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$\qquad$

Unit 1 Chemical Math - Guided Notes
Scientific Method List the steps to the scientific method
1.
2.
3.
4.
5.
6.

## Types of Observations

- Qualitative:
- Quantitative:

Significart Figures

- $\qquad$ is a common type of measurement. The measurement is
$\qquad$ and can be expressed $\qquad$ .
- In science, measurements should only have $\qquad$ degree of uncertainty (or
$\qquad$ estimated digit).
- Significant figures:
- Exactness is also called $\qquad$ -
- 5 Rules for Significant Figures:

1. 
2. 
3. 
4. 
5. 

- "Cheat Sheet"/ Atlantic-Pacific Method:
- Learning Check:

1) Which answers contain 3 significant figures?
a. 0.4760
b. 0.00476
c. 4760
2) All the zeros are significant in
a. 0.00307
b. 25.300
c. $2.050 \times 10^{3}$
3) 534,675 rounded to 3 significant figures is $\qquad$
$\qquad$
4) In which set(s) do both numbers contain the same number of significant figures?
a. 22.0 and 22.00
b. 400.0 and 40
c. 0.000015 and 150,000

State the number of significant figures in each of the following:
5) 0.030 m
6) 4.050 L
7) 0.0008 g
8) 3.00 m
9) $2,080,000$ bees

## Calculations with Sig Figs

- A calculated answer cannot be.....
- Adding and Subtracting:
- Rule:
- Example:
25.2
1.34
$+\quad 1$
- Learning Check: In each calculation, round the answer to the correct number of significant figures.

1) $235.05+19.6+2.1=$
2) $58.925-18.2=$

- Multiplying and Dividing:
- Rule:
- Example: $15.7 \times 0.63=$
- Learning Check:

1) $2.19 \times 4.2=$
2) $4.311 \div 0.07=$
3) $2.54 \times 0.0028=$ 0.105 .060
$\qquad$

## Scientific Notation

- What is Scientific Notation?
- What numbers are best for scientific notation?
- Scientific Notation consists of two parts: $\mathrm{Nx} 10^{\mathrm{x}}$
- When you divide by a number that is in scientific notation, use $\qquad$ .
- Standard Form to Scientific Notation
- Place the decimal point so that there is one non-zero digit to the left of the decimal point.
- Count the number of decimal places the decimal point has "moved" from the original number. This will be the exponent on the 10.
- If the original number was less than 1, then the exponent is negative. If the original number was greater than 1 , then the exponent is positive.
- Examples:
- 289,800,000
- 0.000567
- Scientific Notation to Standard Form
- Simply move the decimal point to the right for positive exponent 10.
- Move the decimal point to the left for negative exponent 10. (Use zeros to fill in places.)
- Examples:
- $\quad 5.093 \times 10^{6}$
- $1.976 \times 10^{-4}$
- Learning Check: Express these numbers in Scientific Notation:

1) 405789
2) 0.003872
3) 3000000000
4) 2
5) 0.478260
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Measurements
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- In every measurement there is a $\qquad$ followed by a $\qquad$ from a measuring device
- The number should also be as $\qquad$ as the measurement.
- Use the SI units- based on the metric system
- Length
- Mass
- Volume
- Time
- Temperature
$\qquad$ Period: $\qquad$
- Which tool(s) would you use to measure:
- Temperature
- Volume
- Time
- weight
- Learning Check: Indicate what is being measured: Length, Mass, or Volume

1) A bag of tomatoes is 4.6 kg . $\qquad$
2) A person is 2.0 m tall. $\qquad$
3) A medication contains 0.50 g Aspirin.
4) A bottle contains 1.5 L of water. $\qquad$

- What are some U.S. units that are used to measure each of the following?
- length
- volume
- weight
- temperature
- Can you hit the bull's eye?

Thres fargers with three arpoys esch to shoot.


Both
accurate and precise

Precise but not accurate


Neither accurate nor precise

- Can you define accuracy and precision?
- Accuracy:
- Precision:
- Reading a Meter stick:

- Answer: $\qquad$
- In you answer, underline the certain digits and circle the uncertain digit
- Learning Check: What is the length of the line?

