

Percent error  
precision or accuracy  
– physics



**ASSIGN  
BUSTER**

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### Experiment 1: Experimental Uncertainty (Error) and Data Analysis

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#### **PRELAB:**

1. Do experimental measurements give the true value of a physical quantity?

Explain. No. Statistical methods are used to establish the deviations in the measurement.

2. Distinguish between random (statistical) error and systematic error, and give an example of each. Random errors are caused by unknown and unpredictable changes in the experiment like mechanical vibrations of an experiment setup.

3. Systematic errors are constant errors in the same experiment like an improperly zeroed scale.

4. What is the difference between measurement accuracy and precision?

Explain the general dependence of these properties on the various types of errors. Accuracy is how close a measurement is to the actual measure.

Precision is the agreement of repeated measures.

5. What determines how many figures are significant in reported measurement values? What would be the effect of reporting more or fewer figures or digits than are significant? All the numbers that can be measured plus one estimate number. It would give a slightly different result giving you a higher percent error.

6. In expressing experimental error or uncertainty, when does one use (a) experimental error and (b) percent difference? Experimental error is used when there is an expected value. Percent difference is used when there isn't an accepted value.

**Objective:**

- \* To learn how to properly take measurements of physical quantities.
- \* Learn how to use experiential uncertainty or error.
- \* Recognize that there are random and systematic errors.
- \* Differentiate between precision and accuracy.
- \* How to use percent difference.

Conclusion: Significant figures are the last digit of any measurement that is guessed/estimated. Significant figures are a way of getting a closer and better measurement of a physical object. Accuracy is how close a measurement is to the accepted value and this can be measured by percent error. Precision is how close one measurement is to another and percent can help measure this.

POSTLAB: 2. Were the measurements on the block in part (b) of Procedure 1 of this lab report all done with the same instrument? Explain No. The first two had the same type of instrument but the third doesn't.

It has 2 places after the decimal which indicate that the last number in the hundredth place was a guess rather than the one in the tenth place. 3.

Referring to the dart analogy in Fig. 3, draw a dart grouping that would represent poor precision, but good accuracy with an average value. 4. Do percent error and percent difference give indications of accuracy or

precision? Discuss each. Percent error is how far a measurement is from the accepted value, which can give you how accurate the measure is. Percent difference is how far apart 2 measurements are which can give precision.