Solutions

# Physics 1403-001 Exam #1, Spring 2008

Instructions: Show your work for all problems. Partial credit will be assigned for things that make sense.
$g=9.81\ m/s^2$

All questions are equally weighted (so they are 7.692 points each). For numerical answers, PLEASE write your answer on the right of the problem with a box around it. Your low question will be dropped.

1. Write 2540.0 in scientific notation with the correct number of significant figures.

$2.5400 \times 10^3$

2. What volume of paint (in $m^3$) is required to paint a 8.0 m by 2.8 m rectangular wall to a thickness of 1 mm?

$(8.0m)(2.8m)(1mm)\left(10^{-3}\frac{m}{mm}\right) = \underline{0.022\ m^3}$

3. Standing at the top of a 45 m tall building, I throw a ball straight downwards at a speed of 12.0 m/s. How long does it take to reach the ground?

$y-y_0 = v_{y0}t - \frac{1}{2}gt^2 \qquad -45m = (-12.0m/s)t - (4.9m/s^2)t^2$

$(4.9m/s^2)t^2 + (12.0m/s)t - 45m = 0$ quadratic formula

$t = \frac{1}{2(4.9m/s^2)}\left[-12.0m/s \pm \sqrt{(12.0m/s)^2 + 4(4.9m/s^2)(45m)}\right] = \underline{2.04s}, -4.49s$

4. Amarillo is 120 miles from Lubbock. If we drive there and then drive back, what is our **displacement**?

$\underline{0}$ $\qquad \Delta = x_2 - x_1 \qquad x_2 = x_1$

5. Two cars are traveling side by side down a highway at 35 m/s. At t=0, car #1 begins to slow down with a constant acceleration of –0.14 $m/s^2$ while car #2 continues at constant speed. At the instant that car #1 stops, how far apart are the two cars?

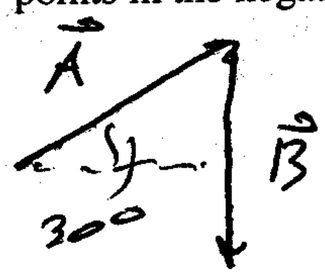
$x_2 = v_0 t$

$x_1 = v_0 t + \frac{1}{2}at^2$ or $v_{f1}^{\,0} = v_{01} + at \Rightarrow t = -\frac{v_{01}}{a} = 250s$ to stop

So $x_1 = (35m/s)(250s) + \frac{1}{2}(-.14m/s^2)(250s)^2 = 4380m$

$x_2 = v_0 t = (35m/s)(250s) = 8750m \qquad x_2 - x_1 = \underline{4370m}$

7. Vector $\vec{A}$ has a length of 15.0 m and points 30 degrees counterclockwise from the x axis. Vector $B$ points in the negative y direction and has a length of 20.0 m. What is the magnitude of the vector $\vec{A}+\vec{B}$?




$\vec{C} = \vec{A} + \vec{B} \qquad C_x = A_x + B_x = A_x = A\cos 30° = 13m$

$C_y = A_y + B_y = A\sin 30° + (-20m) = -12.5m$

$|\vec{C}| = \sqrt{C_x^2 + C_y^2} = \sqrt{(13.0)^2 + (12.5)^2}\,m = 18.0m$

8. An object is thrown upwards at an angle of 35 degrees above the horizontal and lands at the same height as it was thrown from. Which of the following is **not** true, neglecting air friction?

a) It lands with the same speed (magnitude of velocity) that it was launched at

b) At the peak of its motion, its acceleration is zero

c) Its velocity is horizontal at the peak of its motion

d) It takes the same amount of time to reach the peak of its motion as it does to fall from the peak to the ground