HOMEWORK 1

Hand-in deadline: End of Week 3: 2pm Thursday 20th October 2011

Note: *Remember to attach securely all sheets of paper relevant to the problem, and to display your name on your answers. Be sure to do* ***all*** *the things that are asked, and show* ***how*** *you arrived at your answers. Solutions should be placed in the SCM pigeon hole on the first floor by* ***2pm****. Marked solutions will be returned as soon as possible.* ***Comments on the marking*** *will be available on the course* ***website****, and posted on the* ***notice board*** *in the laboratory.*

You are required to use the computer program REACTION to test your reaction time. It can be found on the Windows PCs, under Physics Courses in the folder Scientific Measurement. Using the program is quite simple — the **Rules** button brings up a quick summary. If you have problems, just ask the course organiser, a demonstrator, or the laboratory technicians. REACTION works by timing the fraction of a second between an on-screen change of a 'traffic light' and your reaction to it by clicking the mouse button.

Before you start taking measurements, press the program's **Calibrate** button. It will take a short time for the program to determine the time calibration for that particular computer.

Your task is to obtain at least 50 values of your reaction times. Display this **data** in the form of a **table**, and then make a **histogram**. Be careful to use suitable bin sizes and limits. Determine the **mean**, **variance**, **standard deviation**, and **standard error of the mean** of your data. By definition, the mean is your average reaction time. The standard error of the mean is the error on this quantity — this has been discussed in the lectures. As in all physics experiments, all of your **final results** should be **restated** with the correct **units** and a **meaningful significance** in number of decimal places, etc. (i.e. never just copy all the decimal places on computer output in the histogram). You should also be sure to show your input **data**, so that results and histograms can be checked.

It might be interesting to try the experiment at the beginning and end of the day to see if you measure a significant change between when you are alert and when you are tired. Or perhaps 'practice makes perfect' and your reaction time improves for a second set of data.

The program **PhysPlot**, available under Physics Applications, can be used to compute the statistical quantities and print the histogram. (It is part of the object of this homework *not* to give you detailed instructions on the use of computer packages, so that you learn to investigate their use yourself as part of the exercise!)

Think carefully about the **bin size** you finally choose for the printed version of the histogram. Comment on the shape of the histogram and any anomalies you may see, but a long write-up is *not* required. Your raw data, the results, and three or four sentences, are all that is required.

Note that the marking is not based on the *speed* of your reactions, but for an intelligent and truthful conduct of the experiment and presentation of results. (This is a Physics course, not an athletic competition!)