GRAVITATIONAL POTENTIAL ENERGY

Gravitational Potential ENERGY

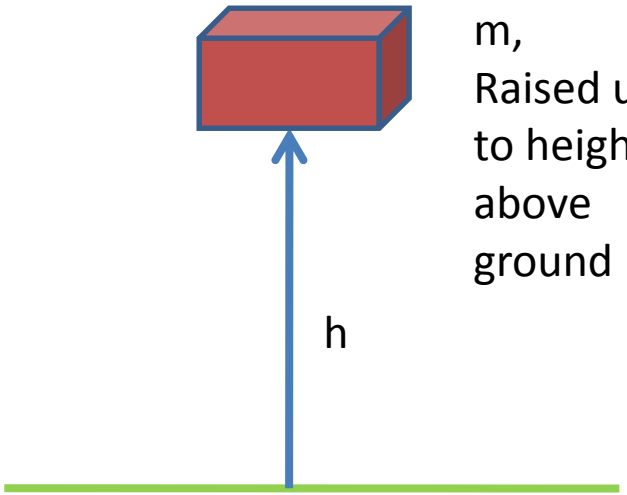
· the energy an object has due to its position in a gravitational field

$$E_g = mgh$$

· m- object mass (in kg)

· g- gravitational field strength (9.81 N/kg)

· h=height above a reference level



Box mass, m, Raised up to height h above ground

GROUND, defined as zero level h=0 m

** We are usually interested in CHANGES in gravitational potential energy:

$$\Delta E_g = mg\Delta h = mg\,(h_{final} - h_{initial})$$

Example:

A book with mass 1.45 kg is placed on a shelf 2.40 m above the floor. What is the book's gravitational potential energy relative to the floor?

Ans: 34.0 J

If the book is now taken from the shelf and placed on a table at height of 0.75 m, what is its change in gravitational potential energy?

Ans: -23.5 J

Changes in Potential Energy

- We are usually only interested in CHANGES in gravitational potential energy!

$$\Delta E_g = mg\Delta h = mg\,(h_{final} - h_{initial})$$

- When looking at a book falling to the floor…
  - Does it matter that we are on the second floor of a building?
  - Does it matter that Brampton is 85m above sea level?

- We are free to pick the most convenient reference point as our zero point.

Example:

A book with mass 1.45 kg is raised to a height of 1.00m above a table. The top of the table is 0.75m above the floor.

a) What is the book's change in energy if it is dropped to the table top?

b) What is the book's change in energy if it is dropped to the floor?