# Week 1: Introduction to the Use of Math in Chemistry

**Significant Figures**

Significant figures are all of the figures in a number that are known with certainty plus one additional digit that is uncertain.

Rules determining significant figures in *measured* values.

1. Digits that are significant
   * 1. Nonzero digits

1.2 has 2 significant figures

8117 has 4 significant figures

* + 1. Zeroes between nonzero digits

4.08 has 3 significant figures

30002 has 5 significant figure

* + 1. Zeroes at the end of number including a decimal

3.6050 has 5 significant figures

490. has 3 significant figures

* + 1. All digits in a properly written number in scientific notation

1.20 x 103 has 3 significant figures

3 x 102 has 1 significant figure

1. Digits that are not significant
   * 1. Zeroes at the beginning of a number

0.067 has 2 significant figures

0.0009 has 1 significant figure

* + 1. Zeroes at the end of a number without a decimal

12000 has 2 significant figures

3000 has 1 significant figure

A potential ambiguity can occur with numbers that end in zeroes but do not have a decimal. In order to avoid this problem, scientific notation should be used. In order to write 12000 with 2, 3, 4 and 5 significant figures, it must be written as:

1.2 x 104 has 2 significant figures

1.20 x 104 has 3 significant figures

1.200 x 104 has 4 significant figures

1.2000 x 104 has 5 significant figures

**Handling significant figures in calculations:**

For addition or subtraction, the answer must have the same number of decimal places as the term with the smallest number of decimal places.



For multiplication or division, the result must have the same number of significant figures as the term with the least number of significant figures.



In cases with more than one mathematical operation determination of significant figures is slightly more complicated. It is important to solve the problem with the correct order of operations. “Please excuse my dear aunt Sally” or parentheses, exponents, multiplication, division, addition and then subtraction. It is important to correctly determine the numbers of significant figures for each step along the way.



**Preparing for the Quiz**

No pre-lab quiz will be given for week 1 and 2.

**1105: Intro Chemistry Report Sheets**

**Experiment 1: Safety, Measurement, and Significant Figures**

**Name: Sean Poston Lab Day: 5/17/2021 and 5/18/2021**

**Date of Experiment: 5/17/2021 Instructor: Dr. Ragain**

Be sure to **show all numbers with appropriate units** and significant figures. All calculations must be clearly shown and neatly numbered on the calculations page.

1. **Mass Measurements**

|  |  |  |
| --- | --- | --- |
|  | Mass | Number of significant figures |
| Sample A | 2.347 g | 4 |
| Empty Beaker | 45.159 g | 5 |
| Beaker + Sample B | 115.227 g | 6 |
| Sample B  (Beaker + Sample B) – Empty Beaker | 70.068 g | 5 |

1. **Temperature Measurements**

|  |  |  |
| --- | --- | --- |
|  | Temperature | Number of significant figures |
| Hot Water Bath | 62.8 C | 3 |
| Cold Water Bath | 0.8 C | 1 |
| Room Temperature Water Bath | 23.2 C | 3 |

1. **Volume Measurements**

|  |  |  |
| --- | --- | --- |
|  | Volume | Number of significant figures |
| Graduated cylinder | 8.71 mL | 3 |
| Buret | 15.38 mL | 4 |

1. **Significant figures and calculations**

1. Convert each value into scientific notation.

|  |  |
| --- | --- |
| Value | Written in scientific notation |
| 823 | 8.23 x 102 |
| 902000 | 9.02 x 105 |
| 0.0000123 | 1.23 x 10-5 |
| 204.5 x 104 | 2.045 x 106 |
| 12.5 x 10-3 | 1.25 x 10-2 |

2. Convert each value into decimal form.

|  |  |
| --- | --- |
| Value | Written in decimal form |
| 3.42 x 10-4 | 0.000342 |
| 7.00001 x 1010 | 70,000,100,000 |
| 302 x 103 | 302,000 |
| 0.000891 x 10-3 | 0.000000891 |
| 0.00159 x 103 | 1.59 |

3. Calculate the following. Give the answer in correct scientific notation.

a. = **2.9 x 1024**

b. = **-4.32 x 104**

c.  **4.955555556 x 1066**

Would this round to 4.9 x 1066 because of sig figs?

d.  = **1.2152 x 10-3**