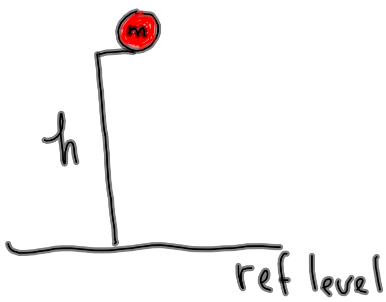
§6-3 Potential Energy + The Work-Energy Theorem

Gravitational Potential Energy

The energy stored due to an object's position above a certain reference level.

$$E_g = mgh$$



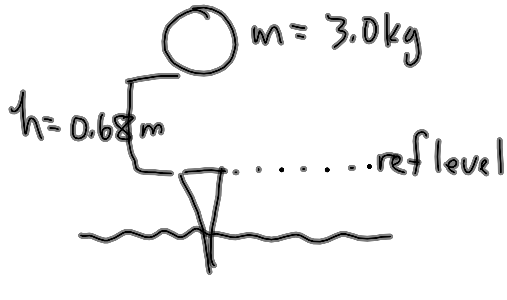
Where E_g is the gravitational potential energy (J)

m is the mass (kg)

g is $9.81\,m/s^2$

h is the distance above the reference level (m)

MP| 249

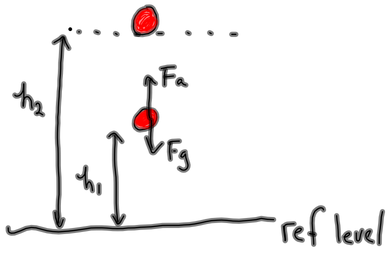


$E_g = mgh$

$E_g = (3.0\,kg)(9.81\,\frac{m}{s^2})(0.68\,m)$

$E_g = 2.0 \times 10^1\,J$

Consider lifting an object from h_1 to h_2:



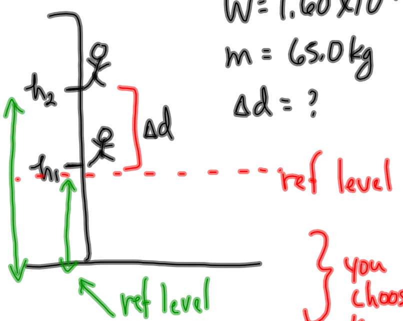
In order to lift the ball, you must apply a Force equal to F_g.

$$W = F_{\parallel} \Delta d$$
$$W = F_g \Delta d$$
$$W = F_g(h_2 - h_1)$$
$$W = mgh_2 - mgh_1$$
$$W = E_{g_2} - E_{g_1}$$
$$W = \Delta E_g$$

Work-Energy Theorem

The work done on the object is equal to the change in gravitational potential energy.

MP|252



$W = 1.60 \times 10^4 J$
$m = 65.0 kg$
$\Delta d = ?$

you choose the reference level

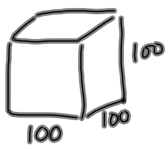
$W = \Delta E_g$ OR $W = F_{\parallel} \Delta d$

$W = E_{g_2} - E_{g_1}$ ($E_{g_1} = 0$) $\qquad W = mg\Delta d$

$$W = E_{g_2}$$
$$W = mgh$$
$$W = mg\Delta d$$
$$\Delta d = \frac{W}{mg}$$
$$\Delta d = \frac{1.60 \times 10^4 J}{(65.0 kg)(9.81 m/s^2)}$$
$$\Delta d = 25.1 m$$

So the rock climber ascended 25.1 m.

TO DO: ① PP|250 (HINT for #28 convert $1 m^3$ water to kg — may want to use factor labelling)
② PP|254



$100 cm \times 100 cm \times 100 cm^2$

↓

$1 cm^3 = 1 mL$