1. 


$\qquad$
$\qquad$

- How does your answer compare with your neighbor's answer? Explain any differences.

2. 

. ${ }^{3}$.....I..... $l^{4}$.....I..... $l^{5}$. . cm

How much water is in the graduated cylinders?


## Metrics

- Learning check: Select the unit you would use to measure the following:

1. Your height: a) millimeters
b) meters
c) kilometers
2. Your mass: a) milligrams
b) grams
c) kilograms
3. The distance between two cities: a) millimeters
b) meters
c) kilometers
4. The width of an artery:
a) millimeters
b) meters
c) kilometers

- Metric Prefixes: You MUST know these

|  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

- Metric Conversions: Convert 3.400 kiloliters to Decaliters
- To convert using metrics:

1. Determine which prefix you are starting with
2. Determine which prefix you are converting to
3. Count how many spaces you move when you go from step 1 to step 2
4. Move the decimal over that many spaces in the same direction

- Learning Check:

1) $1000 \mathrm{~m}=$ $\qquad$ mm
2) $0.001 \mathrm{~g}=$ $\qquad$ kg
3) $0.1 \mathrm{~L}=$ cL
4) $0.01 \mathrm{~m}=\quad \mathrm{dm}$
$\qquad$
5) ? kilometer (km) = 500 meters (m)
6) 2.5 meter $(\mathrm{m})=$ ? centimeters ( cm )
7) 1 centimeter $(\mathrm{cm})=$ ? millimeter $(\mathrm{mm})$
8) 1 nanometer $(\mathrm{nm})=1.0 \times 10^{-9}$ meter

Dimensional Analysis

- What is a conversion factor?
- Example: what is the conversion factor involving inches and centimeters?
- Learning Check: Write conversion factors that relate each of the following pairs of units:

1) Liters and mL
2) Hours and minutes
3) Meters and kilometers

- Example: How many minutes are in 2.5 hours?
- What conversion factor are you going to use?
- What units go in the numerator and denominator and why?
- Steps to Problem Solving:

1. Write down the given amount. Don't forget the units!
2. Multiply by a fraction.
3. Use the fraction as a conversion factor. Determine if the top or the bottom should be the same unit as the given so that it will cancel.
4. Put a unit on the opposite side that will be the new unit. If you don't know a conversion between those units directly, use one that you do know that is a step toward the one you want at the end.
5. Insert the numbers on the conversion so that the top and the bottom amounts are EQUAL, but in different units.
6. Multiply and divide the units (Cancel).
7. If the units are not the ones you want for your answer, make more conversions until you reach that point.
8. Multiply and divide the numbers. Don't forget "Please Excuse My Dear Aunt Sally"! (Order of operations)

- Examples:

1. You have $\$ 7.25$ in your pocket in quarters. How many quarters do you have?
2. If Jacob stands on Spencer's shoulders, they are two and a half yards high. How many feet is that?
$\qquad$
$\qquad$
3. A rattlesnake is 2.44 yards long. How long is the snake in meters? (note: 1 yard $=0.9144$ meters)
4. How many seconds are in 1.4 days?
5. What is wrong with the following setup?
1.4 day $\times \frac{1 \text { day }}{24 \mathrm{hr}} \times \frac{60 \mathrm{~min}}{1 \mathrm{hr}} \times \frac{60 \mathrm{sec}}{1 \mathrm{~min}}$

- English and Metric Conversions:
- If you know ONE conversion for each type of measurement, you can convert anything!
- You must use these conversions:
- Mass: $\qquad$ grams = $\qquad$ pound
- Length: $\qquad$ m = $\qquad$ inch
- Volume: $\qquad$ $L=$ $\qquad$ quart

6. An adult human has 4.65 L of blood. How many gallons of blood is that?

## Temperature

- What are the three temperature scales?
- Which unit of temperature are we going to use most often in this class?

