Physics 1P — Traeger

Kinematics Problems 83-88

83) $V_f^2 = V_0^2 + 2a(x - x_0)$

$V_f^2 - V_0^2 = 2a(x - x_0)$ $\therefore \frac{V_f^2 - V_0^2}{(x - x_0)} \cdot \frac{1}{2} = a$

$a = \frac{1}{2}\left(\frac{(85\frac{m}{s})^2 - (0\frac{m}{s})^2}{(36m - 0m)}\right) = \frac{1}{2}\left(\frac{7225\ \frac{m^2}{s^2}}{36m}\right) = \boxed{100.3\ \frac{m}{s^2}}$

84) $V_f^2 = V_0^2 + 2a(x - x_0)$

$V_f^2 - V_0^2 = 2a(x)$ $\therefore x = \frac{V_f^2 - V_0^2}{2a} =$

$x = \frac{0^2\frac{m^2}{s} - 54^2\frac{m^2}{s}}{2 \cdot -6.8\frac{m}{s^2}} = \frac{-2916\ \frac{m^2}{s^2}}{-13.6\ \frac{m}{s^2}} = \boxed{214\ m}$

85) $V_f = ?$ $V_0 = 0\frac{m}{s}$ $x_0 = 0\ m$ $x_f = -32m$

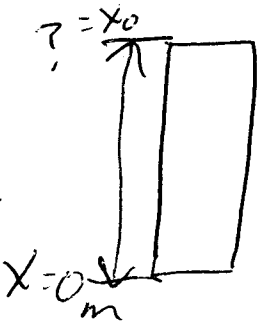
$V_f^2 = V_0^2 + 2a(x - x_0)$

$V_f = \sqrt{V_0^2 + 2a(x - x_0)} = \sqrt{0^2 + 2a(\overset{?}{+}32m - 0m)}$

$= \sqrt{2 \cdot -9.8\frac{m}{s^2}(-32m)} = \sqrt{627.2\ \frac{m^2}{s^2}}$

$\boxed{V_f = -25\frac{m}{s}}$

86) $V_f^2 = V_0^2 + 2a(x - x_0)$



$V_f^2 - V_0^2 = 2a(x - x_0)$

$\frac{V_f^2 - V_0^2}{2a} = x - x_0 \quad \therefore \quad -x_0 = \left(\frac{V_f^2 - V_0^2}{2a}\right) - x$

$-x_0 = \frac{\left(-31 \frac{m^2}{s^2} - 0 \frac{m^2}{s^2}\right)}{\left(2 \cdot -9.8 \frac{m}{s^2}\right)} - 0$

$-x_0 = \frac{961 \frac{m^2}{s^2}}{-19.6 \frac{m}{s^2}} = -49 \text{ m}$

$\therefore x_0 = 49 \text{ m}$

87) $x = 1.3$ m $\quad a = -9.8 \frac{m}{s^2} \quad V_0 = ?$

$x_0 = 0$ m $\quad V_f = 0 \frac{m}{s}$

$V_f^2 - V_0^2 = 2a(x - x_0)$

$-V_0^2 = 2a(x - x_0) - V_f^2$

$V_0 = \sqrt{2a(x - x_0) - V_f^2} =$

$V_0 = \sqrt{2 \cdot -9.8 \frac{m}{s^2}(1.3 \text{ m} - 0 \text{ m}) - \left(0 \frac{m}{s}\right)^2}$

$V_0 = \sqrt{2 \cdot -12.74 \frac{m^2}{s^2}} = 5.05 \frac{m}{s}$

88) .45 m ↑ $V_f = 0\frac{m}{s}$ assume $V_f = V_0$ here in opposite direction.

$x_0 = 0$ $V_0 = ?$

$V_i = ?$ $V_f = 0\frac{m}{s}$ $a = -9.8\frac{m}{s^2}$

$$V_f^2 - V_0^2 = 2a(x - x_0)$$

$$-V_0^2 = 2a(x - x_0) - V_f^2$$

$$V_0^2 = -(2a(x - x_0) - V_f^2)$$

$$V_0 = \sqrt{(2a(x - x_0) - V_f^2}$$

$$V_0 = \sqrt{2 \cdot -9.8\frac{m}{s^2}(0.45m - 0m) - (0\frac{m}{s})^2}$$

$$V_0 = \sqrt{2 \cdot -9.8\frac{m}{s^2} \cdot 0.45m}$$

$$V_0 = \sqrt{8.82\frac{m^2}{s^2}}$$

$$V_f = V_0 = 2.97\frac{m}{s}$$