

X1.8

205

PHYS-205(8) (Kaldon-18454)

Name _____

WMU - Spring 2001

Exam 1 - 100,000 points + 20,000 ☆ points Book Title _____

05/10/2001•Rev.3

State Any Assumptions You Need To Make – Show All Work – Circle Any Final Answers
Use Your Time Wisely – Work on What You Can – Be Sure to Write Down Equations
Feel Free to Ask Any Questions ☆2a ☆2b ☆2c ☆2e

The Atchison, Topeka and the Santa Fe Railway – 1:1/87.1 (35,000 points)

1.) HO-scale model trains are sized so that 3.5mm of model represents 1 foot in real life. So a scale mile is approximately 60 feet or 18.48 meters. For the model train to appear to go “60 mph”, it needs to cover 18.48 meters in one minute. (a) Find the speed v of the model train.



(b) Model trains accelerate quickly – the train can get going from at rest to “60 mph” in 1.00 meter. Find the acceleration. *If you didn't get an answer to (a), use $v = 0.500$ m/s.*

(c) Or you can accelerate the train so that you go from rest to a scale “60 mph” in 1.00 seconds. Find the acceleration. *Which acceleration is bigger, (b) or (c)? If you didn't get an answer to (a), use $v = 0.500$ m/s.*

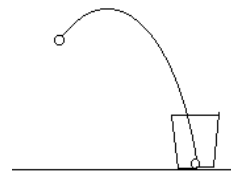
(d) The model train travels 20.0 meters at “60 mph”. A second model train travels 25.0 meters in the same time. How fast was this second model train going? *If you didn't get an answer to (a), use $v = 0.500$ m/s.*

(e) A third model train is traveling at 0.250 m/s and smoothly accelerates to 0.350 m/s with an acceleration equal to 1.00 G . Find the time and distance that this train travels during this acceleration



Trash (35,000 points)

3.) Tired and frustrated, Dr. Phil can't come up another problem at 1:25 am. So he crumples up a piece of paper into a tight little ball and walking over to the trash container and dropping it 1.25 meters into bottom of the trash. (a) How fast was the ball of paper going at the bottom of the trash?



(b) At 1:30 am, Dr. Phil tosses another ball of paper into the trash – this time from 3.00 meters away. It took 0.500 seconds to rise to the *turning point*, and 1.000 second to fall. What is the horizontal speed of the ball of paper, v_x ?

(c) For this second wad of paper, how high above the ground did the ball of paper *start* ?

(d) For this second wad of paper, find v_y of the ball of paper when it reaches the bottom of the trash container.

(e) What is final speed, v , at the bottom of the trash container?

Same But Different. Always Different. (30,000 points)

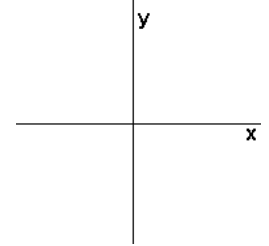
2.) An object's equation of motion is $v_y(t) = \left((1.00m/s^4)t + (1.00m/s^3) \right)t + 1.00m/s^2$.

★(a) Find the equation for the position of this object.

★(b) Find the equation for the magnitude of the speed of this object.

★(c) Find the equation for the acceleration of this object.

(d) Sketch the vector $\vec{C} = \vec{A} + \vec{B}$, where $\vec{A} = 10.2 m/s @ 118^\circ$ and $\vec{B} = 1.21m/s\hat{i} - 3.93m/s\hat{j}$. Find C_x and C_y .



★(e) An object has its position given as $a(t) = (6.00m/s^8)t^6$. Find the sixth derivative of x with respect to time at time $t = 1.00 sec$.