Acceleration Due to Gravity Homework – Answers

1a) $\Delta v = ?$
$a = g = 9.8\ m/s^2$
$\Delta t = 3.0\ s$

$a = \frac{\Delta v}{\Delta t} \Rightarrow \Delta v = a\Delta t$
$= (9.8\ m/s^2)(3.0\ s)$
$= 29.4\ m/s$

∴ the stuntman had a speed of 29.4 m/s after 3.0 s

b) $\Delta t = 6.0\ s$

$\Delta v = a\Delta t$
$= (9.8\ m/s^2)(6.0\ s)$
$= 58.8\ m/s$

∴ the stuntman had a speed of 58.8 m/s after 6.0 s.

2 $v_1 = 4.0\ m/s$
$\Delta t = 2.2\ s$
$a = g = 9.8\ m/s^2$
$v_2 = ?$

$a = \frac{v_2 - v_1}{\Delta t}$

$v_2 - v_1 = a\Delta t$
$v_2 = a\Delta t + v_1$
$= (9.8\ m/s^2)(2.2\ s) + 4.0\ m/s$
$= 25.56\ m/s$

∴ the stone has a velocity of 25.56 m/s after 2.2 s.

3 $\vec{v}_1 = ?$
$\vec{v}_2 = 0\ m/s \rightarrow$ when the ball is at the top of its flight
$\Delta t = 1.4\ s \rightarrow$ at the top of the flight is half the total time
$\vec{a} = g = 9.8\ m/s^2\ [down]$

$a = \frac{v_2 - v_1}{\Delta t}$

$v_2 - \vec{v}_1 = \vec{a}\Delta t$
$-\vec{v}_1 = \vec{a}\Delta t - \vec{v}_2$
$\vec{v}_1 = -\vec{a}\Delta t + \vec{v}_2$ or $\vec{v}_1 = \vec{v}_2 - \vec{a}\Delta t$

∴ $\vec{v}_1 = 0\ m/s - (9.8\ m/s^2\ [down])(1.4\ s)$
$\vec{v}_1 = -13.72\ m/s\ [down]$ or $13.72\ m/s\ [up]$

∴ the ball left the student's hand with a velocity of 13.72 m/s [up].

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4 $A = 9.8\ m/s^2$ [down]

a) $M = 9.74\ m/s^2$ [down]

$$\% = \frac{M - A}{A} \times 100\%$$

$$= \frac{9.74 - 9.8}{9.8} \times 100\%$$

$$= 0.61\ \%$$

b) $M = 9.95\ m/s^2$ [down]

$$\% = \frac{M - A}{A} \times 100\%$$

$$= \frac{9.95 - 9.8}{9.8} \times 100\%$$

$$= 1.53\%$$