

Chapter Eleven: Energy and Its Conservation

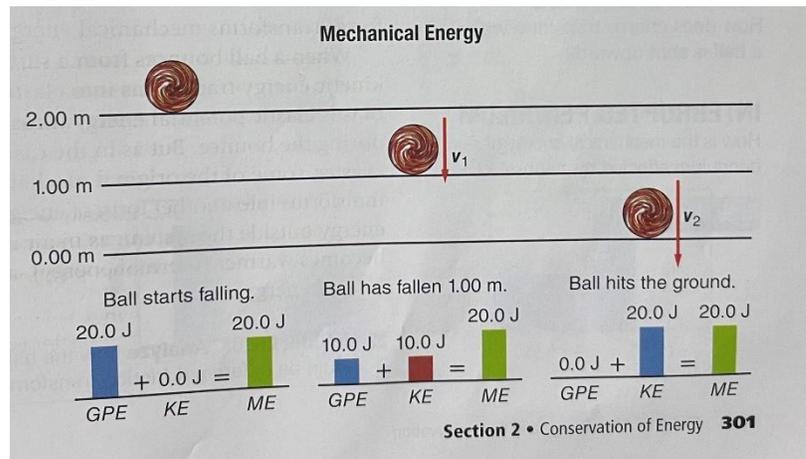
Section 2: Conservation of Energy

Law of conservation of energy: states that in a closed, isolated system, energy can neither be created nor destroyed; rather, energy is conserved

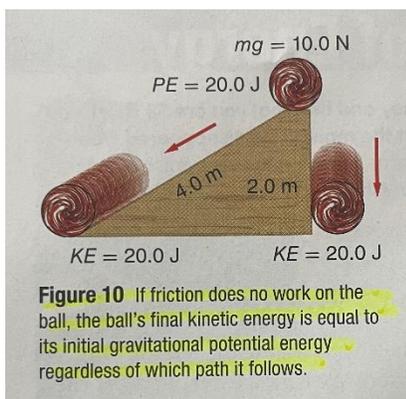
- Energy can change form but the system's total energy in all of its forms remains constant.

Mechanical energy (ME): the sum of the kinetic energy and potential energy of the objects in a system

- Kinetic energy includes translational and rotational
- Potential energy includes gravitational and elastic
- $ME = KE + PE$



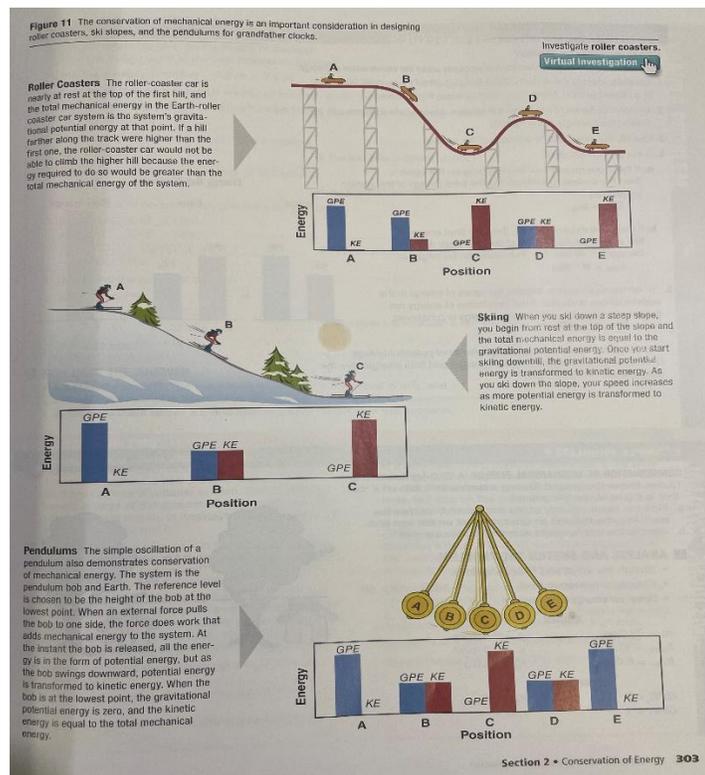
Conservation of mechanical energy: states that the sum of the system's kinetic energy and potential energy before an event is equal to the sum of the system's kinetic energy and potential energy after that event



- $KE_i + PE_i = KE_f + PE_f$
- The kinetic energy is split between translational (moving forward) and rotational (it is rolling).

Conservation and other forms of energy:

- Objects moving through the air experience the forces of air resistance.
- In a roller coaster, there is frictional forces between the wheels and tracks.
- When a ball bounces, it compresses and energy is transformed into elastic potential energy.
 - Some but not all is transformed back into kinetic energy.
 - Thermal energy and sound energy are the rest of the transformed energy.



Analyzing Collisions:

- A collision between 2 objects is one of the most common situations analyzed in physics.
- The strategy is to find the motion of the objects just before and just after the collision.
- If the system is closed and isolated, then momentum and energy are conserved.
 - However, the potential energy or thermal energy in the system might decrease, increase, or remain the same.

- **Elastic collision:** a collision in which the kinetic energy does not change
 - Collisions between hard objects (steel, glass, or hard plastic) are nearly elastic collisions.
- **Inelastic collision:** a collision in which kinetic energy decreases
 - Objects made of soft, sticky materials (clay) act in this way.
 - If 2 objects stick together after a collision, it is called a perfectly inelastic collision.
- Superelastic collision: a collision in which the kinetic energy increases
 - Example: potential energy from a spring was released during the collision
 - Also called explosive collision
- Kinetic energy can be transformed into thermal energy or sound but are difficult to measure.

