

Physics 10154 - Exam #2C

Each problem is worth 50 points. Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. A car travels 140 miles with an average velocity of 62 mi/hr. How fast must the car travel during the last 82 miles of the 222 mile trip in order for the average speed to reach 67 mi/hr?

<u>Part 1</u>	<u>Part 2</u>	<u>Total</u>
$\Delta x_1 = 140$	$\Delta x_2 = 82$	$\Delta x_{TOT} = 222$
$\bar{v}_1 = 62$	$\bar{v}_2 = ?$	$\bar{v}_{TOT} = 67$
$t_1 = ?$	$t_2 = ?$	$t_{TOT} = ?$

$$t_1 = \frac{140}{62} = 2.26 \text{ hr}$$

$$t_{TOT} = \frac{222}{67} = 3.31 \text{ hr}$$

$$\text{so } t_2 = t_{TOT} - t_1 = 1.05 \text{ hr}$$

$$\bar{v}_2 = \frac{\Delta x_2}{t_2} = \frac{82}{1.05} = \boxed{78 \text{ mi/hr}}$$

2. A rock is thrown straight up off the edge of a 75-meter high building, and it just misses the edge of the building on the way down, so it falls all the way to the ground. If the initial velocity of the rock is 15 m/s straight up...

- a) What maximum height does the rock reach?
 b) How many seconds does it take from the time the rock is thrown for it to hit the ground?

Max height

$$\Delta y = ?$$

$$v_0 = 15$$

$$v = 0$$

$$a = -9.8$$

$$t = ?$$

$$v^2 = v_0^2 + 2a\Delta y$$

$$0 = 15^2 - 19.6\Delta y$$

$$\Delta y = \frac{-225}{-19.6} = \boxed{11 \text{ m}}$$

$$v = v_0 + at$$

$$0 = 15 - 9.8t \quad t_1 = \frac{-15}{-9.8} = 1.53$$

$$\Delta y = -86.5$$

$$v_0 = 0$$

$$v = ?$$

$$a = -9.8$$

$$t_2 = ?$$

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

$$-86.5 = 0 - 4.9t^2$$

$$t_2 = \sqrt{\frac{-86.5}{-4.9}}$$

$$= 4.20$$

$$t_{\text{TOT}} = t_1 + t_2 = \boxed{5.75}$$