8.1: ENERGY

Sankey Diagrams

- Shows energy transfers in a system
  - Arrow's width represents energy for a purpose
    - Waste energy is downwards arrow
    - Useful energy is shown by a horizontal arrow

Conservation

- Energy cannot be created or destroyed
  - Energy can only be transformed from one form to another
    - In a closed system, the total energy remains constant

Efficiency

$$\text{Efficiency} = \frac{\text{Useful Energy Transferred}}{\text{Total Energy Supplied}}$$

- Waste Energy
  - Some supplied energy transformed into non-useful forms
    - Mechanical processes waste energy due to friction and heat loss to surroundings
  - Lubrication
    - Reduces heat loss due to friction
  - Insulation
    - Reduces heat loss to surroundings

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8.2: ENERGY

Energy Transfers

Kinetic Energy
- Doubling speed quadruples KE
- Moving objects have KE
- KE = ½ x Mass x Velcoity^2

Bungee jumper
- As cord stretches, KE → Elastic Potential Energy, slowing down the jumper
- GPE → KE as jumper falls

Vehicle braking
- The vehicle slows down
- KE → heat energy by friction in the brakes

Gravitational Potential Energy
- GPE = Mass x Gravitational Field Strength x Height
- Objects at a height have GPE

Electric kettle
- Electrical energy → heat energy
- Energy wasted as sound & heat to surroundings

Power

$$\text{Power} = \frac{\text{Work Done (J)}}{\text{Time Taken (s)}}$$

- 1 W = 1 J/s
- The unit of power is the Watt (W)

Work Done

Work Done (J) = Force (N) x Distance (m)

- Work done when energy is transferred from one form to another
- 1 J = 1 Nm
- The work done is equal to energy transferred
- Must use the force in the direction of motion

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