General Physics 2014-2015; Quiz and Homework:

Homework:

1. (**Due Oct 2, 2014 in class**) As demonstrated in class, we have a pen covered underneath an A4 paper. A volunteer had determined that the dimension of this object to be of dimension roughly 15×1×1 (cm). Can you design an experiment to determine what it is? Note, this will be an experiment we sometimes call it “thought experiment”. This means you design something based on principles, it may not be easy to carry out, but it should be in principle possible.

2. (**Due Oct 23, 2014 in class**) As we started our introduction on the concept of “energy”, we started by defining a term called “work”, with a spring as our example. In this example, we derived what is the potential of the spring system. Why spring can be considered as a very fundamental model to describe a physical system? In fact, it is a basic model for physics. To answer this, you are suggested to reference to more senior text book, such as Mechanics (2^{ND} year physics), and quantum physics (3^{RD} year physics), and Solid State Physics (4^{TH} year Physics). If we look at these text books, you will see the more of spring keep coming back. More specifically, this system is called “Simple Harmonic Oscillator, SHO”.

3. (**Due Nov 13, 2014 in class**) What are “infinite” and “finite”? To address this, you are suggested to look up any mathematic book to see how they were defined, and then perhaps give some example on this.

4. (**Due Nov 25, 2014 in class**) What is the gravitational force acted on the electron of a hydrogen atom due to the proton of the nucleus?

5. (**Due Mar 5, 2015 in class**) Almost All the home has water tank system on the roof in Taiwan. "Is there any difference in-terms of the energy between the roof and ground? “Why do people set water tank on the roof instead of ground?" Please answer this question in comparing the two ways (on the roof, and on the ground) in terms of the energy needed to operate the system.

6. (**Due April 9, 2015 in class**)
   In the class of 04/07, we had calculated the drift velocity of the electrons in copper to be 2.22×10^{-4} m/s (page 27-1 in note), which is not too impressively high. On the other hand, the speed of electric current is very high (~speed of light). Current is the moving of the conducting electrons in a conductor, explain why these two numbers

don’t agree with each other?

7. (**Due April 21, 2015 in class**)
   Please refer to lecture note, pages 28-2, 3, there we talked about a simple RC circuit. Please write a small program to calculate and plot for a given R and C, the function of q(t) as indicated in page 28-3.

8. (**Due May 26, 2015 in class**)
   In this homework, you are asked to build a simple RL circuit and measure the inductance. You can get a resistor (**R**) in the general physics laboratory, find a 1.5 volt battery, and use copper wire to make a solenoid (**L**). Connect all these in series, and use an oscilloscope to measure the I-t curve. Plot the I-t curve and find out what the inductance is.

Quiz: The followings are possible problems to appear in the quiz, for your reference.

Chapter 1: 5, 7, 17, 37	Chapter 12: 2, 17, 21, 33, 46
Chapter 2: 1, 9, 25, 49	Chapter 13: 10, 18, 26, 32, 37
Chapter 3: 3, 7, 21, 29	Chapter 14: 7, 22, 27, 47, 53
Chapter 4: 3, 9, 15, 55	Chapter 15: 12, 23, 32, 39, 63
Chapter 5: 3, 9, 33, 63	Chapter 16: 11, 21, 25, 29, 47
Chapter 6: 5, 15, 23, 27	Chapter 17: 1, 15, 29, 37, 45
Chapter 7: 3, 15, 31, 41, 51	Chapter 18: 8, 19, 29, 35, 47
Chapter 8: 6, 16, 23, 40, 65	Chapter 19: 6, 13, 26, 29, 48
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Chapter 37: 13, 19, 29, 39, 47, 57, 63, 67, 73
Chapter 38: 15, 20, 27, 37, 41, 55, 61, 65, 67, 73