Chemistry CP

Summer Packet

2022-2023

110 points

DUE ON THE FIRST DAY OF CLASS

In preparation for Chemistry CP, complete the following exercises for the first day of class. The packet will be collected that first day and this assignment will count as a 110-point assignment for the first quarter. Late assignments will lose 15% and after one class period late can only earn half credit.

"On my honor…." _____ (must be signed, loss of five points if NOT signed)

Section 1: Scientific Method

Throughout the year, we will be using the Scientific Method when we participate in lab activities. The following is the correct order of the Scientific Method that we will be following:

Problem – this is what you are trying to solve in the experiment

Hypothesis – this is a testable explanation as to the solution of your problem; written as an "if, then" statement

Independent Variable – this is what you control in an experiment; the "if" part of your hypothesis

Dependent Variable – this is the hopeful result in the experiment; the "then" part of your hypothesis

Materials – a list of the equipment used in the experiment

Procedure – step by step set of directions used to complete the experiment

Data – information gathered in an experiment; can be ***qualitative (****dealing with the senses)* or ***quantitative*** *(dealing with numbers)* data

Conclusion – discussion of the results of the experiment; RERUN METHOD is used here

R- restate the problem (1 sentence)

E- explain hypothesis (1-2 sentences; was your hypothesis correct?)

R – discuss ALL results (depends on how many results and how complex experiment is)

U- uncertainty or errors made in the experiment (1-2 sentences)

N – two new things learned in the experiment (2-3 sentences)

In the space below, think of a problem that would involve the Scientific Method. It could be something like "how to make a peanut butter and jelly sandwich?" or "how do I dress for a day at Holy Cross High School?" Using the Scientific Method and using your problem that you chose, design an experiment using the seven steps of the Scientific Method described above. (20 points)

Problem: _____

Hypothesis: _____

Independent Variable: _____

Dependent Variable: _____

Materials: _____

Procedure: (add more lines if needed)

1. **_____**
2. **_____**
3. **_____**
4. **_____**
5. **_____**

Data:

Conclusion: (use RERUN METHOD)

<u>Section 1 Questions</u>: Answer the following questions using complete sentences. (**15 points)**

1. Why do scientists follow a specific Scientific Method when conducting experiments?

2. When an experiment has a lot of data, how can scientists organize that data? What might they use in order to organize the data?

3. What is the importance of a graph in an experiment?

4. Is it "ok" if your hypothesis proves to be incorrect? Explain your answer.

5. Give three examples of **qualitative** data that could be gathered in an experiment.

6. Give three examples of **quantitative** data that could be gathered in an experiment.

Section 2: Metric System

King	Hector	Died	By	drinking	chocolate	milk
Kilo-	Hecto-	Deca-	Base Unit	deci-	centi-	milli-
K	H	D	g, L, m	d	c	m

The metric system is going to be used the entire year in Chemistry. Most countries in the world follow this system of measurement. This is a relatively easy system to use when doing conversions as this system is based on multiples of ten. Basically, you are moving decimal points to complete the conversions between units. Listed below are a few examples:

Sample Question 1:

15.0 g = _____ Hg

You are starting with 15.0 grams, which is at the base unit column on the table above. The question is asking for you to convert "grams" to "hectograms." Hectograms is TWO spaces to the left of the base units on the table above. All you do is move the decimal point two spaces to the left. Therefore, your answer would be:

15.0 g = .150 Hg (notice the placement of the decimal point)

Sample Question 2:

23.4 Km = _____ mm

You are starting with 23.4 kilometers, which is at the "kilo" column on the table above. The question is asking for you to convert to "kilometers" to "millimeters." Millimeters is SIX spaces to the right of "kilo" on the table above. All you do is move the decimal point six places to the right. You must add "0's" to spaces where there are no numbers present. Therefore, your answer would be:

23.4 Km = 23,400,000. (notice the placement of the decimal point)

Complete the following <u>15</u> conversions using the table above. (15 points)

a) 12.0 L = _____ mL
b) 26.4 HL = _____ cL
c) 2300.0 mm = _____ m
d) 7.9 Kg = _____ Dg
e) .00034 Hm = _____ mm
f) 3.8 dg = _____ Dg
g) 15.3 m = _____ cm
h) 700.cL = _____ KL
i) 123.7 L = _____ HL
j) 67.9 Dm = _____ cm
k) 26.8 KL = _____ DL
l) 39.7 mL = _____ L
m) .0056 Hg = _____ dg
n) 19.0 m = _____ mm
o) 88.6 Dg = _____ cg

<u>Section 2 Questions</u>: Answer the following questions using complete sentences.

