Question #1

If you throw a ball straight upward at a height of 1.5 m, it will rise into the air and then fall back down toward the ground. Imagine that you throw the ball with an initial velocity of 13.7 m/s.

a. How long does it take the ball to reach the top of its motion?

b. How far will the ball rise before it begins to fall?

c. At what speed will the ball hit the ground?

$V_i = 13.7 \frac{m}{s}$

$\bar{a} = -9.8 \frac{m}{s^2}$

$d_i = 1.5\,m$

$V_f = 0 \frac{m}{s}$

(@ the top of its motion)

$t = \_\_\_ s$

$V_f = V_i + \bar{a}t$ (+1)

$(0 \frac{m}{s}) = (13.7 \frac{m}{s}) + (-9.8 \frac{m}{s^2})t$

$t = \frac{V_f - V_i}{\bar{a}} = \frac{(0) - (13.7)}{(-9.8)}$ (1pt)

$t = 1.397959\,s$ 3 SF $1.40\,s$ (1pt)

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$V_i = 13.7 \frac{m}{s}$

$V_f = 0 \frac{m}{s}$

(at the top of its motion)

$t = 1.40\,s$

$d_i = 1.5\,m$

$\bar{a} = -9.8 \frac{m}{s^2}$

$\Delta d = d_f - d_i = 11.076 - 1.5$ (1pt) $\Delta d = 9.6\,m$

$d_f = \_\_\_ m$

$V_f^2 = V_i^2 + 2\bar{a}\Delta d$

$(0 \frac{m}{s})^2 = (13.7 \frac{m}{s})^2 + 2(-9.8)\Delta d$ (1pt)

$\Delta d = \frac{0 - (13.7)^2}{2(-9.8)} = 9.576\,m$

$\Delta d = 9.58\,m$ (1pt)

$d_f = d_i + V_i t + \frac{1}{2}\bar{a}t^2$

$d_f = 1.5 + (13.7)(1.40) + \frac{1}{2}(-9.8)(1.40)^2$

$d_f = 11.076\,m$

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$V_{i\,(up)} = 13.7\frac{m}{s}$ $\quad \bar{a} = -9.8\frac{m}{s^2}$ $\quad V_{f\,(dn)} = \_\_\_\frac{m}{s}$

$d_i = 1.5m$ $\quad V_{i\,(dn)} = 0\frac{m}{s}$

$V_{f\,(up)} = 0\frac{m}{s}$ $\quad d_{f\,(dn)} = 0m$ Δd

$d_{f\,(up)} = 11.0m$ $\quad d_{i\,(dn)} = 11.0m$

$t_{f\,(up)} = 1.40s$ $\quad t_{i\,(dn)} = 0s$

$V_f^2 = V_i^2 + 2\bar{a}\Delta d$ (1pt)

$V_f = \sqrt{\left(0\frac{m}{s}\right)^2 + (2)(-9.8)(-11)}$ (1pt)

$V_f = 14.7\frac{m}{s}$ or $15\frac{m}{s}$ (1pt)

Question #2

A hot air balloon is rising at a constant speed of 1.00 m/s. The pilot accidentally drops his pen 10.0 s into the flight.

a. How far does the pen drop?

b. How fast is the pen traveling when it hits the ground, ignoring air resistance?

(a)

$d_i = 0m$

$\bar{V} = 1.00\frac{m}{s}$

$t = 10.0s$

$d_f = \_\_?\_\_ m$

$d_f = d_i + \bar{V}t$

$\Delta d = \bar{V}t$

$d_f = (0m) + \left(1.00\frac{m}{s}\right)(10.0s)$

$d_f = 10.0m$ (a)

(b) $d_i = 10.0m$ $\quad t_i = 0s$ $\quad V_i = 1.00\frac{m}{s}$ $\quad d_f = 0m$ $\quad \bar{a} = -9.80\frac{m}{s^2}$

$V_f^2 = V_i^2 + 2\bar{a}\Delta d$

$V_f = \sqrt{(1.00)^2 + 2(-9.8)(-10.0)}$

$V_f = 14.0\frac{m}{s}$