Physics 11

SigFigs / Experimental Uncertainty

Name: Date:

Block:

**SIGNIFICANT FIGURES AND EXPERIMENTAL UNCERTAINTY**

In Science, we often wish to make quantitative observations. Observations such as these require us to take MEASUREMENTS. All measurements have a certain amount of UNCERTAINTY associated with them.

**PARTI: SIGNIFICANT FIGURES IN MEASUREMENT**

The number of significant figures in a measurement is defined to be all of the certain
figures PLUS the first uncertain figure.

*Example*

157.4
4

150 160

The measured value (shown by the arrow) has 3 certain figures (1, 5 and 7) and 1 uncertain figure (4, or is it a 3, or is it a 5?). Hence, this measurement has 4 significant figures.

If you are given a measured value in science, the number of significant figures may often be determined by writing the value in scientific notation and counting the digits. (See exception in Rule #4)

Example 127.3 = 1.273 xlO2 and 1.273 has 4 significant figures.

Example 0.00851 = 8.51 xlO"3 and 8.51 has 3 significant figures.

NOTE: We do not start counting digits until we encounter the first non-zero digit (starting from the left).

Example 0.0030000 = 3.0000 x 10"3 whichhas 5 significant figures.

NOTE: All digits to the right of the first significant digit must be counted.

(Note exception in Rule #4)

**SUMMARY OF RULES FOR SIGNIFICANT FIGURES**

All non-zero digits are significant. Each of these numbers contains three significant figures: 425, 25.2, 1.61, 19.5

All zeros between non-zero digits are significant. The zeros in each of these are significant: 590.5, 15.03, 3.08, 27.0005

Final zeros to the left of a decimal point are significant. These zeros are significant: 315,000.; 250.; 60.

Final zeros to the left of an UNDERSTOOD decimal point are NOT significant. The following numbers each have three significant figures: 315,000; 1,050,000; 2060

Final zeros to the right of a decimal point are always significant These numbers have three significant figures: 0.390; 45.0; 20.0; 0.800 Zeros at the beginning of a number are NOT significant. They simply mark the place for the decimal (are PLACE HOLDERS only). None of these zeros are significant; each number contains only three significant figures: 0.00574; 0.0376; 0.826

MULTIPLICATION and DIVISION

The answer to a multiplication or division problem should have only as many significant figures as the LEAST ACCURATE NUMBER in the problem (the number having the lowest number of sig figs).

Example 4.1 x 5.67 = 23

(2 sig figs) (3 sig figs) (2 sig figs)

Example 12,975.6 + 423.4 = . 30.65

(6 sig figs) (4 sig figs) (4 sig figs)

ADDITION and SUBTRACTION

The number of significant figures in the answer to an addition or subtraction problem is limited by the SMALLEST NUMBER OF DIGITS AFTER THE DECIMAL POINT.

Example 123.465 (3 digits after the decimal)"

-l- 0.3 (1 digit after the decimal)

123.765 ROUND OFF TO 123.8 (I digit after decimal)

Example 141.347 (3 digits after the decimal)

- 141.32 (2 digits after the decimal)

0.027

ROUND OFF TO 0.03 (2 digits after decimal)