Assignment 0

Physics 141
Spring, 2013

Answer the following questions. Use the "Got the Concept" questions for self-instruction, but prepare answers for the other two questions as if you were going to hand them in to discuss in recitation. In all cases it is best to briefly explain your answer, even if the problem does not explicitly require it.

Short Problem 1.

Got the Concept 1-8
Dimensional Analysis

An object of mass m_0 oscillates back and forth on the end of a spring. (Flip forward in the book and look at Figure 12-2.) You determine a relationship for the time it takes for one full cycle T_0, which depends on a constant k that has dimensions of mass divided by time squared, M/T^2:

$$T_0 = 2\pi\sqrt{\frac{m_0}{k}}$$

Use dimensional analysis to determine whether the answer could be correct.

Short Problem 2.

Got the Concept 1-9
Working with Units

The relationship between and object's speed v and the time t it has been moving is found to be $v = gt$. The variable g represents a physical constant. What are the SI units of g?

Short Problem 3.

Got the Concept 2-1
Average Speed

It takes you 15 minutes to drive 6 miles (odometer reading) to the local hospital to shadow a doctor. It takes 10 minutes to go the last 3 miles, 2 minutes to go the last mile, and only 30 seconds to go the last half mile. Can you estimate your instantaneous speed at any point during the trip. If so, what is it?

Short Problem 4.

Got the Concept 2-2
Average Velocity

Is it possible to determine your average velocity for the trip described in the previous problem? Why or why not?

[Added by rgb: If you were given the *additional information* that the hospital was four miles due north of the point where you began your trip "as the crow flies", could you answer it then? Why or why not?]

Short Problem 5.

Conceptual Question 2-6

Which speed moves one through the largest total distance in a fixed time:

  a) $1 \; m/s$

  b) $1 \; km/h$

  c) $1 \; mi/h$

Short Problem 6.

Multiple Choice 2-29

A 1 kg ball and a 10 kg ball are dropped (from rest) from a height of 10 m at the same time. In the absence of air resistance (drag forces):

  a) The 1 kg ball hits the ground first.

  b) The 10 kg ball hits the ground first.

  c) the two balls hit the ball at the same time.

  d) The 10 kg ball will time 10 times the amount of time to reach the ground.

  e) There is not enough information to determine which ball hits the ground first.