

## ***Honors Chemistry Summer Assignment***

This assignment is due the first day of school and will be briefly reviewed in class for common errors within the first few days of class. It is expected that you complete this on your own and make the best attempt to answer all questions. This should be completed shortly before school begins to help serve as a review and introduction to the course.

### **I. Data and observations**

1) There are 2 general types of observations that you will observe in science: qualitative data and quantitative data. Write a brief statement discerning between the 2 types:

2) Using the paragraph below, list which type of data is which.

A family plans to take a road trip and packs the car up. They pack up their Toyota Camry and are leaving at nine o'clock in the morning. They drive for four hours and stop in Poughkeepsie, NY after a distance of one hundred and twenty miles. They fill up their tank with regular gasoline, costing them thirty five dollars. While waiting, they notice that the air is thick with the smell of fresh-baked bread from the bakery nearby. As they get back on the road they continue driving east until they notice grey smoke arising from under the hood of the car. They call a tow truck and wait for two hours until it arrives. Their road trip ends at a motel in Hartford, Connecticut as they await repairs for the journey home.

Quantitative observations

Qualitative observations

### **II. Lab Instruments**

Search the following pieces of lab equipment. Pictures of each are on the next page. For each:

- a) Briefly describe their purpose
- b) Describe a chemistry situation where each would be used

1) Beaker:

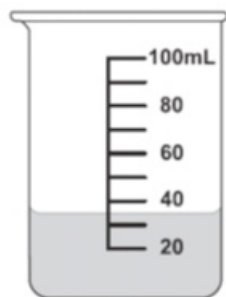
2) Evaporating dish:

3) Graduated cylinder:

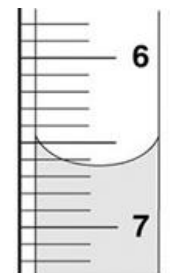


### III. Reading lab instruments using significant figures

When taking measurements, you must record all digits of the measurement that you are certain of, as well as one digit that is estimated. How do you know what digits are certain on a lab device?



- 1) What is the volume of liquid in the beaker to the left?
- a) 34 ml      b) 34.0 ml      c) 35.5 ml      d) 35.00 ml
- 2) What is the volume reading of liquid in the buret to the right?
- a) 6.6 ml      b) 6.60 ml      c) 6.63 ml      d) 6.630 ml



3) For the beaker, what digits are you certain of? Why?

What digit are you estimating? Why?

4) For the buret, what digits are you certain of? Why?

What digit are you estimating? Why?

5) Which device is generally better for reading a volume? Why?

### IV. Taking Laboratory data

Another lab skill that will need to develop is being able to read instructions and generate your own data table from them. Some labs may not have instructions at all. In these cases you will need to think through a procedure, generate a data table, and fill it with your own data.

1) Using the information below, generate a step-wise procedure to gather and analyze the data needed to achieve the objective. In place of any data readings in the table, just put a dash (-). **You do NOT need to use all of the material, or procedure numbers!**

Objective: Determine the density of a penny.

You have the following equipment at your disposal: 10 identical pennies, a beaker, a flask, a graduated cylinder, water, a digital balance, a dropper.

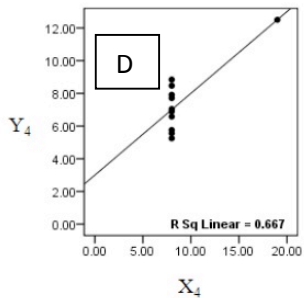
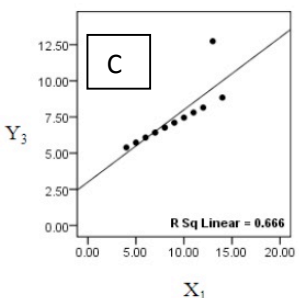
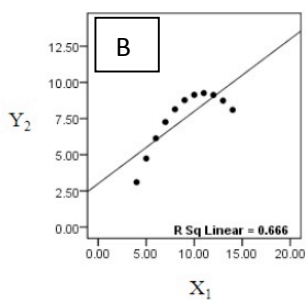
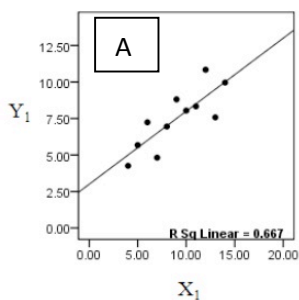
Procedure

- 1.
- 2.
- 3.
- 4.
- 5.

Data table:

**V. Interpreting data**

Graphs play an enormous role in science because they help us find qualitative and quantitative patterns. Generating a proper graph is a skill you have built in previous science classes, and will be reviewed briefly. The focus in chemistry and physics is combining your math and graphing skills to deduce new information. One skill that you need to develop is to recognize the pattern of the data and draw a proper “trend line.”



1) Which of the following graphs shows an appropriate trend line given the point plotted?

- A      B      C      D

What is a trend line?

2) Which graph shows *no relationship* between variables?      A      B      C      D

How does the graph show this?

3) How do you calculate the slope of a line?

