Clearview Regional High School District
2016 Summer Assignment Coversheet

Course:	**Honors Chemistry**
Teacher(s):	**Mr. Navins, Mrs. Huhman, Mrs. Good**
Due Date:	**Completion Check: Monday 9/11/17** **Assessment: After 9/12/17**
Purpose of Assignment:	**To measure and maintain/sharpen skills learned in previous science courses that are relevant to honors chemistry.**
Description of Assignment:	• **Reading on the origin of the metric system/E=mc^2** • **Solving 14 scientific notation problems** • **Accuracy vs. Precision practice** • **28 Dimensional Analysis practice problems**
NJ Student Learning Standards	• **HS-PS1-7 - Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction**
Grading/Use of Assignment: Category/Weight for Q1:	**The packet will be three daily assessment grades:** 1. **Scientific Notation and Accuracy/Precision worksheets** 2. **Factor Label Method for Conversions** 3. **Unit 1 worksheet 6**
Specific Expectations:	**The packet will be checked for completion and reviewed in class. A major assessment will be given after 9/12/17 on this material and additional material after it has been reviewed in class.**
Where to Locate Assignment:	**The summer packet will be picked up by students before leaving for summer break. It will also be located on the Clearview website.**
Teacher Contact Information:	**Mr. Navins:** **Navinsja@clearviewregional.edu** **Mrs. Huhman** **huhmanma@clearviewregional.edu** **Mrs. Good** **goodbr@clearviewregional.edu** **Mr. Antinori, department supervisor:** **antinoriro@clearviewregional.edu** **work: 856-223-2724 cell: 609-457-1156**
Additional Help/ Resource(s)	1. **Enclosed readings** 2. **Email a teacher**

Honors Modeling Chemistry Summer Preparatory Work

Instructions: Each section is designated to review and reinforce science topics and math application that you have learned in the past. You may encounter some problems that you have forgotten or are not quite sure of how to solve. There are a plethora of websites (YouTube) that offer tutorials and explanations for any of these problems. Try to solve all problems and circle any problems that you have difficulty with. We will resolve any misconceptions and difficulties the first full week of class in September.

Section #1: Reading: Origins of the Metric System and Ancestors of $E=mc^2$

Section #2: Scientific Notation-Notes and worksheet

Section #3: Accuracy and Precision- Worksheet

Section #4: Metric Conversion Factors, Factor Label Method, and Dimensional Analysis-Tutorial, reference charts, and worksheets. Show your work for all problems.

Honors Chemistry Summer Packet

To: All Honors Chemistry Students

From: Clearview Chemistry Teachers

Re: Summer Prep Packet

Dear _____,

Homeroom: _____

Welcome to the wonderful world of chemistry! The Clearview Science Team has prepared a summer preparatory packet to reinforce the science that you have previously studied and will prepare you for the topics that you will see in September. We are

encouraged that many students are enrolling and doubling up in additional science classes in their sophomore year, as well as challenging AP courses in math and science, during their junior and senior years. This summer preparatory packet will prepare you for the required summer work in many other AP classes. Please completed this packet to the best of your ability. The packet will be graded for completion on Monday, September 11, 2017, and checked in class for correctness before an assessment will be given on the material. We will have an assessment on the material the week of September 11, 2017. The majority of the summer packet is a reinforcement of your math skills from middle school and freshmen year. We are looking forward to meeting all of you in September!

Thank you!

Jim Navins, Maureen Huhman, and Brittany Good

Please email us if you have any questions and we will reply in a timely manner:

navinsja@clearviewregional.edu, huhmanma@clearviewregional.edu, goodbr@clearviewregional.edu

Please fill out and return the bottom to Mr. Navins in Room 231, Mrs. Huhman in Room 219, or Mrs. Good in Room 229 by 6/15/17.

I, _____, understand that the summer preparatory packet will be graded for completion, by my teacher, and checked for correctness in class. The assessment for this material will be after 9/12/17.

