TA physics lab 2:

Class 1:

To the class:

Physics II labs can be found on the course webpage:

<http://sites.uml.edu/andriy-danylov/teaching/physics-ii/>

Lab course policy are found there.

No pre quizzes.

Thoroughly introduce theory for a lab since we are way ahead of the class.

Athletes must do all labs. Need to find another section to do a lab if they travel for games, and this is suitable for all if anyone need to be absent for any lab because of any issue. Make me know that we can discuss how to hand in the reports.

Report collected in one week, drop them in my mailbox. If your reports are late, drop them in the late mailbox in front of the storage room. I’ll directly help to pass late reports to the late mailbox after deadline.

Attendance. Sign lab roster every class. They have credits.

In this course, you will be introduced to a wide range of physical phenomena, measurement techniques and

methods of analysis. You will be required to keep a careful record of your observations and measurements in a

laboratory notebook and to write a formal report on each of your experiments. Working with a partner will enable

you to share the data taking, but each of you should participate in all observations and measurements and check

the other’s work for accuracy. You are **separately responsible** for all measurements taken and should keep

independent records in your laboratory notebook – do not simply copy from your partner’s notebook. You are

encouraged to discuss your results and learn from each other, but your reports must reflect **strictly individual**

**efforts**. The **Lab Manual Pages** with data tables pertaining to the experiment are **not** part of the lab report – they

should stay in the manual or be stapled/ taped to your lab notebook. The data tables will be checked and initialed

by the instructor at the end of the lab, and they will serve as proof of your attendance and participation. The

information from the data tables should be copied to and presented in the lab report

Personal points why we need to learn the lab/experiment:

Science is the most reliable in understanding our world. The question is why science gain this unbeatable reliability comparing other ways of understanding the world in human history. The answer is the science methodology.

Einstein wrote in 1953: Development of Western Science is based on two great achievements: the invention of the formal logical system ( in Euclidian geometry ) by the Greek philosophers, and the discovery of the possibility to find out causal relationship by systematic Experiment ( Renaissance ).

In Einstein’s words, he mentioned two basic methods: the first is logical reasoning/ deductive reasoning. It helps to build the theory which can explain what we already see and can predict the phenomenon we haven’t seen yet. It’s not enough for a theory to be self-consistent because that self-consistent theoretical hypothesis may be so many. Therefore, we need the second science method: experiment to provide the criteria for judging right and wrong, as well as they can help to inspire genius’ brain to establish a new theoretical hypothesis.

It’s interesting to see that these two parts of science are developed alternately in history. For example, Rutherford scattering experiment in 1911 ( they fired a beam of alpha particles at foils of gold leaf only a few atoms thick), to later atom structure theory build and developed, and then new element were predicted by theoretical scientist and later found by experimental scientist. Another example is the development of basic physics. Newton’s Law predict the existence of new planets, but the results can be weird when classics mechanics is applied in electromagnetic dynamics. Einstein set up the special relativity supposing light speed is the same in different coordinates. Later he developed general relativity and predict gravitational waves which are confirmed by LIGO (laser interferometer Gravitational-Wave Observatory) in 2015/2016, three scientists award Nobel prize in 2017.

What we do now is called verification experiment. We compare the results with your prediction based on what you learnt to help better understand the physics. That will be good for you not only you can gain better credits in college but also you can think scientifically in your whole life. Many years later, you may forget what physics books taught you, you must know that you can always find some methods to examine what you see, you hear, you think. If you can gain some pleasure in experiment trial, it cannot be better.

Main part:

1. Electric and Potential Field
2. Definition of electric field.

Points: test particle (positive charge, small won’t change the background electric field), force (static in a static field, opposite direction if negative charge so that E won’t change, conservative force), vector (start position, magnitude, direction)

1. Electric field line or line of force

Points: Not real just representative lines, draw lines that E is tangential at each points the lines go through, generally speaking it’s different with the trace of a moving positive test particles because the velocity can be different with the E&F.

1. Potential energy & work

Points: work (vector dot product), potential energy ( U, notice it’s negative work), related to the charge positive or negative

1. Potential

Points: definition (not related to the charge), similar to voltage in our daily life