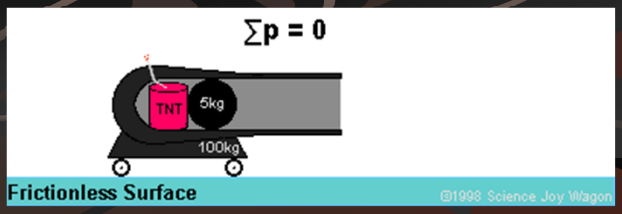
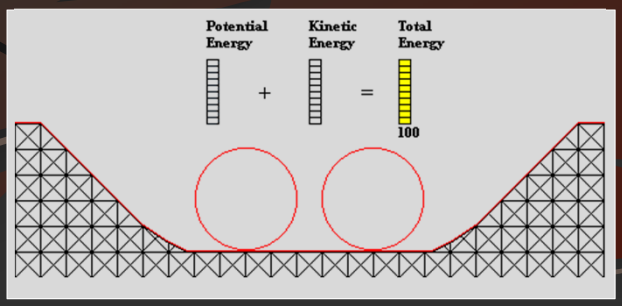
PHYS 210 - General Physics I





- Impulse – a wee bit more
- Conservation of linear momentum
- Collisions & explosions
- Energy!

IMPULSE

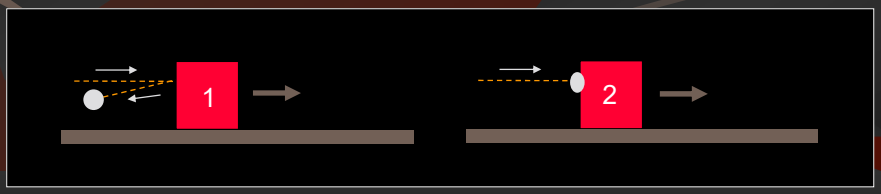
The change in momentum from a collision is equal to the impulse:

$$\Delta\vec{p} = \vec{J} = \int_{t_i}^{t_f} \vec{F}(t)\,dt = \vec{F}_{ave}\Delta t$$

Question:

- Two balls of equal mass are thrown horizontally with the same initial velocity. They hit identical stationary boxes resting on a frictionless horizontal surface.
- The ball hitting box 1 bounces back, while the ball hitting box 2 gets stuck.
  - Which box ends up moving fastest ?

(a) **Box 1** (b) **Box 2** (c) **same**



Conservation of Linear Momentum

For a system of particles, if there are no external forces,

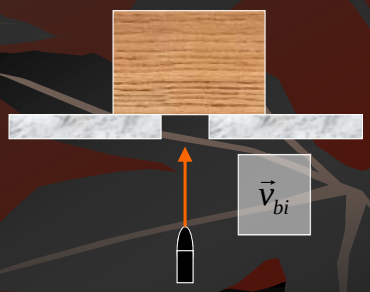
$$\vec{P} = \text{constant}$$

or

$$\vec{P}_i = \vec{P}_f$$

Example

- A 10 g bullet moving upwards at 1,000 m/s strikes and passes through the center of mass of a 5.0 kg block which is initially at rest. The bullet emerges at 400 m/s. To what maximum height does the block then rise above its initial position?



Ahead Yawns Evidence!