Science 10

Unit B: Energy flow in technological systems

Mechanical energy transformations

Height and speed on a ramp

- A cart released from a higher point reaches the bottom of a ramp at a greater speed.
- With small friction, decreasing gravitational potential energy corresponds to increasing kinetic energy.



Energy transformation with friction

- Potential energy is transformed mainly into kinetic energy and partly into thermal energy when friction acts.
- Measure release height and final speed while keeping the cart and ramp the same.
- Keep the cart and the ramp the same, link release height to final speed, and account for friction.

Key terms

mechanical energy

The sum of kinetic and potential energy in a mechanical system.

gravitational potential energy

Energy associated with position in a gravitational field. (E_p)

kinetic energy

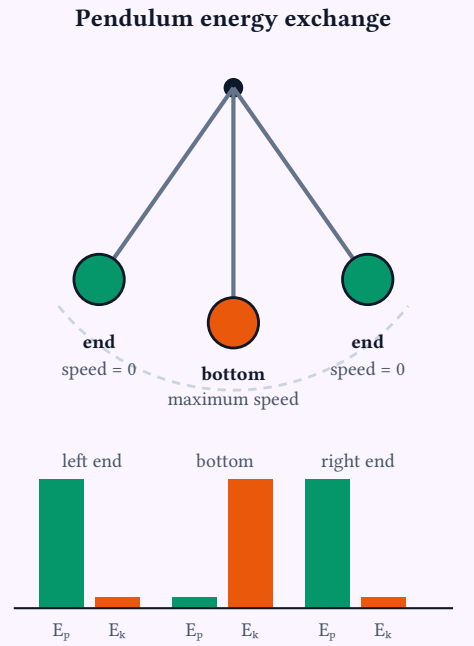
Energy associated with motion. (KE or E_k)

energy conservation

The principle that total energy stays constant as it transfers and transforms.

One-dimensional scalar motion

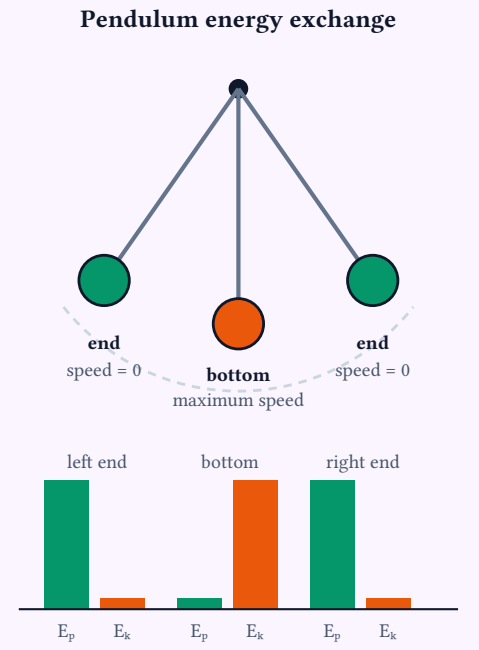
- In one dimension, distance, elapsed time, and velocity describe the motion.
- Work on that system is the force along the motion times the distance moved.



Ideal model: $E_p + E_k$ stays constant when friction is ignored.

Conservation in transformations

- In an ideal system, mechanical energy trades between kinetic energy and potential energy.
- In a real system, friction turns some of that energy into thermal energy.



Ideal model: $E_p + E_k$ stays constant when friction is ignored.

Ramp evidence

- Predict and compare final speed from two release heights, then explain differences using energy transformations.
- A complete answer keeps the variables controlled, links height to speed, and accounts for friction.

Image credits

Airtime Thrills Raw Footage, The drop of the roller coaster Orion, at Kings Island, CC BY 4.0