Class ID

(NOT your university ID)

Homework Exam II

(30% of the entire exam)

Please read the following before you write your name.

Name:_____ (↖Don't forget your ID number!)

You must follow all of the instruction. Please read every item carefully. Asking questions is your responsibility if you are not sure about the instruction.

For the first question, write each step on this paper. (**Do not attach extra papers for the first part.**) **Print your answers neatly**. [Calculate it on a scratch paper first, and then print all of the answer in this format.] For the second question, type and print it out to staple it to this series of papers.

Discussing with other people is allowed. **However, copying someone's or asking someone to do this exam is strictly prohibited.** (**NO PAIN, NO GAIN!!** The final exam will prove how much you understand. *All that is hidden will be revealed somehow later in your life*.)

However, asking the class instructor questions is allowed and encouraged especially for students who do not know how to get started.

Not writing your class ID or your name will be minus five points for each.

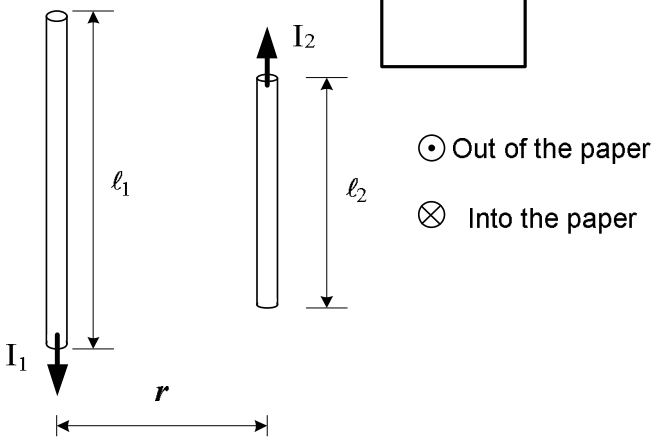
It will be rejected when the answers are incorrect or incomplete.

The **due date** is on the day of the in-class exam.

Magnetic Forces between Two Parallel Conductors

Total Score

[I] Understand the lecture note of Ch19 Sec7.
Look at the physical phenomena in the following system. There are two current flows. A current flow creates the magnetic field. Then, the current and the magnetic field will produce the force.



① Find the magnetic field created by each current at the other conductor. [Draw them in the figure.] ☞ Label B_1 if it is created by current I_1. Label B_2 if it is created by current I_2.

② Which rule or law did you use to find the directions of the magnetic field?

③ Find the forces at each conductor. [Draw them in the figure.] ☝ Label F_1 if it is on current I_1, and label F_2 if it is on current I_2.

④ What rule or law did you use to determine the directions of the forces?

⑤ Find the values of B_1 and B_2 if $I_1 = 4.37$ A and $I_2 = 6.80$ A, and the separation distance, r, is 0.150 m.

Write every step of the calculation.

⑥ Find the value of each force if ℓ_1 is 0.310 m; and ℓ_2 is 0.230 m. [Assume both magnetic fields are uniform in space.]

Write every step of the calculation.

⑦ Write the differences from the results of the similar example shown in the lecture.

[Check your answers: B_1 is 5.83×10^{-6} T; and F_2 is 9.11×10^{-6} N.]

Make your own presentation!

[II] Find the note of Chapter 19 section 5. You will make a presentation associated with the mass spectrometer toward the audience who has only elementary knowledge of science and math, or toward high school students. The basic procedure is the same as the lecture; namely, you will find the mass of the charged particle. Follow the instructions:

① **Attract** the audience with an idea, so they can be interested in the topic.

② Start deriving the final result **algebraically**. (Refer to the notebook.)

i) Explain the concept why you use a certain formula when you introduce it for the derivation.

ii) Explain each mathematical step such as, "Transpose the second term of the left hand side."

iii) Then, display each expression of the equation after the explanation above.

iv) Do not skip any mathematical step.

③ For the conclusion, plug in all of the values which have to be slightly different from what I gave in class, and then interpret if the result is reasonable.

Notes:

- **You do not need to follow the lecture note exactly**. There are many ways to derive the final result. As far as math is correct, you can derive it by your own way. (The lecture has to be pedagogical and consistent; therefore, some of steps might be redundant.)
- **Type all of the sentences.** However, for the equations, you do not need to use any equation editor. For example, you can express the power as follows: 10^9 ⇨ 10^9. Or write them down by hand.
- The length of this presentation is **about one page**, but not more than two pages with single space.
- The format has to be **neat** and **understandable**, so anyone can read it easily.
- **Do not substitute** any numbers until you solve for the mass.