# Potential Energy (elastic) example problem

A mass is placed on a spring scale. The mass made the scale displace a distance of 1 m. The spring constant is 100 N/m. How much energy is stored?

$PE_e = \frac{1}{2}kx^2$

$PE_e$ = elastic potential energy (J)
$k$ = spring constant (N/m)
$x$ = displacement (m)

$PE_e = \frac{1}{2}(100\,N/m)(1\,m)^2$

$PE_e = 50\ J$

How big was the mass on the scale?

$PE_g = mgh$

$PE_g$ = gravitational potential energy (J)
$m$ = mass (kg)
$g$ = gravity ($m/s^2$)
$h$ = height (m)

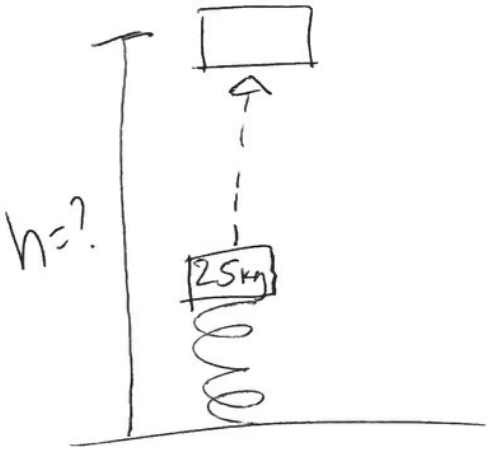
$50\,J = (m)(9.8\,m/s^2)(1\,m)$

$m = 5.1\ kg$

KHDbdcm

We place a 25 kg mass on a spring and push it down 0.5 m. The spring constant is 10 kN/m. How high does the mass go when we let go?

convert to N/m → 10,000 N/m




Step 1: Find PEe

$PE_e = \frac{1}{2}kx^2$

$PE_e = \frac{1}{2}(10{,}000\ N/m)(0.5m)^2$

$PE_e = 1250\ J$

Step 2: Use PEg formula to find height.

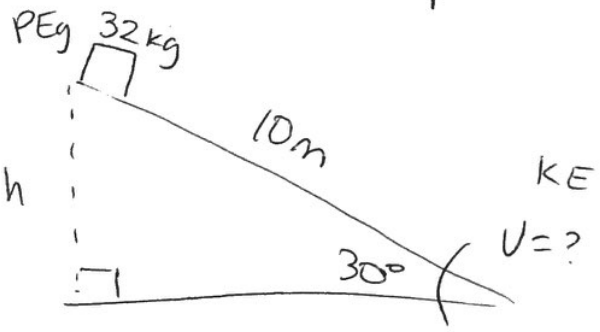
$PE_g = mgh$

$1250\ J = (25\ kg)(9.8\ m/s^2)(h)$

$\frac{1250\ J}{245} = \frac{245(h)}{245}$

$5.1\ m = h$

There is a 32 kg mass sitting on a 30° incline. The mass begins to slide down the incline which is 10 m long. How fast is the mass going at the bottom of the ramp? (Frictionless surface)




Step 1: Find $PE_g = mgh$

$PE_g = mgh$

$PE_g = (32\,kg)(9.8\,m/s^2)(5\,m)$

$PE_g = 1568\,J$

Find height

$10\,m \sin 30°$

$5\,m$

Step 2: Find V using $KE = \frac{1}{2}mv^2$

$1568\,J = \frac{1}{2}(32\,kg)(v)^2$

$\frac{1568}{16} = \frac{16v^2}{16}$

$\sqrt{98} = \sqrt{v^2}$

$9.9\,m/s = V$