Honors Physical Science – Summer Assignment – 2018 Tiverton High School

The enclosed packet contains the summer assignment for students entering Tiverton High School's 9th grade honors physical science class.

The assignment is due in the Tiverton High School Office on **Friday, August 17, 2018.** If you submit the assignment late there will be a 20 % deduction in your grade for every day late.

Part 1 - Worksheets

First, the students should read Chapter 1 in the textbook 'Physics – A First Course'.

Next answer the questions for 'The Way Science Works LT 2' and 'Organizing Data LT 3' the students should refer to Chapter 1 and the scientific method.

There are three worksheets on scientific notation to complete, 1) Standard to Scientific (answer question 1 a – e), 2) Scientific to Standard (answer questions 1-5) , 3) Products and Quotients (answer questions 1-7). The worksheets contain an explanation and examples.

There are several math worksheets on data organization, 1) Evaluating Data, 2) Making and Interpreting Tables, 3) Making a Line Graph, and 4) Slope of a Line. You may complete these on the worksheets. If you need more space just use a separate piece of paper.

Neatness and legibility count. If your answers can not be read they will be marked incorrect.

Once you have completed the assignments be sure to write your name on every page and attach them in the original order with a staple. Do not fold over corners.

Part 2 – Essay

Apply the concepts of inertia, motion, and momentum to predict and explain a situation involving forces and motion, including stationary objects and collisions. The goal of the assignment is for you to explore something of personal interest (astronomy, auto racing, dance, roller coaster rides, sports, etc.) and to discover how the fundamental laws of physics are involved.

First, you should read the sections on Newton's Laws of Motion and the Law of Conservation of Momentum in Chapters 2 and 3 from the textbook Next you will select an event or system of personal interest to analyze with respect to how the event or system operates with regards to Newton's Laws of Motion and the Law of Conservation of Momentum. The essay should be at least one complete page but no more than two pages in length. You should begin with a description of the event or system you are analyzing. The rest of the essay should discuss how your event or system illustrates the basic laws of physics according to Newton's Laws of Motion and the Law of Conservation of Momentum.
Since this activity is designed to have you begin your exploration into physics, your choice of topic will determine in part what principles you discuss. Oftentimes, students select one of these basic physics principles to be the foundation of their paper and use others to provide supporting information.

Please use scientific language appropriately in your paper. Words that might apply include, force, acceleration, velocity, mass, action, reaction, inertia, energy, power, work, friction, momentum, and motion.

The paper should be typed, double-spaced, using 12 point font and one inch margins on all sides. A well written essay with appropriate grammar, sentence structure, and spelling is expected.

Plagiarism

All work submitted must be your own. Incorporating other peoples words or ideas into your submissions without proper acknowledgement is dishonest. For your benefit, the Honor Code is as follows: Students are responsible for earning grades honestly and honorably. Failure to meet this responsibility may have extensive academic and disciplinary ramifications.

Definition of Plagiarism

Plagiarism includes the literal repetition without acknowledgement of the writings of another author. All significant phrases, clauses, or passages taken directly from source material must be enclosed in quotation marks and acknowledged.
Plagiarism includes borrowing without acknowledgement another writer's general plan in the creation of one's own plan.
Plagiarism includes borrowing another's ideas and representing them as one's own. To paraphrase the thought of another writer without acknowledgement is to plagiarize.
Plagiarism includes allowing any other person or organization to prepare work which one then submits as his or her own.

Your teacher has given you the following assignment: Investigate the impact on plant growth of adding various amounts of fertilizer to potted plants. Think about what you would need to do to be certain that the fertilizer was having the impact on the plant growth. Then answer the items below.

1. Place a *Y* besides items that would be part of your plan to investigate plant height and fertilizer. Place a *N* besides items that will not help you investigate ***this particular connection.***

   a. _____ Put one plant in a sunny windowsill and one in a dark corner.

   b. _____ Give plants the same amounts of water.

   c. _____ Give different plants different amounts of fertilizer without keeping track of which plant got extra fertilizer.

   d. _____ Use some new plants from seeds and some old plants that have been growing for months.

   e. _____ Start with plants that are the same size.

   f. _____ Keep all plants in a similar location.

   g. _____ Carefully note amounts of fertilizer each plant is given.

   h. _____ Keep one plant fertilized but with no water.

2. Name at least five tools or supplies will you need to perform this experiment.

   _____

   _____

   _____

   _____

   _____

3. What quantities will be measured, and what units will you use to record these measurements?

   _____

   _____

Organizing Data

LT 3

HOLT Science Spectrum

Imagine your teacher asked you to study how providing different amounts of fertilizer affected the heights of plants. You perform a study and collect the data shown in the table below. Use this data to answer the items that follow.

