

## Practice Problems in Foundational Material

These problems emphasize some of the foundations of understanding measurement errors, uncertainty, significant figures, etc. Many of these concepts were drawn from the readings in the book, so if you struggle with this material, you may refresh the assigned chapters.

1. You measure the voltage of a battery and get the following digital read out in V. What is the uncertainty in this measurement? State both in terms of absolute and fractional uncertainty.



2. You want to measure reaction time for 5 students in class by asking them to press a button when a light comes on.
  - a. What are potential sources of error in this measurement? State and label 1 systematic error and 1 random source of error.
  - b. What is the average reaction time of this sample? For the time being, use 3 significant figures. The reaction times are as follows:  
 $S1 = 0.57 \text{ sec}$     $S2 = 0.139 \text{ sec}$     $S3 = 0.2 \text{ sec}$     $S4 = 0.2543 \text{ sec}$     $S5 = 0.315 \text{ sec}$
  - c. To estimate the average reaction time for all students within the class, which source of uncertainty is most appropriate to use? Calculate this uncertainty.
  - d. What is our best estimate of the average reaction time for students within the class?
3. Solve problems 2.1 and 2.5 from the book and check the answers in the back.