Student name (print): _____

Student signature: _____ Date: _____

Parent signature: _____ Date: _____

Scientific Notation Notes

What is Scientific Notation?	A way to write very large or very small numbers more easily (takes up less space and less likely to make mistakes.) Often used by scientists. Ex: 3.45×10^{9} instead of 3,450,000,000
Definition	A number is in scientific notation when it has a number between 1 and 10 multiplied by 10 to a power. Which of the following are in scientific notation? Explain. 4.89×10^{-8} 56.7×10^{5}

	0.35×10^{3} 7.244×10^{-6} * the circled items are in scientific notation because their numbers are between 1 and 10 (not bigger like 56.7 or smaller like 0.35)
How to put numbers into scientific notation	1. Move the decimal point until you have a number between 1 and 10. 2. Count the number of digits you moved the decimal point over. This number becomes the power of 10. 3. If you moved the decimal point to the right, it is a negative power (you started with a really small decimal.) If you moved the decimal point to the left, it is a positive power (you started with a really large number.) 4. Rewrite the number with the decimal point where you moved it to and multiplied by 10^{n}.
Examples	#1. 37,498, 000,000 3.7498000000.  Correct answer is: 3.7498×10^{10} #2. 0.0000000492 0.00000004.92  Correct Answer is: 4.92×10^{-8}
How to change numbers from scientific notation to standard form	1. Move the decimal point the number of digits indicated by the power on the 10. You may need to add some zeros. 2. If the power is positive, move the decimal point to the right. (this will give you a large number.) If the power is negative, move the decimal point to the left. (This will give you a small decimal number.) 3. Double check that you counted the number of digit spaces to move the decimal point correctly- this is the most common mistake.
Examples	#1. 1.45×10^{4}

	1.4500.  Correct answer is: 14,500 #2. 2.07×10^{-5} 0.00002.07  Correct answer is: 0.0000207

Scientific Notation Practice

Part A: ***Express each of the following in standard form.***

1. 5.2×10^{3}
2. 9.65×10^{-4}
3. 8.5×10^{-2}
5. 3.6×10^{1}
6. 6.452×10^{2}
7. 8.77×10^{-1}

4. 2.71×10^{4}

8. 6.4×10^{-3}

<u>Part B</u>: Express each of the following in scientific notation.

1. 78,000

2. 0.00053

3. 250

4. 2,687

5. 16

6. 0.0043

7. 0.875

8. 0.012654

<u>Part C</u>: Use the exponent function on your calculator (EE or EXP) to compute the following.

1. $(6.02 \times 10^{23})(8.65 \times 10^{4})$

2. $(6.02 \times 10^{23})(9.63 \times 10^{-2})$

3. $\dfrac{5.6 \times 10^{-18}}{8.9 \times 10^{8}}$

4. $(-4.12 \times 10^{-4})(7.33 \times 10^{12})$

5. $\dfrac{1.0 \times 10^{-14}}{4.2 \times 10^{-6}}$

6. $\dfrac{7.85 \times 10^{26}}{6.02 \times 10^{23}}$

7. $(-3.2 \times 10^{-7})(-8.6 \times 10^{-9})$

8. $\dfrac{(5.4 \times 10^{4})(2.2 \times 10^{7})}{4.5 \times 10^{5}}$

9. $\dfrac{(6.02 \times 10^{23})(-1.42 \times 10^{-15})}{6.54 \times 10^{-6}}$

10. $\dfrac{(6.02 \times 10^{23})(-5.11 \times 10^{-27})}{-8.23 \times 10^{5}}$

11. $\dfrac{(3.1 \times 10^{14})(4.4 \times 10^{-12})}{-6.6 \times 10^{-14}}$

12. $\dfrac{(8.2 \times 10^{-3})(-7.9 \times 10^{7})}{7.3 \times 10^{-16}}$

13. $\dfrac{(-1.6 \times 10^{5})(-2.4 \times 10^{15})}{8.9 \times 10^{3}}$

14. $(7.0 \times 10^{28})(-3.2 \times 10^{-20})(-6.4 \times 10^{35})$

Accuracy and Precision

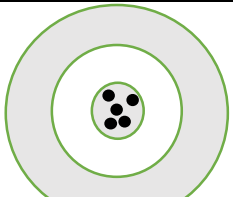
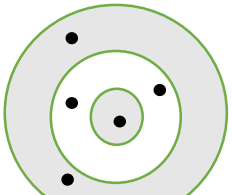
Definitions:

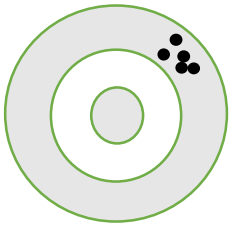
Accuracy – how close a measurement is to _____

Precision- how close a measurement is to _____

Precision versus Accuracy

Look at each target and decide whether the "hits" are accurate, precise, both accurate and precise, or neither accurate nor precise. (Note: an accurate "hit" is a bulls eye!)

		
Accurate? YES/ NO Precise? YES/NO	Accurate? YES/NO Precise? YES/NO	Accurate? YES/NO Precise? YES/NO

Precision Problems:

A group of students worked in separate teams to measure the length of an object. Here are their data:

Team 1	Team 2	Team 3	Team 4	Team 5	Team 6	Team 7
2.65 cm	2.75 cm	2.80 cm	2.77 cm	2.60 cm	2.65 cm	2.68 cm

- The average length is _____ cm
  This is the mean or the average.

