20-R-WE-DK-2

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20-R-we-Dk-2 Beginner Work

Inspiration: None

A crane lifts up a crate with mass ***m = 30 kg*** by a cable. If the crane applies a force ***F = 400 N*** and lifts it up to a height ***h = 5 m***, determine the work done by both the crane and gravity, and the crate's final velocity if it started from rest.

$\Sigma F_x = 0$

$\Sigma F_y = F - F_G = ma_{Gy}$

$400 - (30)(9.81) = 30\,a_{Gy}$

$a_{Gy} = 3.5233$

$U_G = -mgh = -30(9.81)(5) = \boxed{-1471.5\ J}$

$U_F = Fh = 400(5) = \boxed{2000\ J}$

$v^2 = v_0^2 + 2ad$

$v^2 = 0 + 2(3.5233)(5)$

$\boxed{v = 5.935767\ m/s}$