Lab 1

*A take-home set of exercises, due April 9, 6:00 p.m.*

*Print* your full LAST name: ________________________________

*Print* your full first name: ________________________________

*Print* your Lab TA's name: ________________________________

What is your Lab TA's box # (located outside of Wngr 234)? ______

*Print* your Lab SECTION # here: ----------------->

Sign your name (full signature): ________________________________

*Print* today's date: __________________________________________
I. PH 213 Lab and Course Introduction

Purpose: To familiarize yourself with the purposes and policies of PH 213, and to practice with some needed math skills.

Directions: The answer to items here can be found either on the OSU web site or the PH 213 web site: http://www.physics.oregonstate.edu/~coffinc/COURSES/ph213. You’ll save a lot of time by first thoroughly reading all parts of the PH 213 web site (starting with the Syllabus and Frequently Asked Questions), rather than just skimming for answers. And note that some answers will be found in the first portion of the online lab manual.

You may either use the space provided here, or you may supplement as needed with your own paper. (If you use your own paper, there is no need to re-state the questions.) But you’ll always need to provide (and complete) the cover sheet (first page) of this file.

1. a. Where will you find the written materials for each lab?

b. What information about each lab will your lab TA provide?

c. A lab group consists of how many students?

d. Why is it important to read each lab and prepare for it prior to arriving in lab?

e. What is the purpose of the labs in PH 213?

f. What portions of lab are covered on the exams?
2. **a.** If you have to miss a lab (or want to repeat it for a better score), what are your options?

   **b.** What are the consequences of getting a zero on any lab report or take-home lab?

   **c.** What is your lab section #? What is your TA's box #? Why are both numbers important enough to put on the front of any take-home lab assignment? Why is it important not to confuse the two numbers?

3. **a.** When are the PH 213 exams this term? *Give the day of the week, the date, and the starting time for each:*
   - **Midterm 1:**
   - **Midterm 2:**
   - **Final:**

   **SIGN HERE** to confirm that you are aware of the above exam dates and times and that you will notify Chris no later than *Friday, April 13* about ANY time conflicts you have for ANY of these exams.

   ______________________________________________________  

   *(your signature)*

   **b.** What are you allowed to bring to the exams? Give a complete and detailed list.

   **c.** When and how will you learn full details about the exam locations, rules and topics?

   **d.** What should you do if you disagree with the scoring on your exam? Where is the form and specific information about this?
4. a. What portion of your total grade are the clicker questions?
   Can any other portion of the course be substituted for your clicker score?

b. How do you register your clicker app so that your clicker responses are credited?

c. Does your clicker registration work in both sections of lecture?

d. How does the clicker scoring work? (And what if you’re absent, late, you forget your clicker, or it doesn’t work?)

e. Where are clicker questions posted? How about the answers?

5. a. Where do you find the Prep problem sets? How about the Prep problem solutions?

b. How closely do Prep problems represent typical exam or HW problems?

c. What portion of your grade do you earn with Prep problems?
6. a. Where do you find the HW (homework) assignments? How about the HW solutions?

b. How many HW assignments are there?

c. What are those other links (e.g. Lab 2-V, Lab 5-III, Prep 1, etc.)? What sorts of assignments are they?

d. Where do you get full details on what the HW sets are like—and when/where they are due?

e. How will you know how you did on your HW assignments?

f. What portion of your total grade are the HW assignments?
   Can any other portion of the course be substituted for your HW score?
7.  a.  What are Chris’ office hours this term—and where is his office?

    b.  Do you need to make an appointment with Chris in order to visit during office hours?

    c.  If you need to make an appointment with Chris for any other time, how should you do this?

    d.  What number of hours does Chris recommend as a rough “time budget” for you to spend per week—outside of class and lab time—studying in this course?

        What number of hours per credit hour does OSU (via its Academic Success Center) recommend that you budget for study in any course?

    e.  What are the key factors Chris recommends for more effective learning and better success in this course?

    f.  Where do the Prep problems come from? What is the real purpose of the Prep problem sets and how should you use them?

    g.  According to OSU’s Academic Regulations, what does a grade of C represent?

    h.  What portion of all students who enrolled in PH 213 last Spring here at OSU earned a course grade of C or better?
8. **a.** Suppose that these are your course totals through the first unit (so, through Week 3 of classes and the first three labs, plus the first HW set and the first midterm exam):

- **Clicker:** (19 questions asked; 15 answered; 7 correct): 27/30
- **Labs 1-3:** (including the take-home portions): 30/35 with no missing lab parts (no “lab zeroes”)
- **HW 1:** 10/35
- **MT 1:** 115/250

Estimate your overall course % through Week 3. **Show all work here—use the example calculation sheet linked on page 14 of the Syllabus as your guide. (To confirm your calculations, you may then use the spreadsheet tool also linked on page 14 of the Syllabus, but you still need to show all your own calculations here.)**

**b.** Suppose that these are your course totals through the first two units (so, through Week 6 of classes and the first six labs, plus the first two HW sets and both midterm exams):

