Honors Chemistry Summer Assignment

Welcome to Honors Chemistry!!!!!!

PLEASE READ THIS WHOLE PAGE BEFORE YOU START.

During the course of the year we will be focusing on many topics dealing with significant figures, scientific notation and unit conversions using dimensional analysis.

Each of the three topics has a "notes" page that explains how to do the problems. There are examples along with written explanations.

- <u>Significant figures.</u> Ever do a math problem and get a really long answer and wonder should I round it? Well, significant figures tells you how to round off your answers. You <u>do not</u> have to show work on the one sig fig worksheet.
- Scientific Notation. Read the directions and complete the 2 worksheets. You <u>do not</u> have to show work but your answer <u>MUST</u> have the same number of sig figs as the original number (the x 10^{exponent} is not included in rounding for significant figures).
- 3. <u>Dimensional Analysis</u>. After reading the first page, you should be able to complete the worksheets. In order to get full credit, you must use the method described, you must round off your answer to the correct number of sig figs and you must label your answer with the correct unit. (We will use this method with chemistry terms all year so it is really important you learn it first with units you are familiar with...)

Answers to Frequently Asked Questions.

This assignment will be due the first day of school. (start the year off right.... Have it done)

It will be your first grade of the first marking period. (so do a good job 🐵)

It will be a test grade. (it should be worth something since you are taking time away from your summer to do it)

If you have any questions, you can email me at <u>kscott@nazarehtacademyhs.org</u>.

And lastly.... And most importantly.... This is HONORS CHEMISTRY. You are expected to do this work independently. You get out of it what you put into it.

We are going to have a great year and I look forward to working with you this fall. Enjoy your summer!

I ______ agree to do this assignment independently and that the work that is turned in is my own.

Name

Significant Figures

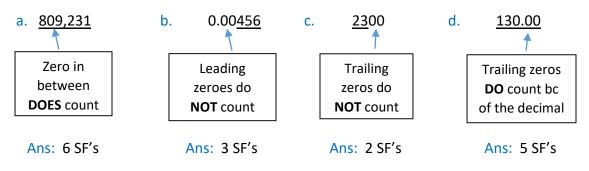
The **Significant Figures** of a number refer to those digits that have *meaning in reference to a measured or specified value*. Correctly accounting for Significant Figures is important while performing arithmetic so that the resulting answers accurately represent numbers that have computational significance or value.

There are three rules that are used to determine how many significant figures are in a **number**. There are also rules for determining how many digits should be included in numbers computed using addition/subtraction, multiplication/ division, or a combination of these operations.

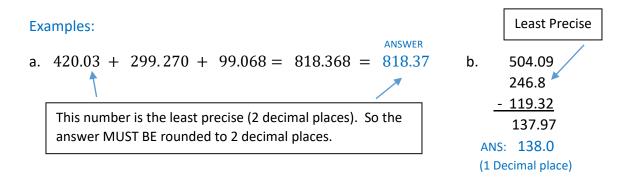
A. Rules for determining how many Sig Figs are in a number:

Rule #1: Non-Zero digits (# 1 – 9) and Zeros that are <u>in between</u> two non-zero digits are <u>alway</u>s significant.
Rule #2: Leading zeroes are <u>never</u> significant.
Rule #3: Trailing zeroes are <u>only significant if a decimal point is present</u> in the number.

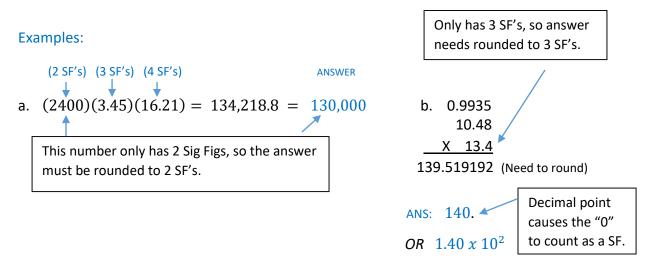
Examples:



B. **Rules for performing Addition / Subtraction:** The final answer is written so that it has the *same number of decimal places as the <u>measurement that has the</u> <i>fewest decimal places (i.e. the number that is the least precise)*.



