Chapter 8 – Work, Power, Efficiency

Physical Science Physics

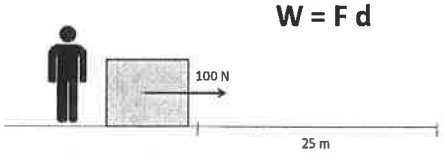
Work

- *"An object's motion is related to both force and how long that force acts..."*
- WORK (W) = Fd
  - Force = N
  - Distance = m.
- Measured in JOULES (J)

Work

- *How much work is done on a box if you pushed with 100 N for a distance of 25 meters?*

W = F d



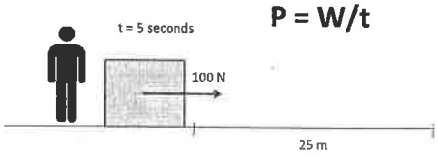
Power

- *"How fast work is done..."*
- POWER (P) = Work (W) / Time (t)
  - Work = Joules (J)
  - Time = Seconds
- Measured in WATTS (W)

Power

- *In the same problem, if it took you 5 seconds to push that box the distance of 25 meters, how much power was used?*

P = W/t



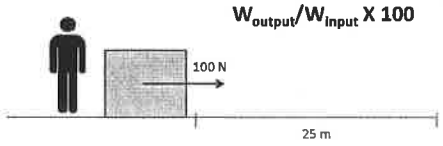
Efficiency

- *"How well an object transfers energy during work..."*
- Efficiency = (W_{output} / W_{input}) X 100
- Measured in a percentage (%)

Efficiency

- *In the same problem, what is your efficiency if it took you 15000 J to move the box but only measured 9500 J when the box moved?*

W_{output}/W_{input} X 100



Chapter 3: Energy

Potential and Kinetic

What is energy?

- **ENERGY:** The ability of an object or system to do work.
- **IDEA:** Apply a force...move an object.

Q: How are FORCE and ENERGY connected?

Energy

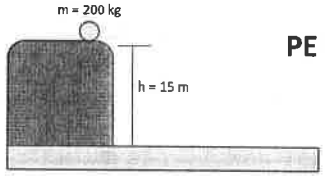
- *"An object may store energy...and hold it ready to use".*
- *POTENTIAL ENERGY*: **PE**
  - It has the "potential" to do work.
  - Examples:
    - Gasoline.
    - Food.
    - Gravity.

Energy

- *Gravitational Potential Energy*: **GPE**
  - Work required to elevate objects against gravity.
  - Measured in Joules (J)
- Calculate
  - PE = mgh
    - m = mass (kg)
    - g = gravity (10 m/s^2)
    - h = height (m)

Energy

- *How much potential energy is in a boulder with a mass of 200 kg at the top of a 15 meter cliff?*



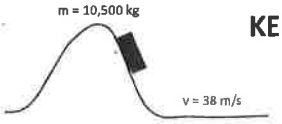
PE = mgh

Energy

- *"If an object is moving, then it can do work."*
- *Kinetic Energy*: **KE**
  - Energy in motion; measured in Joules (J)
- Calculate
  - KE = (1/2 m)(v^2)
    - m = mass (kg)
    - v = velocity (m/s)

Energy

- *How much kinetic energy is in a roller coaster at the bottom of the first hill if it has a mass of 10,500 kg and is traveling at 38 m/s?*



$KE = (1/2m)v^2$

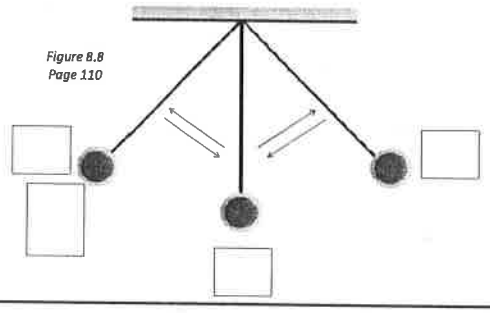
Conservation of Energy

- *"Energy cannot be created or destroyed."*
- *"It can only be transferred from one form to another."*
- **IDEA:** **PE = KE**

The amount of PE in a system is EQUAL TO the amount of KE in a system.

Conservation of Energy

Figure 8.8
Page 110



Force and Energy

Q: How are FORCE and ENERGY connected?

ENERGY is the ability to do WORK.

WORK depends on FORCE and distance.

Therefore...

More FORCE = More ENERGY
(WORK = ENERGY)