1. Most countries in the world use the metric system. Name one country that does NOT use the metric system. (**1 point**)

2. In your opinion, what makes the metric system so easy to use? (**2 points**)

3. What are **<u>three</u>** professions that would use the metric system on a regular basis? (**2 points**)

<u>Section 3 – Scientific Notation</u>

Scientific Notation is a skill we will use the entire year in Chemistry, starting right in the first quarter. Scientific Notation is a way of expressing numbers that are too large or small to be conveniently written in a decimal format. It is ALL about the decimal point and moving it in the right direction.

<u>Sample Question 1</u>: Suppose you have the number 456,000,000,000,000,000**. (notice the decimal point at the end of the number)** This is a very large number, scientific notation is helpful here. Scientific Notation has the following format:

$$4.56 \times 10^{17}$$

The number **<u>4.56</u>** is called the **<u>coefficient</u>**. The coefficient **<u>MUST</u>** be a number between **1 and 10**. In our example above, notice that we moved the decimal point 17 spaces to the left to between the 4 and the 5.

The **<u>10</u>** is called the **<u>base</u>**. This will always be the same for everything we write in Scientific Notation.

The **<u>17</u>** is the **<u>exponent</u>**. This is how many times you move the decimal point. If you move the decimal to the **<u>left</u>** (as we did above), the exponent will be **<u>POSITIVE</u>**. If you came across a situation where the decimal was moved to the **<u>right</u>**, the exponent would be **<u>NEGATIVE</u>**. Sample Question 2 will demonstrate that.

Sample Question 2: Write **.**000000346 in Scientific Notation. Notice the decimal point is located at the very beginning of the number. You must move the decimal point to the right 7 places. This will give a **coefficient** of **3.46**. The **base** is **10** as always, and you moved the decimal **7 places to the right**, so the **exponent** will be a **-7**. Your answer is **3.46 x 10^{-7}**

Convert the following numbers into Scientific Notation. (10 points)

a) 423,000,000,000. = _____
b) .0000257 = _____
c) 602,000,000,000,000,000 = _____
d) .0000000732 = _____
e) 16,000,000 = _____
f) .000643 = _____
g) .00298 = _____
h) 132,000. = _____
i) .0489 = _____
j) 230 = _____

We will also be multiplying and dividing Scientific Notation throughout Chemistry. It involves some of the basic Algebra I skills learned in math classes.

Sample Question 3: Multiply (2.30 x 10^3) x (1.24 x 10^2)

Multiply the coefficients. (2.30 x 1.24) = 2.85

When **multiplying exponents**, we **add** the exponents together. (10^{3+2}) = 10^5

So, your answer is **2.85 x 10^5**.

Sample Question 4: Divide (6.00 x 10^5) / (3.00 x 10^3)

Divide the coefficients. (6.00/3.00) = 2.00

When **dividing exponents**, we **subtract** the exponents. (10^{5-3}) = 10^2

So, your answer is **2.00 x 10^2.**

Complete the following multiplication and division problems using Scientific Notation. Show your work. (20 points)

a) (3.13 x 10^4) x (2.15 x 10^3)
b) (1.68 x 10^3) x (3.57 x 10^5)
c) (5.23 x 10^2) x (1.34 x 10^4)
d) (2.79 x 10^6) x (3.46 x 10^3)
e) (4.12 x 10^3) x (2.11 x 10^3)
f) (8.34 x 10^7) / (4.24 x 10^4)
g) (4.22 x 10^6) / (2.35 x 10^4)
h) (7.24 x 10^5) / (2.03 x 10^2)
i) (8.18 x 10^8) / (5.05 x 10^4)
j) (6.20 x 10^4) / (3.16 x 10^3)

Section 4: Rounding and Significant Figures

Throughout the year, we will be rounding and using significant figures during class and experiments. We will generally round to the nearest tenth, which is three significant figures.

Sample Problem 1: Round 12.345 to three significant figures.

First, look at the number given: 12.345 – all of these numbers are "significant." Starting at the left, the third significant figure is "3." So, we MUST look at the fourth significant figure, which in this case is "4." Ask yourself this question; is "4" less than "5?" Yes! Of course, it is, so the "4" and "5" will go to "0." Our answer is now **12.300**

Sample Problem 2: Round 34,567 to three significant figures.