C. Rules for performing Multiplication / Division: The final answer is written so that it has the same number of Sig Figs as the <u>measurement with the fewest SF's.</u>



D. Rules for Performing a Combination of Operations: The previous rules listed for A/S and M/D still apply along with incorporating the rules for order of operations (*i.e. PEMDAS*). Be cautious, however, that you **do not round the answer too** early!

Example: $1.4 \times 2.639 + 117.25$ (Order of Operations \rightarrow Multiply then Add)

This is **CORRECT**!

This is **NOT** Correct!

Step 1: Multiply -

 $1.4 \times 2.639 + 117.25$ = 3.6946

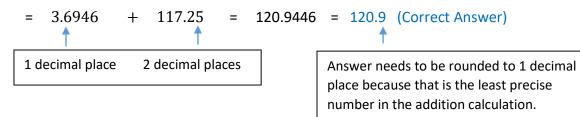
Because this is multiplication, the answer to this part can only have 2 SF's. This means that the first and second digits are significant. For this particular problem, this means the ones place and the first decimal place. Make note of this, but do **NOT** round yet.

= 1.4 x 2.639 + 117.25

 $= 3.7 + 117.25 = 120.95 \neq 121.0$

Error - Rounded too early. Should have been left as 3.6946.

Step 2: Addition -



Note - Conversion Factors are considered to be "perfect" quantities and are not used to determine the number of sig figs / decimal places in the calculated answer.

Significant Figures Worksheet

1. Indicate how many significant figures there are in each of the following measured values.

| 246.32 | 1.008 | 700000 |
|---------|---------|---------|
| 107.854 | 0.00340 | 350.670 |
| 100.3 | 14.600 | 1.0000 |
| 0.678 | 0.0001 | 320001 |

2. Calculate the answers to the appropriate number of significant figures.

| 32.567 | 246.24 | 658.0 |
|----------|---------|------------|
| 135.0 | 238.278 | 23.5478 |
| + 1.4567 | + 98.3 | + 1345.29_ |

3. Calculate the answers to the appropriate number of significant figures.

| a) 23.7 x 3.8 | = | e) 43.678 x 64.1 | = |
|------------------|---|------------------|---|
| b) 45.76 x 0.25 | = | f) 1.678/0.42 | = |
| c) 81.04 x 0.010 | = | g) 28.367 / 3.74 | = |
| d) 6.47 x 64.5 | = | h) 4278 / 1.006 | = |

Name: ______ Period: ______

Scientific Notation

Scientific notation is often used in science to make working with very small or very large numbers easier. It is not practical to write out numbers like **0.0000000028** or **1,300,000**– scientific notation gives us another way to represent the same number.

A number given in scientific notation consists of three parts: the coefficient, the base, and the exponent. Coefficients must be between **1.0 and 9.99999**, the base is always **x10**, and the exponent represents the number of places we have moved the decimal point in order to convert from standard form to scientific notation.

- For numbers less than 1, the exponent will always be negative.
- For numbers greater than 1, the exponent will always be positive.

Examples:

Example 1: If we convert 0.0000000028 to scientific notation, we must first get the coefficient within the accepted range. The coefficient here would be **2.8**. The base is always **x10**, so the only thing left is identifying the correct exponent. For numbers less than 1, the exponent will always be negative.

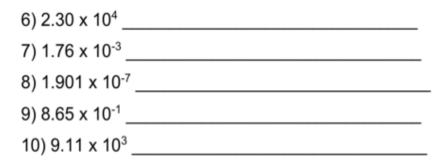
The exponent is equal to the number of decimal places we moved the decimal to get to our coefficient. For this example the exponent would be -10. The final answer would be written as **2.8** x10⁻¹⁰

Example 2: Converting **1,300,000,000** to scientific notation will use the same rules; the only difference is the exponent will be positive since the original number is greater than 1. The coefficient would be **1.3**, base **x10** and the exponent would be **9**. The final answer would be **1.3** $x10^9$.

