

**Question: If Work is done on an object and this creates a change in energy, how is this related to Gravitational Potential Energy?**

## Gravitational Potential Energy

The energy gained by applying work to an object.

$$\mathbf{GPE = mgh}$$

### Proving the energy - work theorem:

If work = force x distance

In order to lift the object we must overcome the force holding it to the earth which is Force = mass x Gravity

And if we lift an object the distance is now represented by height (h)

Then Work also = Mass x gravity x height

Therefore.....Work = m g h

If the energy is zero before the barbell is lifted ( $E_0$ ), then the final Energy ( $E_f$ ) after the barbell is lifted is equal to the amount of work applied to the barbell:

$$E_f = E_0 + W$$

If  $E_f$  is the Potential Energy the barbell has if it were to drop it we can call this Gravitational Potential Energy.

Therefore: Gravitational Potential Energy = Work  
and work is the same as  $m \times g \times h$

This is how we have the equation for Gravitational Potential Energy  $GPE = mgh$

### Example:

Weight is a measure of the mass and the gravitational force acting on it, so weight = mg

