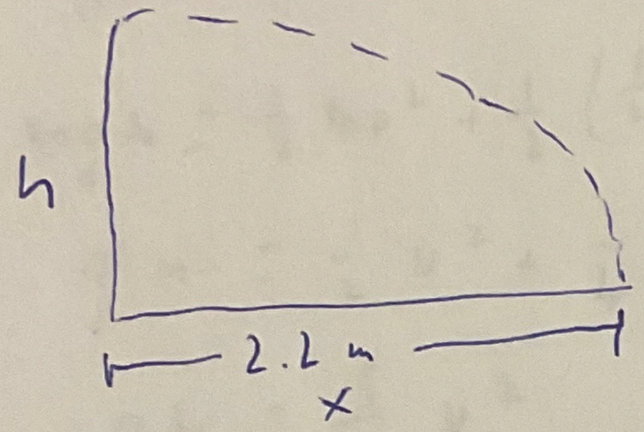
Question 9



initial energy:-

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

$= \frac{1}{2}k(0.011)^2$

$= 0.05 \times 10^{-5}(J)$

$x = v_0 t$

$h = \frac{1}{2}gt^2$

$t = \sqrt{\frac{2h}{g}}$

$x = v_0\sqrt{\frac{2h}{g}}$

$D_1 = 2.2 - 0.27$

$= 1.93$

using ratios:-

$\frac{v_{02}}{v_{01}} = \frac{D}{D_1}$

$v_{02} = \frac{D}{D_1} v_{01}$

equating initial spring energy to kinetic energy:-

$\frac{1}{2}kx^2 = \frac{1}{2}mv_0^2$

$\frac{1}{2}kc^2 = \frac{1}{2}mv_0^2$ (c is compression)

using ratios:-

$\frac{v_{02}}{v_{01}} = \frac{l_2}{l_1}$

$l_2 = \frac{D}{D_1} l_1$

$= \frac{2.2}{1.93} \times 0.011$

$= 0.01253$

$\simeq 1.25$ cm

is the required compression.