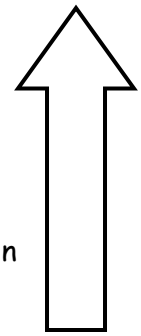

Gravitational Potential Energy

If a rock rolls down a mountainside, it has the ability to do work at the bottom: it can exert a force over a distance and cause another rock to move. A textbook dropped on your toe does work – it exerts a force over a small distance and it hurts!

The rock did not do work as it sat on the top of the mountain and the textbook did not do work as it sat on the desk yet they had the 'potential' to do work. As gravity pulls these objects towards earth, the objects gain the ability to do work.

Gravitational Potential Energy: (Eg) is the energy that an object has as a result of its distance from a celestrial body like Earth. Eg is measured in Joules (J).

Gravitational **Potential** Energy can be **stored** (hence the 'potential') anytime an object is raised up and kept at that height. Often we talk about roller coasters (they have Grav. Potential energy at the top of the hills!), or cars going up and down hills (top of hill has lots of Eg, bottom of hill has none) or balls bouncing (up higher = lots Eg, down lower = less Eg).

Formula:

We know $W = F\Delta d$ (#1) and that falling objects can do work.

$Fg = mg$ (#2) What force does the falling object exert? The force of gravity.

$W = mg\Delta d$ Plug in 'mg' for 'F' in #1

$W = mg\Delta h$ Δd we rename 'height' when things are falling and we simplify this to 'h'

So the Eg stored at the 'top' of a given height is

$$Eg = mg\Delta h$$

where Eg = Gravitational Potential Energy (J)
m = mass (kg)
g = gravitational intensity which is 9.8 N/kg on Earth.
Δh= height (m)

Gaining/Losing Eg

Remember that the higher something is, the more Eg it has; the lower something is, the less Eg it has. As an object rises, it gains Eg and as it falls it looses Eg.