- Subtract the highest value from the lowest value: _____ cm
  This is the range or spread.

- Divide this number by 2: _____ cm
  This is the approximate ± range from the average.

- The precision of the measurement can be shown as average ± range.
  The precision of the measurement was _____ ± _____ cm.

A second group of students obtained the following data:

Team 8	Team 9	Team 10	Team 11	Team 12	Team 13	Team 14
2.60 cm	2.70 cm	2.80 cm	2.75 cm	2.65 cm	2.62 cm	2.78 cm

- The average length is _____ cm

- The precision of the measurement was _____ ± _____cm

In comparing groups, the first or the second, which group was more precise or was the precision the same? Justify your answer.

Expressing Errors in Measurement

Scientists often express their uncertainty and error in measurement by giving a percent error. The percent error is defined as:

$$\% \text{ error} = \frac{\text{actual value} - \text{theoretical value}}{\text{actual value}} \times 100$$

Answer the following questions. Show your work!

1. While doing a lab, a student found the density of a piece of pure aluminum to be 2.85 g/cm^3 . The accepted value for the density of aluminum is 2.70 g/cm^3 . What was the student's percent error?

2. A student measured the specific heat of water to be 4.29 $J/g \cdot C^o$. The literature value of the specific heat of water is 4.18 $J/g \cdot C^o$. What was the student's percent error?

3. A student took a calibrated 200.0 gram mass, weighed it on a laboratory balance, and found it read 196.5 g. What was the student's percent error?

Summer Reading

This portion of your summer packet requires you to log on to two different websites, and read the articles thoroughly. Be prepared for class discussion on these articles in September. If you do not have access to the internet, copies of these articles are located in the Guidance office.

1. **The Origin of the Metric System**

   http://www.us-metric.org/origin-of-the-metric-system/

2. **The Ancestors of $E=mc^2$**

   http://www.pbs.org/wgbh/nova/physics/ancestors-einstein.html

Clearview SI Conversion Factors for Test Hand-Out

Meters

Kilometers > Meters > Millimeters

1 kilometer equals 1000 meters or 1 meter equals 0.001 kilometers

1 hectometer equals 100 meters or 1 meter equals 0.01 hectometers

1 dekameter equals 10 meters or 1 meter equals 0.1 dekameter

1 meter equals 10 decimeters or 1 decimeter equals 0.1 meter

1 meter equals 100 centimeters or 1 centimeter equals 0.01 meter

1 meter equals 1000 millimeters or 1 millimeter equals 0.001 meters

Kilograms

Kilogram > Gram > Milligram

1 kilogram equals 1000 grams or 1 gram equals 0.001 kilograms

1 gram equals 1000 milligrams or 1 milligram equals 0.001 gram

Liters

Kiloliters > Liters > Milliliters

1 kiloliter equals 1000 liters or 1 liter equals 0.001 kiloliters

1 liter equals 1000 milliliters or 1 milliliter equals 0.001 liter

Seconds

1 second equals 1000 milliseconds or 1 millisecond equals 0.001 second

1 second equals (1,000,000) microseconds or 1 microsecond equals 0.000001 seconds

1 second equals (1,000,000,000) nanoseconds or 1 nanosecond equals (0.000000001) seconds

Liter Conversions to Volume and Mass

1 mL of H_2O at 4^OC equals 1 cm^3 (cubic centimeter) of H_2O

1000 cm^3 is equal to 1000 mL which is equal to 1 Liter

1 Liter is equal to 1 dm^3 (cubic decimeter)

1 M^3 (cubic meter) is equal to 1000 dm^3 or 1 dm^3 is equal to 0.001 M^3

I cm^3 of H_2O at 4^OC is equal to one gram

Metric Conversions With Factors

"Or King Henry is Dead"

Name	Symbol	Size	Factor	or
nano	n	10^{-9}	$\frac{10^9 \text{ nm}}{1 \text{ m}}$	$\frac{1 \text{ m}}{10^9 \text{ nm}}$
micro	µ	10^{-6}	$\frac{10^6 \text{ µm}}{1\text{m}}$	$\frac{1 \text{ m}}{10^6 \text{ µm}}$
milli	m	10^{-3}	$\frac{10^3 \text{ mm}}{1 \text{ m}}$	$\frac{1 \text{ m}}{10^3 \text{ mm}}$
centi	c	10^{-2}	$\frac{10^2 \text{ cm}}{1 \text{ m}}$	$\frac{1 \text{ m}}{10^2 \text{ cm}}$

kilo	k	10^3	$\frac{1\text{ km}}{10^3\text{ m}}$	$\frac{10^3\text{ m}}{1\text{ km}}$
Mega	M	10^6	$\frac{1\text{ Mm}}{10^6\text{ m}}$	$\frac{10^6\text{ m}}{1\text{ Mm}}$