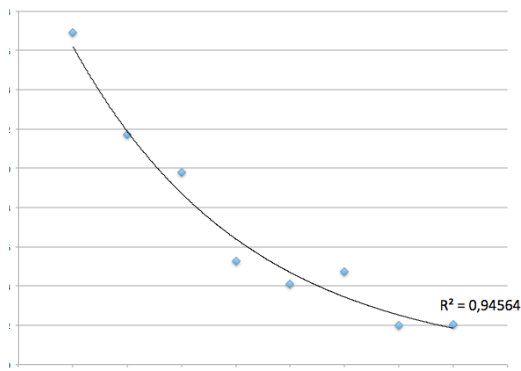
4) Ignore the lines in the above graphs. Mathematically describe the **slope** of the data in each graph above (don't calculate, just use words like “no slope,” “negative slope...”)

A

B

C

D



X-axis	Y-axis A	Y-axis B	Y-axis C	Y-axis D
0	2	100	100	100
1	3	50	80	100
2	4	25	60	100
3	5	13	40	100
4	6	6	20	100
5	7	3	0	100

5) For the graph above:

a) Name the type of relationship shown:

b) Which set of data would most likely generate the shape seen?      A      B      C      D

c) Looking at the *other* data sets, name the type of relationship shown between variables for those:

d) List 3 things wrong with the graph displayed above:

### VI. Mathematics skills *without calculators*

1) Each of the following measurements is written in scientific notation but it is in an incorrect form. Record each measurement in correct scientific notation on the blank provided.

- a.  $13500 \times 10^{18}$  meters      \_\_\_\_\_
- b.  $2700 \times 10^{-15}$  meters      \_\_\_\_\_
- c.  $0.0000437 \times 10^{18}$  meters      \_\_\_\_\_
- d.  $0.000000956 \times 10^{-14}$  meters      \_\_\_\_\_

2) Complete each of the following calculations **WITHOUT** the use of a calculator. Record your final answer on the blank provided. Then use a calculator to check your work and indicate if you were correct or incorrect by placing a ✓ or X in the appropriate space.

- a.  $1 \times 10^{13} \times 1 \times 10^8 =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- b.  $1 \times 10^{15} \times 1 \times 10^{-6} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- c.  $1 \times 10^{-5} \times 1 \times 10^{-7} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- d.  $1 \times 10^8 \div 1 \times 10^{12} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- e.  $1 \times 10^{13} \div 1 \times 10^6 =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- f.  $1 \times 10^5 \div 1 \times 10^{-8} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- g.  $1 \times 10^{-13} \div 1 \times 10^8 =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- h.  $1 \times 10^{-19} \div 1 \times 10^{-6} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_
- i.  $1 \times 10^{-13} \div 1 \times 10^{-18} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_

3) WITHOUT using a calculator, complete each of the following calculations and record the final answer in correct scientific notation on the blank provided. After you have recorded your answer, indicate if you are correct or not.

- a.  $3 \times 10^5 \times 5 \times 10^{-8} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_  
 b.  $6 \times 10^{12} \times 6 \times 10^3 =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_  
 c.  $2 \times 10^{13} \div 8 \times 10^5 =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_  
 d.  $3 \times 10^{-6} \div 9 \times 10^{-8} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_  
 e.  $4 \times 10^{-9} \div 8 \times 10^{-6} =$  \_\_\_\_\_ correct \_\_\_\_\_ incorrect \_\_\_\_\_

WITHOUT a calculator, give the best answer choice for the following calculations.

4)  $4.20\text{g} \div 0.0914\text{ mol} = ???$

- (a) 14.6 g/mol      (b) 46. g/mol      (c) 88 g/mol      (d) 94.1 g/mol      (e) 138 g/mol

5)  $4.6\text{ mol} \div 60.1\text{ mol} = ???$

- (a) 0.0046      (b) 0.076      (c) 0.083      (d) 0.20      (e) 0.72

6)  $(0.020\text{mol} \div 0.50\text{ mol}) \times 100 = ???$

- (a) 0.08%      (b) 0.2%      (c) 1%      (d) 2%      (e) 4%

7)  $\frac{(0.014\text{L})(0.050\text{mol})(5)}{(0.025\text{L})} = ???$

- (a) 0.0010mol      (b) 0.0056mol      (c) 0.028mol      (d) 0.090mol      (e) 0.14 mol

### VII. Introductory Ion list

As we move through the year, you will notice some repeated concepts. One of the topics that we will use the entire year will be ionic compounds, which are based on combining a variety of ions. Below is a short list of ions that you should commit to memory:

$\text{CrO}_4^{2-}$	chromate	$\text{ClO}_4^{-1}$	perchlorate
$\text{Cr}_2\text{O}_7^{2-}$	dichromate	$\text{ClO}_3^{-1}$	chlorate
$\text{NO}_3^{-1}$	nitrate	$\text{ClO}_2^{-}$	chlorite
$\text{NO}_2^{-1}$	nitrite	$\text{ClO}^{-1}$	hypochlorite
$\text{OH}^{-1}$	hydroxide	$\text{NH}_4^{+1}$	ammonium
$\text{C}_2\text{H}_3\text{O}_2^{-1}$	acetate	$\text{MnO}_4^{-1}$	permanganate
$\text{CH}_3\text{COO}^{-1}$	acetate	$\text{CO}_3^{2-}$	carbonate
(two different ways to write the same ion)		$\text{Ag}^{+1}$	silver
$\text{SO}_4^{2-}$	sulfate	$\text{Zn}^{+2}$	zinc
$\text{SO}_3^{2-}$	sulfite		
$\text{PO}_4^{-3}$	phosphate		