Chapter 2  The Laws of Motion (Part 2)

Section 2.2  Wheels

Friction - opposes the relative motion of two surfaces.

Read Section 2.2 on friction!

Sliding friction "wastes" energy.
Energy doesn't disappear, it is conserved!

Where does it go?  \( \rightarrow \) thermal energy!
friction causes heat.
heat \( \rightarrow \) internal energy of molecules

Friction and Thermal Energy.

ex: sliding file cabinet across floor.
There is force, but why no increase in acceleration?  \( \rightarrow \) energy goes to heat.
Wheels.

Static friction vs sliding friction.

No loss to heat since point of contact between wheel and floor are not in relative motion.

- How about sliding friction at axle?
  - Eliminate by ball bearings!

→ Shopping a Car

Where does energy go? Friction → heat on break pads

Breaks get hot.

How much energy is in a moving object?

Talked about potential energy

\[ U = mgh \] (gravity)
Energy associated with moving object

Kinetic energy \( (K) \)

\[ K = \frac{1}{2} m v^2 \]

= \frac{1}{2} \text{mass} \times \text{velocity}^2

Demonstration:

1) Ball on Hill Track C8-04

Kinetic vs. Potential

2) Racing balls C2-11

II. 63 Hydrogen Explosion
Bumper Cars Section 2.3

Bumper Cars collide, what happens

1) We know energy is conserved
   and exchanged. - directionless!

What else? - vector quantity that
Momentum has direction:
   car hit from the side versus head on.

\[ \vec{p} = m \vec{v} \]

Momentum is conserved in collisions

C7-23 Medicine ball
C7-42 Air pucks
or
C7-44

or
D3-03 Rotating chair
D3-05 Rotating chair wheel