Convert the following numbers into scientific notation:

- 1) 3,400 _____
- 2) 0.000023 _____
- 3) 101,000 _____
- 4) 0.010 _____
- 5) 45.01 _____

Convert the following numbers into standard notation:



Convert the following numbers into scientific notation: Make sure to have the correct number of significant figures

sig figs!

| 1) 923 | |
|---|---|
| 2) 0.00425 | |
| 3) 4523000 | |
| 4) 0.94300 | |
| 5) 6750 | |
| 6) 92.03 | |
| 7) 7.80 | |
| 8) 0.0000032 | |
| 9) 0.000780 | |
| 10) 0.00020 | |
| Convert the following numbers into standard notation: Use | 3 |
| | |
| 11) 3.92400 x 10 ⁵ | |
| 11) 3.92400 x 10 ⁵ 12) 9.2 x 10 ⁶ | |
| | |
| 12) 9.2 x 10 ⁶ | |
| 12) 9.2 x 10 ⁶ 13) 4.391 x 10 ⁻³ | |
| 12) 9.2 x 10 ⁶ 13) 4.391 x 10 ⁻³ 14) 6.825 x 10 ⁻⁴ | |
| 12) 9.2 x 10 ⁶ 13) 4.391 x 10 ⁻³ 14) 6.825 x 10 ⁻⁴ 15) 4.6978 x 10 ⁴ | |
| 12) 9.2 x 10 ⁶ 13) 4.391 x 10 ⁻³ 14) 6.825 x 10 ⁻⁴ 15) 4.6978 x 10 ⁴ 16) 8.36 x 10 ¹ | |
| 12) 9.2 x 10 ⁶ | |

MATH HANDBOOK TRANSPARENCY MASTER

Operations with Scientific Notation

Use with Appendix B, Operations with Scientific Notation

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Multiplication

When numbers in scientific notation are multiplied, only the number is multiplied. The exponents are added.

$$(2.00 \times 10^3)(4.00 \times 10^4) = (2.00)(4.00) \times 10^{3+4}$$

 $= 8.00 \times 10^{7}$

Division

When numbers in scientific notation are divided, only the number is divided. The exponents are subtracted.

$$\frac{9.60 \times 10^{7}}{1.60 \times 10^{4}} = \frac{9.60}{1.60} \times 10^{7-4}$$
$$= 6.00 \times 10^{3}$$

Date ____

MATH HANDBOOK TRANSPARENCY WORKSHEET

Operations with Scientific Notation

Use with Appendix B, Operations with Scientific Notation

- 1. Perform the following operations and express the answers in scientific notation. a. $(1.2 \times 10^5) + (5.35 \times 10^6)$
 - **b.** $(6.91 \times 10^{-2}) + (2.4 \times 10^{-3})$
 - **c.** $(9.70 \times 10^6) + (8.3 \times 10^5)$
 - **d.** $(3.67 \times 10^2) (1.6 \times 10^1)$
 - **e.** $(8.41 \times 10^{-5}) (7.9 \times 10^{-6})$
 - **f.** $(1.33 \times 10^5) (4.9 \times 10^4)$
- 2. Perform the following operations and express the answers in scientific notation.
 a. (4.3 × 10⁸) × (2.0 × 10⁶)
 - **b.** $(6.0 \times 10^3) \times (1.5 \times 10^{-2})$
 - **c.** $(1.5 \times 10^{-2}) \times (8.0 \times 10^{-1})$
 - **d.** $\frac{7.8 \times 10^3}{1.2 \times 10^4}$
 - e. $\frac{8.1 \times 10^{-2}}{9.0 \times 10^2}$
 - **f.** $\frac{6.48 \times 10^5}{(2.4 \times 10^4)(1.8 \times 10^{-2})}$