

THE PENDULUM AND  $g$ 

- Objectives:**
- Review notions of uncertainty and error propagation.
  - Measure the local value gravitational acceleration to a part in  $10^3$ .

- Pre-Lab:**
1. Read this lab
  2. Given that the magnitude of gravitational force is  $F_G = G \frac{m_1 m_2}{r^2}$ , calculate the acceleration due to gravity on the surface of the planet earth.
  3. The standard acceleration due to gravity used in converting between mass and force is defined to be  $9.80665 \text{ m/s}^2$ . Is this number the same, higher, or lower than your answer for question 2?

**Apparatus:** string, brass mass, clamps, etc for pendula, measuring tape, stop watches, Excel

**The Lab:**

Before you on the lab table are the makings of a pendulum and familiar measuring devices. The objective of the lab is to construct a simple pendulum that allows you to measure the local gravitational acceleration “ $g$ ” to 1 part in 1000.

Once your group has played around with some theory and the pendulum, take a good look at the sources of uncertainty in your measurements. Reduce these to the maximum extent possible and begin to make a high precision measurement!

Please talk to your lab instructor about your procedure and your result(s). Feel free to try lots of ideas. And do not feel constrained to measure  $g$  only once...

Enjoy!