Plant number	Fertilizer (g)	Height (cm)	Plant number	Fertilizer (g)	Height (cm)
1	10	15	5	5	14
2	25	21	6	30	19
3	20	18	7	15	17
4	0	12	8	35	16

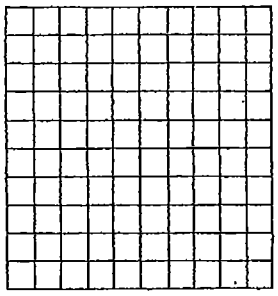
1. Which amount of fertilizer produced the tallest plants?

_____

2. Which amount of fertilizer produced the smallest plants?

_____

3. Plot the data on the grid below.



4. Describe the overall trend as more fertilizer is added to the plants.

_____

_____

_____

Name: _____ Date: _____

Scientific Notation: Standard to Scientific

READ

Do you know what 300,000,000 m/sec is the measure of? **It's the speed of light.**

Do you recognize what 0.000 000 000 753 kilograms is the measure of? **This is the mass of a dust particle.**

Scientists have developed a shorthand method for writing very large numbers. This method is called scientific notation. A number is expressed in scientific notation when it is written as a product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10.

The form for scientific notation is written as $a \times 10^n$, where $1 \leq a < 10$ and n is an integer.

EXAMPLES

Example 1:

Express 28,500,000 in scientific notation.

$28{,}500{,}000 = 2.85 \times 10^7$

The decimal point moved 7 places to the left, so the point is between the 2 and the 8. Since $28{,}500{,}000 > 1$, the exponent is positive. When the decimal point moves left the exponent is positive.

Example 2:

Express 0.0000432 in scientific notation.

$0.0000432 = 4.32 \times 10^{-5}$

The decimal point moved 5 places to the right, so the point is between the 4 and the 3. Since $0.0000432 < 1$, the exponent is negative. When the decimal point moves right the exponent is negative.

Example 3:

Express each of the numbers in scientific notation.

$0.000781 = 0007.81 \times 10^n$ Move the decimal point 4 places to the right.
$0.000781 = 7.81 \times 10^{-4}$

$21{,}845{,}000 = 2.1845 \times 10^n$ Move the decimal point 7 places to the left.
$21{,}845{,}000 = 2.1845 \times 10^7$

Remember if the number you start with is larger than 1 than you will get a positive exponent in your answer.

PRACTICE

1. Convert the number from standard notation to scientific notation:

	Standard Notation	Scientific Notation
a.	0.0453	
b.	18,700,000.0	
c.	0.257000	
d.	999.0	
e.	264,000	
f.	761,000,000	
g.	1,030	
h.	0.00120	
i.	0.03040	
j.	0.000 000 000 000 000 052	
k.	42,000,000,000,000	
l.	7,650,000	
m.	0.000999	

2. Write the numbers in the following sentences in scientific notation:
   a. The national debt in 2000 was about $5,670,000,000,000.
   b. In 2000, the U.S. population was 281,000,000.
   c. Earth's crust contains approximately 120 trillion metric tons of gold (120 trillion = 120,000,000,000,000).
   d. The mass of an electron is 0.000 000 000 000 000 000 000 000 000 000 91 kilograms.
   e. The usual growth rate of human hair is 0.00033 meters per day.
   f. The sun burns about 4,400,000 tons of hydrogen per second.
   g. In 1995 the population of Iran was about 65,100,000.
   h. In the middle layer of the sun's atmosphere, called the chromosphere, the temperature averages 27,800°C.
   i. There are approximately 200,000,000,000 stars in the Androeda Galaxy.
   j. Alex Rodriguez signed a contract with the Texas Rangers in 2000 that guarantees him $25,200,000 a year for 10 seasons.
   k. The Great Pyramid of Giza stands about 137 meters high.
   l. A normal, healthy body temperature for a human being is 98.6°F.

Name: _____ Date: _____

Scientific Notation: Scientific to Standard

In this skill sheet, you will practice converting numbers from scientific notation to standard (decimal) numbers.

EXAMPLES

Example 1:

Express 3.75×10^4 in standard notation.

3.75×10^4	=	$3.75 \times 10{,}000$	A positive exponent means the power of ten is greater than one.
	=	37,500	Move the decimal 4 places to the right. Add zeros as place holders.

Example 2:

Express 1.05×10^{-5} in standard notation.

1.05×10^{-5}	=	$1.05 \times \frac{1}{10^5}$	A negative exponent means the power of ten is less than one.
	=	1.05×0.00001	
	=	0.000 010 5	Move decimal 5 places to the left. Add zeros as place holders.

