During the collision the details of the forces are impossible to determine.

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Momentum conservation problem

$m=2000\text{kg}$ $m=2000\text{ kg}$

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Momentum conservation problem #2

$m=2000\text{kg}$ $m=5000\text{ kg}$

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Conservation of Momentum problem:

A small lab cart of mass 500 grams is moving at 2 m/s toward the right. It collides with another cart of mass 320 grams moving to the left. The cars lock together and stop. Calculate the original speed of the 320 gram cart.

Nov 26-9:06 AM

OK. Let's try an explosion!

Oct 21-9:59 AM

OK. Let's try an explosion!

A rifle with a weight of 40 N fires a 4.0 g bullet with a speed of 220 m/s. find the recoil speed of the rifle?

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If no outside force acts then momentum is conserved.

But what happens when an outside force DOES act?

Impulse=change in momentum
 $Ft = \Delta (mv)$

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Impulse=change in momentum

$Ft = \Delta (mv)$

What impulse is needed to stop a 4 kg mass moving at 5 m/s?

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Change in momentum = $f\Delta t$

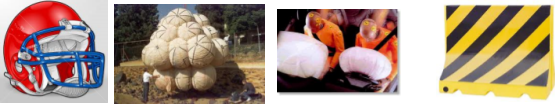
Important in many sports



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Change in momentum = $f\Delta t$

And safety devices



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