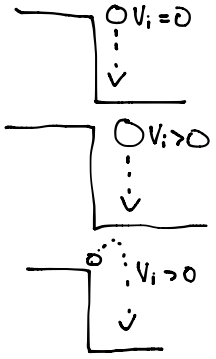
UAM – uniform acceleration

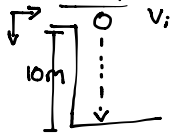
a = constant

$a = 9.81\ m/s^2$



Freefall

|| gravity



Find a) v_f b) t

$$v_f = v_i + at$$

$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$

$$x_f = x_i + v_i t + \frac{1}{2}at^2$$

Solve

$x_i = 0$ $\quad v_f^2 = v_i^2 + 2a(x_f - x_i)$

$x_f = 10$ $\quad v_f^2 = (0)^2 + 2(9.81)(10)$

$v_i = 0$ $\quad v_f = \sqrt{196.2}$

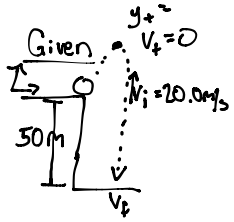
$v_f = \boxed{14.0}$ $\quad v_f = 14.0\ m/s$

$a = 9.81$

$t = \boxed{1.43}$ $\quad v_f = v_i + at$

$(14.0) = (0) + 9.81t$

$\boxed{t = 1.43\ s}$



Find a) t b) v_f c) y_t

Solve a) $y_i = 0$

$y_f = -50$

$v_i = 20$

$v_f = \boxed{-37.1}$

$a = -9.81$

$t = \boxed{5.83}$

$y_f = y_i + v_i t + \frac{1}{2}at^2$

$-50 = 0 + 20t + \frac{1}{2}(-9.81)t^2$

$0 = -4.9t^2 + 20t + 50$

$\boxed{t = 5.83\ s}$

b) $v_f = v_i + at$

$v_f = 20 + (-9.81)(5.83)$

$\boxed{v_f = -37.1\ m/s}$

c) $y_i = 0$

$y_t = \boxed{20.4}$

$v_i = 20$

$v_t = 0$

$a = -9.81$

$t = \boxed{\quad}$

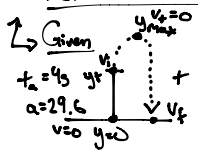
$v_t^2 = v_i^2 + 2a(y_t - y_i)$

$(0)^2 = (20)^2 + 2(9.81)(y_t - 0)$

$0 = 400 + 19.62y_t$

$\boxed{y_t = 20.4\ m}$

Bottle Rocket Freefall



$y_t = 0 + 0 + \frac{1}{2}(29.4)(4)^2$

$= 235.2\ m$

Find a) v_i b) y_{max} c) v_f

Solve a) $y = 0$

$y_t = \boxed{\quad}$

$v = 0$

$v_i = \boxed{117.6}$

$a = 29.4$

$t = 4$

$v_i = v + at$

$= 0 + 29.4(4)$

$\boxed{v_i = 117.6\ m/s}$

b) $y_t = \boxed{235.2}$

$y_{max} = \boxed{\quad}$

$v_i = 117.6$

$a = -9.81$

$t = \boxed{\quad}$

$v_t = 0$

$v_t^2 = v_i^2 + 2a(y_{max} - y_t)$

$0^2 = (117.6)^2 + 2(-9.81)(y_{max} - 235.2)$

$y_{max} = \boxed{940\ m}$

c) $y_t = 235.2$

$y_f = 0$

$v_i = 117.6$

$v_f = \boxed{\quad}$

$a = -9.81$

$t = \boxed{\quad}$

$v_f^2 = v_i^2 + 2a(y_f - y_t)$

$v_f^2 = (117.6)^2 + 2(-9.81)(0 - 235.2)$

$\boxed{v_f = -136\ m/s}$