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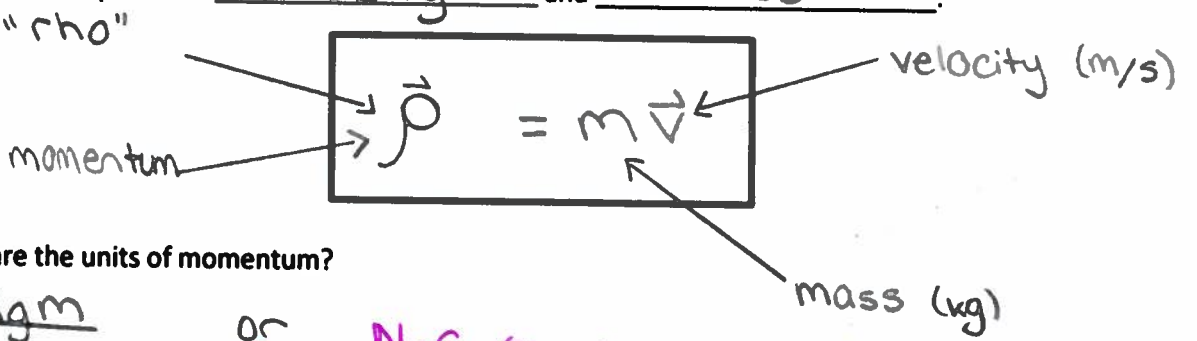
Physics 11

Unit 6 – Momentum and Impulse
Section 6.1: Momentum

Every moving object has momentum, which is a measure of

how scared you should be of something coming at you.

Momentum depends on velocity and mass.



What are the units of momentum?

$\frac{kgm}{s}$ or N·S (Newton seconds)

Example: A 10,000 kg train is traveling at 5 m/s east.

a) What's its momentum?

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

$= 10{,}000\,kg \times 5\,m/s$

$= 50{,}000\,kgm/s$ east

b) How fast would a 730 kg smart car need to go in order to have the same momentum?

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

$50{,}000\,kgm/s = (730\,kg)\vec{v}$

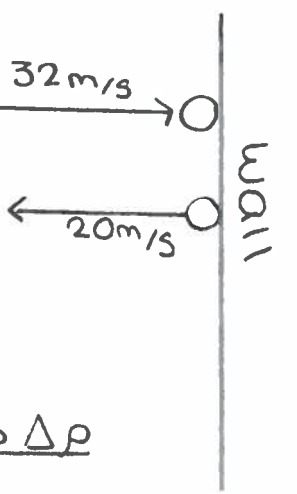
$\frac{50{,}000}{730} = \vec{v}$

68.49 m/s or 246.6 km/h

When an object experiences a net force, its momentum changes. It's often useful to calculate the change in momentum (a.k.a. Δp) Δ = final − initial

Example: A bouncy ball strikes a wall at 32 m/s east and bounces back at 20 m/s west. Calculate Δp.

(m = 30g) or 0.03 kg



$\Delta p = p_f - p_i$

$= mv_f - mv_i$

$= m(v_f - v_i)$

$= 0.03\,kg(-20\,m/s - 32\,m/s)$

$= 0.03\,kg(-52\,m/s)$

$= -1.56\,kgm/s$

1.56 kgm/s west is Δp