Name: _____ **Date:** _____   **Class Notes**
Chemistry

Scientific Notation

    It is not unusual to encounter very small or very large numbers during a scientific investigation. But, much of the time these numbers are bulky and contain zeroes that are not significant making these numbers inconvenient to write in data tables. Therefore, scientists will express these numbers using scientific notation.

Scientific notation makes very large numbers or very small numbers easier to write and work with in data calculations.

Writing Numbers in Proper Scientific Notation

1. Move the decimal point to the **right** or the **left** in order obtain only **ONE** leading digit.

2. If the decimal is moved to the **right**, then subtract from the <u>power of 10</u> the number of times you moved the decimal.

3. If the decimal is moved to the **left**, then **add** to the **power of 10** the number of times you moved the decimal.

   Example: $5{,}230 = 5.23 \times 10^3$ or $.00523 = 5.23 \times 10^{-3}$

Practice

Directions: Express the following numbers in proper scientific notation.

_____ 1. 0.00005   _____ 2. 83,600

_____ 3. 6200   _____ 4. 0.792

_____ 5. 53.7   _____ 6. 0.000000302

Operations with Scientific Notation

<u>**Addition and Subtraction**</u> - to add or subtract, the numbers must have the <u>same power of 10</u>. So, convert the smaller power to the larger power, and then add or subtract the mantissas together.

<u>**Multiplication**</u> - In order to multiply, <u>add the powers of 10</u> and multiply the numbers.

<u>**Division**</u> - In order to divide, <u>subtract the powers of 10</u> and divide the numbers.

Practice

Directions: Perform the following operations first with a calculator.

1. $(9.42 \times 10^4) + (881 \times 10^2)$

2. $(5.01 \times 10^2) - (30.1 \times 10^{-1})$

3. $(6.022 \times 10^{23}) \times (0.71)$

4. $(8.09 \times 10^{-4})(7.7 \times 10^{-6})$

Operations with Significant Figures

<u>**Addition:**</u> Use the number with the **least precise** <u>place value</u> to decide the sig figs.
<u>**Multiplication:**</u> Use the factor with the **fewest sig figs** to decide the sig figs.
<u>**Counting numbers:**</u> Never use counting numbers for sig figs.
<u>**Conversion factors:**</u> Never use numbers from conversion factors or definitions for sig figs.

Example: $51.34 + 12.1 = 63.35$ *63.4* $321.5 \times 22.3 = 7169.45$ *7170*
                                    Least place value   *fewest sig figs*

Practice

Directions: Perform the following operations and use significant figures in your answer.

1. 25.5 - 1.46

2. 60.0 + 8.01 + 760.

3. 7.5 + 0.016 + 44.04

4. 22.4 - 6.26

5. (0.100)(8.14)

6. $(6.022)^2$

7. $\dfrac{65.35}{4.15}$

8. $\dfrac{5.206}{0.291}$

9. $\dfrac{6.022 \times 10^{14}}{5.813 \times 10^{12}}$

10. 5.0 cm x 5 .0 cm

"Great souls have wills; feeble ones have only wishes." - Chinese Proverb