Application Experiment, Conical Pendulum

Design two independent experiments to determine the magnitude of the net force exerted on a conical pendulum by other objects as the bob of the pendulum moves in a circle at constant speed. Available equipment: A heavy bob at the end of a string, a meter stick, a spring scale, a stopwatch.

Include in your report for each experiment:

a) Describe your experimental design. Include a labeled diagram.

b) Devise a procedure that you will use to determine the net force.

c) List the physical quantities you will measure. Briefly (but specifically) describe how you will measure them. For example, if you are measuring length of the pendulum, mention which point on the bob you consider – the top of the bob, the center of the bob, or the bottom of the bob.

d) List additional assumptions that you made. Explain how each assumption can affect the result.

e) List sources of experimental uncertainty, and possible methods to minimize them. Evaluate how experimental uncertainties can affect the data.

f) Perform each experiment and record the data. Make sure you take steps to minimize experimental uncertainties.

g) Determine the net force based on your procedure and measurements. Use the weakest link rule to determine the uncertainty in the outcome.

h) After you have performed both experiments, compare the two values you obtained. Decide if these values are different or not. If they are different, discuss possible reasons for the difference (think of the effects of your assumptions).

i) Reflection: In one of the experiments you probably tried to get the bob move in circle. However you noticed that the path that the ball followed was not the exact circle – it looked more like an ellipse. Compare the net force exerted on the bob at different points of the trajectory. Now think whether the assumption that the path is circular makes you overestimate or underestimate the average net force.