

P RECISION AND ACCURACY

Name _____ Box _____

Group Members _____ Group # _____

Purpose: Study a simple system and examine the difference between precision and accuracy.

Procedure: You will be divided into four groups. Each group will use a different timing device to make ten measurements of the duration of a selected reproducible event. You will be introduced to the system at the beginning of class. Each group will have 15 minutes to get set-up to make their measurements.

I - Group One: Second Hand on Watch

Use a watch with a second hand.

II - Groups Two: Stop Watch

Use the manual stop watch or a computer timing program.

III - Group Three: Pendulum

Assemble a pendulum with a period of one second using a string 0.24811 m (24.811 cm) long.

IV - Group Four: Photogate

Place photogates at both ends of the motion.

Data Table - Event Durations in Seconds

Trial #	Group 1	Group 2	Group 3	Group 4
1	_____	_____	_____	_____
2	_____	_____	_____	_____
3	_____	_____	_____	_____
4	_____	_____	_____	_____
5	_____	_____	_____	_____
6	_____	_____	_____	_____
7	_____	_____	_____	_____
8	_____	_____	_____	_____
9	_____	_____	_____	_____
10	_____	_____	_____	_____

Questions: Discuss, explain and calculate these on a separate sheet or sheets of paper. Feel free to expand the scope of these questions to include calculations that will expand your understanding of the process of evaluating data. Each group will make a presentation of their results and musings.

- A. Explain the difference between accuracy and precision. Discuss the sources of inaccuracy and the sources of imprecision in your group's measurements. Discuss the relative roles of the experimenters and the measurement device in your group's inaccuracy and imprecision.
- B. How would you quantify the precision of your group's measurements?
- C. How would you quantify the accuracy of your group's measurements? (What group made the best estimate of the correct answer?)
- D. When dealing with large data sets, we often report the average of the measurements. What is the purpose of calculating the average? (Summarizing or simplifying the results is NOT the answer.)
- E. If you happen to know what a standard deviation is, what do you think it represents?
- F. High precision and high accuracy often go together. Why is this likely to be so? When and why might it not be true in some specific circumstances? Describe the characteristics of two highly precise but not very accurate "experimenter/measurement device" combinations.