Start with a number fact, such as 4.1 cm or 0.075 mL. Examine the units of the desired answer. Multiply your fact with the factor $\frac{\textit{what you want}}{\textit{what you have}}$

The starting units cancel out and you end up with the desired units.

$$4.1\text{cm} \times \frac{1\text{ m}}{10^2\text{ cm}} = 4.1\times10^{-2} \text{ or } 0.041\text{ cm}$$

Some conversions require more than one factor; e.g. we do not convert directly from kg to μg. So, the best approach is to convert from kg to g (the base unit) then from g to μg.

$$0.38\text{kg} \times \frac{10^3\text{ g}}{1\text{ kg}} \times \frac{10^6\text{ μg}}{1\text{ g}} = 3.8\times10^8\text{ μg}$$

Remember, even though we write factors with x signs, we multiply by the numerators and divide by the denominators.

Factor Label Method for Conversions

Tutorial

Problem: How many seconds are there in a month?

Step#1: Draw a straight horizontal line on your paper.

Step #2: Start by writing the given on the top left of the line that you just drew.

1 month

Step #3: Next, start your conversions by placing the identical unit below the line. Then draw a vertical line between the units and place the equivalent conversion factor above the horizontal line.

1 month	30 days
	1 month

Step #4: Continue to place identical units below the line and their equivalent conversion factor above the line until you reac the final desired unit.

1 month	30 days	24 hours	60 minutes	60 seconds
	1 month	1 day	1 hour	1 minutes

Step #5: Eliminate like units, simplify numerical values, and multiply all numbers in the numerator together and all numbers in the denominator together.

1 month	30 days	24 hours	60 minutes	60 seconds
	1 month	1 day	1 hour	1 minutes

Step #6: Provide final answer with units. **(2,592,000 seconds)**

Factor Label Conversions

Convert the following given values to the requested value using the factor label method. Show all of your work!

1. 9.5 human years is equal to _____ dog years. (1 human year = 7 dog years)

2. 900 kilometers is equal to _____ yards. (1 kilometer = 0.6 miles, 1 mile = 1760 yards)

3. 22.2 kilograms is equal to _____ lbs. (1 kilogram = 2.2 lbs)

4. 12 moles is equal to _____ liters. (1 mole = 22.4 liters)

5. 3.5 moles is equal to _____ molecules. (1 mole = 6.02×10^{23} molecules)

Chemistry – Unit 1 - Worksheet 6
Dimensional Analysis

Use the factor-label method to make the following conversions.

Part 1

1. 74 cm x _____ = _____ meters

2. 8.32×10^{-2} kg x _____ = _____ grams

3. 55.5 mL x _____ = _____ cm^3

4. 0.00527 cal x _____ = _____ kilocalories

5. 9.52×10^{-4} m x _____ = _____ micrometers

6. 41.0 mL x _____ = _____ liters

7. 6.0×10^{-1} g x _____ = _____ mg

8. 8.34×10^{-9} cg x _____ = _____ g

9. 5.0×10^{3} mm x _____ = _____ m

10. 1 day x _____ x _____ x _____ = _____ seconds

11. 5×10^{4} mm x _____ x _____ = _____ km

12. 9.1×10^{-13} kg x _____ x _____ = _____ ng

13. 1.00 year x _____ x _____ = _____ hours (approximately)

14. 4.22 cL x _____ x _____ = _____ mL

15. 1.0000 mile x _____ x _____ = _____ inches

Part 2

1. How many nickels could you trade for 250 yen? $1 = 150 yen.

2. Your school club sold 600 tickets to a chili supper. The chili recipe for 10 persons requires 2 teaspoons of chili powder? How many teaspoons of chili powder will you need altogether?

3. How many cups of chili powder will you need? Three teaspoons (tsp) equal one tablespoon (TBS) and 16 tablespoons equal 1 cup.

4. How many seconds in a year? (assume 30 days in an average month)

5. Chloroform is a liquid once used for anesthetic. What is the volume of 5.0 g of chloroform. The density of chloroform 1.49 g/mL

6. How many inches long is a football field?

7. How many m^3 is 4.6 cm^3.? Express your answer in scientific notation.

8. How many mg is 59.0 kg? Express your answer in scientific notation.