

Summer Assignment

Hello everyone and welcome to Oakcrest High School and Honors Physical Earth Science. There are two assignments that are in the following packet. This needs to get turned in the first day of school. If you have any questions, feel free to email me at bmattern@geh.nj.k12us.com

Dimensional Analysis – Factor Label Problem Solving Unit Conversion

The above title are all used to describe one simple process; the proper treatment of units when converting from one unit to another.

First a brief description of Factors: Factors are numbers

$$\underline{36} = 36/4 = \underline{3 \ 3 \ 2 \ 2} = 3 \ 3 = 9$$

$$4 \qquad \qquad 2 \ 2$$

Reducing each term to its simplest factor enables you to see common factors which cancel out leaving your answer.

Next description of labels: labels are units

$$\underline{\text{cm}^3} = \text{cm}^3/\text{cm}^2 = \underline{\text{cm cm cm}} = \text{cm}$$

$$\text{cm}^2 \qquad \qquad \text{cm cm}$$

$$18\text{cm}^3/4\text{cm} = \underline{2 \ 3 \ 3 \ \text{cm cm cm}} = 9\text{cm}^2/2$$

$$2 \ 2 \ \text{cm}$$

Now apply this concept to the concept of unit conversion, we have to understand that the process enables us to change form without changing value. We will change the unit but maintain the original value.

We do this by establishing a “statement of equality”, SOE, from which we develop a form of the number one, 1, which enables us to change form without changing value; multiplying by one never changes value.

Example: How many dimes are in 2.5 dollars?

Our first step is to relate dimes and dollars in a SOE.

Determine the larger value and insert one of that unit in the SOE. Then, determine how many of the smaller units are in one of the larger unit.

SOE= 1 dollar = 10 dimes not 1 dime = 0.1 dollars

From the SOE, we can establish two forms of the number one:

1 dollar or 10 dimes

10 dimes 1 dollar

Each fraction is called a conversion factor and has a value of one because the numerator equals the denominator. This fraction will enable you to change form without changing value.

Next, to solve the problem, start with the given then insert the proper conversion factor so that the units cancel

$$\frac{2.5 \text{ dollar}}{1 \text{ dollar}} \times \frac{10 \text{ dimes}}{1 \text{ dollar}} = 25 \text{ dimes}$$

You multiply anything on the top and divide by anything on the bottom

We chose the 10 dimes fraction because we need the units to cancel out

1 dollar

Let's see if you can do one

How many quarters are in 25 dollars?

This is also used in the metric system to convert different prefixes into new prefixes. For the metric system, you use the following SOE

$$1\text{kg} = 1000\text{g}$$

$$1\text{cg} = 100\text{g}$$

$$1\text{dag} = 10\text{g}$$

$$1\text{g} = 10\text{dg}$$

$$1\text{g} = 100\text{cg}$$

$$1\text{g} = 1000\text{dg}$$

You notice that the bigger unit also has the 1 in front of it. You can also use the same chart for meters as well as liters.

Convert 16 meters to centimeters

$$1\text{m} = 100\text{cm}$$

$$\begin{array}{r|l} 16\text{m} & 100\text{cm} = 1600\text{cm} \\ \hline & 1\text{m} \end{array}$$

You can also have two step problems

Convert 2kg to cg.

You have two SOE

$$1\text{kg} = 1000\text{g} \text{ and } 1\text{g} = 100\text{cg}$$

$$\underline{2\text{kg} \quad 1000\text{g} \quad 100\text{cg}} = 200000\text{cg}$$

$$1\text{kg} \quad 1\text{g}$$

Notice that all of the units cancel until you get to cg which is what you are looking for

Try these examples on your own

1) 9.75 cg to mg

2) 250g to cg

3) 119 kg to dg

4) 348hg to cg

5) 98dg to dag

6) 321dag to cg

7) 986kg to dag

8) 9654cg to kg

This will be a method that we use throughout the year to do conversions.

The second part of this summer project is to design an experiment to see which brand of paper towels works the best. You will need 4 different brands of paper towels and this will get you used to writing a full lab report. The first part is to design an experiment to figure out which brand of paper towels work the best.

The first part of the full lab report would be the Problem, which for this experiment would be, which brand of paper towels work the best?

The second step is for you to make a hypothesis (an educated guess to solve your problem)

The third step is to list the materials that you are going to use in your experiment.

The next step is to list the steps of your experiment. You need to list everything you did so that another student could read it and get the same results. Make sure you list everything that you did and the order that they were done. Make sure that you are only testing 1 variable (type of paper towel). All other parts of the experiment should stay the same.

Then you list the data that you collected. I would suggest that you should complete three trials so that you can compare your own results.

The last part of the lab report is a conclusion. The conclusion should be broken up into three parts, intro, body, and concluding statement. In the intro give background information on the

experiment. For example, the differences in the paper towels (cost, texture, thickness, and absorbency)

For the body of the conclusion, summarize your results, do not just list the results that are in your data table. Tell which paper towel worked the best and why? Tell which paper towel worked the worst and why? In the section, explaining your results is the most important part. Also include what you learned in the lab.

The concluding statement is a one sentence conclusion that summarizing the results.

For the report, you need a title page that has your name and class period and title of the lab. This also needs to be typed.

Also another key part of the lab report is not to use the first person use the third person. Do not use I, we, and me instead use the student, experimenter, or scientist.

I have included a grading rubric to help you out

If you have any questions on this summer packet, feel free to email me at bmattern@geh.nj.k12us.com. I hope everyone has a great summer and I look forward to meeting you on August 31st.

Mrs. Mattern

Paper Towel Lab Report Grading Rubric

Part	Content	Possible points	Total points
1. Cover Page	Title, name, date, period, picture	2.5	
2. Purpose/Introduction	Objective clearly stated Background information relevant to subject. This should include what paper towels that were used. If there was any differences in the feel and texture of the paper towels. Hypothesis stated (Make an educated guess of which paper towel would work the best.	5	
3. Materials/Safety	All items and quantities listed Please draw a picture of any apparatus used	5	

4. Experimental section	<p>Procedures are listed in clear steps. Each step is numbered and is a complete sentence.</p> <ol style="list-style-type: none"> 1. 2. 3. <p>etc.</p> <p>This should be written in such a way that anyone reading this can reproduce the lab as you have.</p>	5	
5. Data Section	<p>Data is neat and organized into tables</p> <p>Drawings are neat and accurate</p> <p>Graphs provided are neat and accurate</p> <p>YOU DO NOT EXPLAIN THE DATA HERE</p>	10	
6. Analysis	<p>Data from previous section is explained</p> <p>Data is evaluated and compared to expected results</p> <p>All sources of errors are discussed</p> <p>Calculations discussed thoroughly</p>	10	
7. Conclusion	<p>Objective explained & whether it was met or not</p> <p>Refer back to hypothesis</p> <p>Summary of results</p> <p>The “Big picture” of the lab given/explained</p> <p>Discuss what tools or concepts could have been used to improve your experiment.</p>	12.5	
Final Grade		50	