- **Clicker:** (42 questions asked; 35 answered; 22 correct): 60/60
- **Labs 1-6:** (including the take-home portions): 46/65 with no missing lab parts (no “lab zeroes”)
- **HW 1 and HW 2:** 22/65
- **MT 1 and MT 2:** 186/450

Estimate your overall course % through Week 6. **As above, do your own calculations and show them all here.**

**c.** Suppose that these are your course totals through all three units (so, through Week 10 of classes and all 9 labs, plus all three HW sets and both midterm exams)—everything except the final exam:

- **Clicker:** (69 questions asked; 58 answered; 33 correct): 100/100
- **Labs 1-9:** (including the take-home portions): 64/100 with no missing lab parts (no “lab zeroes”)
- **HW 1, HW 2 and HW 3:** 37/100
- **MT 1 and MT 2:** 186/450

Estimate your overall course % **going into the final exam. Do your own calculations; show them all here.**

**d.** Now, using the result of part **c** above, estimate the net score (i.e. after any final adjustment) that you would need on the final exam to get a C for the course.
8. e. Suppose that these are your course totals for all parts of the course—including the final exam:

- Clicker (69 questions asked; 58 answered; 33 correct): 100/100
- Labs 1-9 (including the take-home portions): 64/100 with no missing lab parts (no “lab zeroes”)
- HW 1, HW 2 and HW 3: 37/100
- MT 1, MT 2 and final exam: 300/700

Estimate your overall course % and final grade. **Do your own calculations; show them all here.**

f. The data in part e above includes a class session where 2 clicker questions were asked, and you were there in class and you answered both questions—but your answers were both incorrect. Now, **what if**, instead, you had simply missed that class (with all other data above the same)? **Re-estimate your final course % and grade in this case.**

g. Return now to the original data in part e above—where you turned in all take-home lab portions and you attended all labs. That included Lab 5, where your lab report score was 5/5. Now, **what if**, instead, you had simply missed Lab 5 (and forgot to make it up during Week 10)? With all other data from part e above the same (including the take-home portion of Lab 5—you didn’t forget that), **re-estimate your final course % and grade in this case.**

h. Why are all these calculations (b-h) only estimates (not exact)? And are the estimates probably conservative (too low) or optimistic (too high)?

i. Does Chris help you calculate such estimates at any point in the term? If so, when—and how?
II. Vector Math Review

A vector is any quantity that has both a magnitude and a direction. This two-part set of information can be expressed in various ways:

**Magnitude and angle** (measured from a conventional 0° point—usually the positive x-axis).  
This form usually gives you the best immediate grasp or “sense” of the whole vector.

**Components as coordinates** (measured along conventional coordinate axes, such as x and y.)  
This is the form you should use when combining (adding or subtracting) vectors.*

**Examples:** A velocity vector of 12 m/s in the negative x-direction could be expressed in any of the following forms:

- \( 12 \text{ m/s} \angle 180^\circ \)
- \( 12[\cos(180^\circ), \sin(180^\circ)] \text{ m/s} \)  
- \([–12, 0] \text{ m/s} \)
- \( < -12, 0 > \text{ m/s} \)

A momentum vector of 25 kg·m/s directed at 30° below the positive x-axis could be expressed in any of the following forms:

- \( 25 \text{ kg·m/s} \angle 330^\circ \)
- \( 25[\cos(330^\circ), \sin(330^\circ)] \text{ kg·m/s} \)
- \( [21.7, -12.5] \text{ kg·m/s} \)
- \( < 21.7, -12.5 > \text{ kg·m/s} \)

a. Express each of the following vectors in at least 3 different ways (with conventional coordinates):

- The local acceleration of gravity, \( \mathbf{g} \), at the surface of the earth:
  - __________________________
  - __________________________
  - __________________________

- The tension force exerted by wire A on the mass in the diagram on page 10:
  - __________________________
  - __________________________
  - __________________________

- The electrical force, \( \mathbf{F}_{E,\text{31}} \), exerted by \( q_3 \) on \( q_1 \) in the diagram on page 11:
  - __________________________
  - __________________________

*Note:* For vectors given in component form, you can use either [ , ] or < , > notation (as shown in the above examples). Many solutions posted in this course will use the [ , ] notation, but there is no preference; < , > is also completely acceptable.
b. The tension in wire A is 144 N. Find the mass, \( m \), in the diagram below. (The mass is hanging at rest, supported by massless wires A and B.)

*Show all your work (use additional paper, if necessary).*
c. Find the total electrical force exerted on $q_1$ in the diagram below. *Express your answer in at least 3 different forms.*

*Show all your work (use additional paper, if necessary).*

(Note/reminder: The diagram represents one “snapshot” in time. All three charges may be moving, but we’re asking only about the forces acting at just this one moment—and only the forces acting on $q_1$.)

$$q_2 = 6.00 \, \mu\text{C}$$

$$q_3 = -5.00 \, \mu\text{C}$$

$$q_1 = 4.00 \, \mu\text{C}$$