PRACTICE

Express the number in each statement in standard notation.

1. An electron has a negative charge of 1.6×10^{-19} coulombs.
2. There are approximately 5.58×10^{21} atoms in a gram of silver.
3. Americans make almost 2×10^{10} phone calls each day.
4. The moon's average distance from Earth is 2.39×10^5 miles.
5. The mass of a proton is about 1.67×10^{-27} kilograms.
6. 1.5×10^8 km is the approximate distance from Earth to the sun.
7. 9.29×10^7 miles is the approximate distance from Earth to the Sun.
8. 5×10^{-4} inches is the thickness of a piece of paper.
9. In 1995 the population of the United States was about 2.63×10^8.
10. In 1995 the population of China was about 1.22×10^9.
11. One millimeter equals 1×10^{-3} meters.
12. The speed of sound in air is about 3.4×10^2 m/sec.

Name: _____ Date: _____

Scientific Notation: Products and Quotients

You can use properties of powers to compute numbers written in scientific notation.

EXAMPLES

Example 1:

Evaluate $(5.9 \times 10^3)(3 \times 10^{-5})$. Express the result in scientific and standard notation.

$(5.9 \times 10^3)(3 \times 10^{-5})$	$= (5.9 \times 3)(10^3 \times 10^{-5})$	Associative and communicative properties
	$= 17.7 \times 10^{-2}$	Compute the product of factors and the product of powers.
	$= (1.77 \times 10^1) \times 10^{-2}$	$17.7 = 1.77 \times 10^1$
	$= 1.77 \times (10^1 \times 10^{-2})$	Associative property
	$= 1.77 \times 10^{-1}$	Product of powers

The solution is 1.77×10^{-1} or 0.177.

Example 2:

Evaluate $\dfrac{2.45 \times 10^8}{7.1 \times 10^5}$. Express the results in scientific and standard notation.

$\dfrac{2.4495 \times 10^8}{7.1 \times 10^5}$	$= \left(\dfrac{2.45}{7.1}\right)\left(\dfrac{10^8}{10^5}\right)$	Associative property
	$= 0.345 \times 10^3$	Quotient of powers (not in scientific notation)
	$= (3.45 \times 10^{-1}) \times 10^3$	$0.345 = 3.45 \times 10^{-1}$
	$= 3.45 \times (10^{-1} \times 10^3)$	Associative property
	$= 3.45 \times 10^2$	

The solution is 3.45×10^2 or 345.

PRACTICE

Evaluate. Express each result in scientific and standard notation.

1. $\dfrac{2.5 \times 10^4}{2 \times 10^2}$

2. $\dfrac{7 \times 10^{-12}}{2 \times 10^{-15}}$

3. $(2.4 \times 10^{-2})(3.0 \times 10^2)$

4. $\frac{2.35 \times 10^{-8}}{2.5 \times 10^{-12}}$

5. $(6.60 \times 10^{5})(3.10 \times 10^{2})$

6. $\frac{1.35 \times 10^{8}}{2.5 \times 10^{10}}$

7. $(9.1 \times 10^{5})(3.1 \times 10^{-4})$

8. $\frac{2.2 \times 10^{-12}}{1.1 \times 10^{-14}}$

9. $\frac{6 \times 10^{-4}}{1.5 \times 10^{2}}$

10. $(4.5 \times 10^{-6})(2.25 \times 10^{-2})$

11. $\frac{5 \times 10^{4}}{2.5 \times 10^{-4}}$

12. Human red blood cells carry oxygen from one place to another in your body. A cubic millimeter of human blood contains about 5×10^{6} red blood cells. An adult human body may contain about 5×10^{6} cubic millimeters of blood. About how many red blood cells does an adult human body contain?

13. A space probe that is 6.4×10^{12} meters away from Earth sends signals to NASA. If the radio signals travel at the speed of light (3×10^{8} m/sec) how long will it take the signals to reach NASA?

14. The minimum distance from Earth to the moon is approximately 2.26×10^{5} miles. There are approximately 6.34×10^{4} inches in one mile. What is the minimum distance from Earth to the moon in inches?

15. The population of Arizona is about 4.78×10^{6}. The land area of Arizona is about 1.14×10^{5} square miles. What is the population density per square mile?

16. During the year 2000, 1.65 billion credit cards were in use in the United States. During that same year, $1.54 trillion was charged to these cards. (Hint: 1 trillion = 1×10^{12}).

    a. Express each of these values in standard and then scientific notation.

    b. Find the average amount charged per credit card.