First, look at the number given: 34,567 – all of these numbers are "significant." Starting at the left, the third significant figure is "5." So, as we did in Sample Problem 1, we must look at the fourth significant figure, which in this case is "6." Ask yourself this question; is "6" greater than "5?" Yes! Of course, it is, so the "5" will round up to a "6." Our answer is now **34,600**

Sample Problem 3: Round .0006789 to three significant figures.

First, look at the number given: .0006789 – the "zeroes" are NOT significant in this case, so the first significant number is "6." So, the third significant figure would be "8." As we did in the two previous sample problems, we look to the fourth significant figure, which in this example is "9." Ask yourself this question; is "9" greater than "5?" Yes! Of course, it is, so the "8" will round to a "9." Our answer is now **.000679**

***The rule is that if zeroes lead off, they are NOT significant*.**

Sample Problem 4: Round 13.056 to three significant figures.

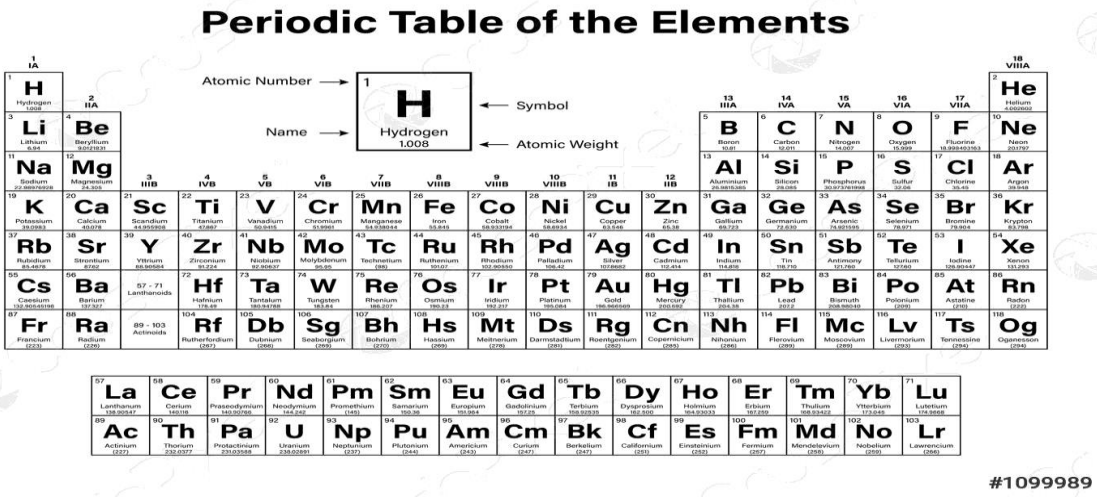
First, look at the number given: 13.056 – the "zero" in this case IS significant and happens to be the third significant figure. We must look to the fourth significant figure, which is the "5." Since it is a "5," we will round the "0" to a "1." Our answer for this problem would be **13.1**

The rule is that if zeroes are in between other significant figures, then the zero IS significant.

Round the following to three significant figures. (15 points)

a) 12,678 = _____
b) 14.265 = _____
c) .0003634 = _____
d) 87,045 = _____
e) .004245 = _____
f) 36.072 = _____
g) .05893 = _____
h) 47.03 = _____
i) 84.25 = _____
j) 39,029 = _____
k) 21.89 = _____
l) 17,045 = _____
m) 4.087 = _____
n) 3,156 = _____
o) .0000007565 = _____

Section 5: The Periodic Table of Elements



The picture above is the Periodic Table of Elements. We will be using this table throughout most of the year. Each of the above elements is given a symbol that is based off Latin. Some of the symbols make sense, for example the symbol for Hydrogen is **H**, but then the symbol for lead is **Pb.** This table provides you with information about each element. If you look at the insert above the table of hydrogen, you can see what information is provided about each element. **Make sure when writing symbols, you follow the capital and lower case of the letters. It makes a difference. For example, Pb is <u>NOT</u> the same as PB.** Using the table, answer the following questions. **(10 points)**

a) What is the atomic number of Cobalt (Co)? _____
b) What is the symbol for Sodium? ____
c) What is the atomic weight (mass) of Sulfur (S)? _____
d) What is the symbol for Barium? ____
e) What is the atomic number of Gold (Au)? ____
f) What is the atomic weight (mass) of Iron (Fe)? _____
g) What is the symbol for Helium? _____
h) What is the atomic number of Iodine (I)? ____
i) What is the atomic weight (mass) of Lithium (Li)? _____
j) What is the symbol for Tin? _____