Lab Quiz for PHY324

Q1: What experiment are you doing?

Kater's Pendulum

Q2: Summarize the physics elements in this experiment.

The pendulum is going to swing due to gravity, and we are going to use the the relationship between gravity, period, effect length to measure the gravity again.

Q3: Describe one major goal of the lab.

To measure the local acceleration of gravity "g" as precise as possible, and how it varies with location.

Q4: What do you measure directly in pursuit of the major goal described above?

timing the swing, measuring the length of the pendulum.
For the effective length, we need to measure k the radius of gyration and rm the radius from center of mass to to pivot.

Q5: Outline how you get the answer to Q3 from the data collected as described in Q4. If you will graph data to achieve the goal in Q3 then explain what you will graph, what the trend-line will look like, and how it achieves the goal in Q3. Include any equations you will use to turn the data described in Q4 into the answer described in Q3.

We have the Period formula $T = 2\pi (L/g)^{\frac{1}{2}}$, and we are going to measure any elements rather than g to calculate g as precise as possible. During the experiment, we need to try to avoid the errors as much as possible.
We will plot period vs. mass position, we will have 2 lines, and we will find the interception of the 2 lines.

Q6: Your TA asked you a/some question(s) about the equipment. Write the question(s) and answer(s) here.

1. Discuss the impact of ≥2 sources of errors in the manual
   ① Buoyancy of air: air resistance exists when the pendulum swings, although it is small, but when the pendulum swings millions of times. it is not negligible anymore.
   ② Damping of pendulum due to friction: This one cannot be avoided. as long as it is a pendulum, the knife has to touch the plat plate. There's friction exists if the knife slides on the plat plate. We will make the small gap barely touch the knife edge to stop sliding, in order to have a better measurement of period.
   ③ Imperfect knife edge: The thinner knife edge is, the smaller error is. However, when the equipment is used many times, the edge becomes blunt, and this might increase the friction and make the pendulum stop faster, which affect the measurment of period.
2. What is the best count limit to set the timer to.
   8 times has smaller systematic error, but 32 times has smaller random error because we have more data.
   So we think 8 times is the best, because we cannot avoid systematic error, but we can do the 8 limit many times to avoid random error.