KINEMATICS

FT KINEMATICS (2I)

Directions: Solve the following problems. Your work will be graded, not just the answer. Each question is worth 5 points. The test is worth 50 points.

1) Hazleton, PA is a town 93 miles north just off of I-81. How long will it take to get there driving at 68 mi/hr?

$x = 93mi$

$a = zero$

$t = ?$

$v_0 = 68 mi/hr$

$x = v_0 t + \frac{1}{2}at^2$

$x = v_0 t$

$\frac{x}{v_0} = t$

$\frac{93mi}{68 mi/hr} = \boxed{1.37\ hr}$

$-or-$

$1hr\ \&\ 22min$

key Level II Physics Pd 2

2) Determine the acceleration of a cart that starts from rest and obtains a speed of 10 m/s in a time of 5 seconds.

$a = ?$

$v_0 = Zero$

$v = 10^{m}/s$

$t = 5s$

$v = v_0 + at$

$$\frac{v - v_0}{t} = a$$

$$\frac{10^m/s - 0}{5s} = \boxed{2^m/s^2}$$

3) Determine the acceleration of a cart that starts at rest and uniformly accelerates for 5 seconds for a distance of 25m.

$a = ?$

$v_0 = Zero$

$t = 5s$

$x = 25m$

$x = v_0 t + \frac{1}{2} a t^2$

$x = \frac{1}{2} a t^2$

$\sqrt{\frac{2x}{a}} = t$

$\sqrt{\frac{2(25m)}{-9.8 m/s^2}} =$

where Is my head?

$\frac{2x}{t^2} = a$

$\frac{(2)(25m)}{(5s)^2} = \boxed{2 \, m/s^2}$

4) A ball is thrown upward at 12 m/s. How long will it take the ball to reach its highest point?

$$v = 0$$
$$v_0 = 12 \text{ m/s}$$
$$a = -9.8 \text{ m/s}^2$$
$$t = ?$$

$$v = v_0 + at$$

$$\frac{v - v_0}{a} = t$$

$$\frac{0 - 12 \text{ m/s}}{-9.8 \text{ m/s}^2} = \boxed{1.2 \text{s}}$$

5) A ball is dropped from the roof of a two story house, a height of about 25 feet (7.6m). How long will it take to hit the ground?

$$y = -7.6m \qquad y = v_0 t + \frac{1}{2}at^2$$

$$a = 9.8 m/s^2 \qquad y = \frac{1}{2}at^2$$

$$t = ?$$

$$v_0 = Zero \qquad \sqrt{\frac{2y}{a}} = t$$

$$\sqrt{\frac{(2)(-7.6m)}{-9.8 m/s^2}} = t$$

$$\boxed{1.25s = t}$$

6) From what height would you need to "fall" from to be in free fall for a whole second? (Not part of the graded question, but is this height survivalable?)

$y = ?$

$a = -9.8 \, m/s^2$

$t = 1s$

$v_0 = Zero$

$y = v_0 t + \frac{1}{2} a t^2$

$y = \frac{1}{2} a t^2$

$= \left(\frac{1}{2}\right)\left(9.8 \, m/s^2\right)\left(1s\right)^2$

$y = -4.9 \, m$

7) Acceleration can be expressed as 5 mi/hr*s. It's possible that your car may accelerate at this rate. If you were to accelerate at this rate for a time of 10 seconds. How fast would you be going? (You may express in mi/hr)

$a = 5 \frac{mi}{hr \cdot s}$

$t = 10 s$

$v_0 = Zero$

$v = ?$

$v = v_0 + at$

$= (10s)(5 \frac{mi}{hr \cdot s})$

$= 50 \frac{mi}{hr}$

8) Your goal is to throw a "box" up to someone that is waiting to catch it 4 m above you. If you throw the box so that it leaves your hand at 14 m/s, how fast is it traveling when your friend catches it?

$$v = ?$$

$$14 \text{ m/s} = v_0$$

4m
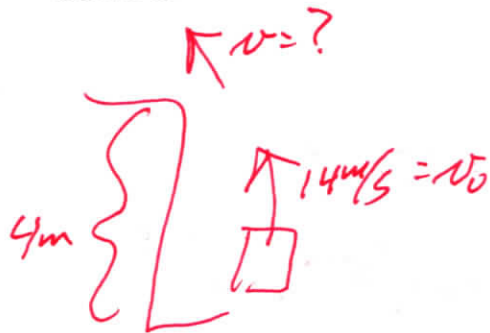
$$v^2 = v_0^2 + 2ax$$

$$v = \sqrt{v_0^2 + (2)(-9.8 \text{ m/s}^2)(4m)}$$

$$v = \sqrt{(14 \text{ m/s})^2 + (2)(-9.8 \text{ m/s}^2)(4m)}$$

$$v = \sqrt{196 \frac{m^2}{s^2} + -78.4 \frac{m^2}{s^2}}$$

$$v = 10.8 \text{ m/s}$$