Name _____

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.

1. **Significant figures.** 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 **do not** have to show work on the one sig fig worksheet.

2. **Scientific Notation**. Read the directions and complete the 2 worksheets. You **do not** have to show work but your answer **MUST** have the same number of sig figs as the original number (the $\times 10^{\text{exponent}}$ is not included in rounding for significant figures).

3. **Dimensional Analysis**. 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 kscott@nazarehtacademyhs.org.

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.

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>always</u>* 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:

a. 809,231

Zero in between **DOES** count

Ans: 6 SF's

b. 0.00456

Leading zeroes do **NOT** count

Ans: 3 SF's

c. 2300

Trailing zeros do **NOT** count

Ans: 2 SF's

d. 130.00

Trailing zeros **DO** count bc of the decimal

Ans: 5 SF's

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 fewest decimal places (i.e. the number that is the least precise)</u>*.

Examples:

a. $420.03 + 299.270 + 99.068 = 818.368 =$ ANSWER 818.37

This number is the least precise (2 decimal places). So the answer MUST BE rounded to 2 decimal places.

b. Least Precise

504.09
246.8
- 119.32
137.97

ANS: 138.0
(1 Decimal place)

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

Examples:

(2 SF's) (3 SF's) (4 SF's) ANSWER

a. $(2400)(3.45)(16.21) = 134{,}218.8 = 130{,}000$

This number only has 2 Sig Figs, so the answer must be rounded to 2 SF's.

Only has 3 SF's, so answer needs rounded to 3 SF's.

b. 0.9935
10.48
X 13.4
139.519192 (Need to round)

ANS: $140.$

OR 1.40×10^2

Decimal point causes the "0" to count as a SF.

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 → Multiply then Add)

This is **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.

This is **NOT** Correct!

$= 1.4 \times 2.639 + 117.25$

$= 3.7 + 117.25 = 120.95 \neq 121.0$

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

Step 2: Addition -

$= 3.6946 + 117.25 = 120.9446 = 120.9$ (Correct Answer)

1 decimal place 2 decimal places

Answer needs to be rounded to 1 decimal place because that is the least precise number in the addition calculation.

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: _____

Date: _____ **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 **0.00000000028** or **1,300,000,000** – 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 **0.00000000028** 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 **2.8×10^{-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 **1.3×10^{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:

6) 2.30×10^{4} _____

7) 1.76×10^{-3} _____

8) 1.901×10^{-7} _____

9) 8.65×10^{-1} _____

10) 9.11×10^{3} _____

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

1) 923 _____

2) 0.00425 _____

3) 4523000 _____

4) 0.94300 _____

5) 6750. _____

6) 92.03 _____

7) 7.80 _____

8) 0.00000032 _____

9) 0.000780 _____

10) 0.00020 _____

Convert the following numbers into standard notation: Use sig figs!

11) 3.92400×10^{5} _____

12) 9.2×10^{6} _____

13) 4.391×10^{-3} _____

14) 6.825×10^{-4} _____

15) 4.6978×10^{4} _____

16) 8.36×10^{1} _____

17) 2.46×10^{-5} _____

18) 8.8×10^{2} _____

19) 2.46×10^{-2} _____

20) 8.8×10^{6} _____

MATH HANDBOOK TRANSPARENCY MASTER 2

Operations with Scientific Notation

Use with Appendix B, Operations with Scientific Notation

Addition and Subtraction

Before numbers in scientific notation can be added or subtracted, the exponents must be equal.

Not equal — Equal

$$(3.4 \times 10^2) + (4.57 \times 10^3) = (0.34 \times 10^3) + (4.57 \times 10^3)$$

The decimal is moved to the left to increase the exponent.

$$= (0.34 + 4.57) \times 10^3$$

$$= 4.91 \times 10^3$$

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.

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

$$= 6.00 \times 10^3$$

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MATH HANDBOOK TRANSPARENCY WORKSHEET 2

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. $(4.3 \times 10^8) \times (2.0 \times 10^6)$

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. $\dfrac{7.8 \times 10^3}{1.2 \times 10^4}$

e. $\dfrac{8.1 \times 10^{-2}}{9.0 \times 10^2}$

f. $\dfrac{6.48 \times 10^5}{(2.4 \times 10^4)(1.8 \times 10^{-2})}$

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