Unit 1: MEASUREMENT

Practice Packet

VOCABULARY

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don't use the words given in your definition!

Claim: _____

Evidence: _____

Reasoning: _____

Significant Figures: _____

Density: _____

absolute zero: _____

accuracy: _____

Celsius: _____

gram: _____

kelvin: _____

liter: _____

mass: _____

matter: _____

meniscus: _____

meter: _____

percent error: _____

precision: _____

scientific notation: _____

volume: _____

water displacement: _____

Intro: What is Chemistry?

Do Now: In a complete sentence, answer the following question: What Does a Chemist Do?

_____

_____

_____

Check your Understanding:

After reading the passage below, re-read your answers to the do now question.
Edit your writing to reflect the additional understanding of what a chemist does based on the reading. Write one paragraph summary on a sheet of paper to be collected describing what a chemist does. Support your writing with examples from the reading. In addition, give your definition for the underlined terms. Use clues from the reading to help you.

What are some of the things that chemists do?

Like most scientists, they observe and measure components of the natural world. Based on these observations they try to place things into useful, appropriate categories and to formulate scientific laws which summarize the results of a great many observations. Indeed, it is a fundamental belief of all science that natural events do not occur in a completely unpredictable fashion. Instead, they obey natural laws. Therefore observations and **measurements** made on one occasion can be duplicated by the same or another person on another occasion. Communication of such results, another important activity, affords an opportunity for the entire scientific community to test an individual's work. Eventually a consensus is reached, and there is agreement on a new law.

Like other scientists, chemists try to explain their observations and laws by means of theories or models. They constantly make use of **atoms, molecules,** and other very small particles. Using such theories as their guides, chemists synthesize new materials. Well over 3 million **compounds** are now known, and more than 9000 are in large-scale commercial production. Even a backpacker going "back to nature" takes along synthetic materials such as nylon, aluminum, and aspirin.

Chemists also analyze the **substances** they make and those found in nature. Determining the **composition** of a substance is the first step in understanding its chemical properties, and detection of very small quantities of some materials in the natural world is essential in controlling air and water pollution. Another role that chemists play is in studying the processes (**chemical reactions**) by which one substance can be transformed into another. Will the reactions occur without prodding? If so, how quickly? Is **energy** given off? Can the reactions be controlled - made to occur only when we want them to? Many persons in other sciences as well as in daily life are constantly doing chemistry, whether they call it by name or not. Indeed, each of us is an intricate combination of chemicals, and everything we do depends on chemical reactions. In studying chemistry you will be able to learn how to apply chemical facts and principles to the problems you will face in the future. Many of the problems are probably not even known yet, and scientists could not possibly anticipate them. If you have learned how to think "chemically" or "scientifically," however, you will be better prepared to face them.

Pure vs. Applied Chemistry

Do Now: Read the following article, underline or highlight information that you believe is important in the passage. In a complete sentence answer the following question: How are pure and applied chemistry related?

Some chemists enjoy doing research on fundamental aspects of chemistry. This type of research is sometimes called pure chemistry. Pure chemistry is the pursuit of chemical knowledge. The chemist does not expect that there will be any practical use for the knowledge. Most chemists do research that is designed to answer a specific question. Applied chemistry is research that is directed toward a practical use for the knowledge. In practice, pure chemistry and applied chemistry are often linked. Pure research can lead directly to an application, but an application can exist before research is done to explain how it works. Nylon and aspirin provide examples of these two approaches.

Nylon
For years, chemists didn't fully understand the structure of materials such as cotton and silk. Hermann Staudinger, a German chemist, proposed that these materials contained small units joined together like links in a chain. In the early 1930's, Wallace Carothers did experiments to test Staudinger's proposal. During his research, Carothers produced some materials that don't exist in nature. One of these materials, nylon can be drawn into long, thin silk like fibers. Because the supply of natural silk was limited, a team of scientists and engineers were eager to apply Carother's research to the commercial production of nylon.

Aspirin
Long before researchers determined how aspirin worked, people used it to relieve pain. By 1950, some doctors began to recommend a low daily dose for patients at risk for a heart attack. Many heart attacks occur when blood clots block the flow of human blood through arteries in the heart. Some researchers suspected that aspirin could keep the blood clots from forming. In 1971, it was discovered that aspirin can block production of a group of chemicals that cause pain. These same chemicals are also involved in the formation of blood clots.

Technology
The development of nylon and the use of aspirin to prevent heart attacks belong to a system of applied science called technology. Technology is the means by which a society provides its members with those things that are needed or desired.

How are pure and applied chemistry related?

Intro: Safety in the Lab

Do Now: Read through safety rules with your teacher. Each question is either **true or false**. Indicate your answer in the margin by marking a T for true or an F for false.

_____ 1) You should always make sure your teacher is present whenever you are working in the laboratory.

_____ 2) You should notify your teacher immediately in the event of injury to yourself or others.

_____ 3) Safety goggles must be worn at all times while working in the laboratory, even when cleaning up after an experiment.

_____ 4) A thorough reading of the experimental procedure before class is important to safety.

_____ 5) An apple may be eaten during an experiment.

_____ 6) The teacher should be notified of all chemical spills, unless they are very minor.

_____ 7) The only safety concern when working with electrical equipment is that it be dry.

_____ 8) If glassware is chipped, but the chip is smooth and not jagged, it may be used in the laboratory.

_____ 9) Burners and heaters should be turned off when not in use, unless they are going to be used in a minute or two.

_____ 10) Only glassware that is meant to be heated should be used for heating.

_____ 11) When a test tube is being heated, its mouth should be pointed away from everyone.

_____ 12) Any heated equipment and materials should be allowed to stand and cool before being touched.

_____ 13) Odors are best detected by placing your nose directly over the opening of the container.

_____ 14) Hair is combustible, and long hair should be tied back whenever work involves the use of burners or flames.

_____ 15) If you do not know what two substances are, it is okay to mix them.

_____ 16) You should watch an open flame and not walk away from it.

_____ 17) You should never taste anything unless instructed to do so by your teacher.

_____ 18) Ties, jackets, and loose sleeves are good examples of proper laboratory clothing.

_____ 19) Purses, books, etc. should be kept on the floor near your lab station.

_____ 20) Spills should be reported to the teacher and cleaned up right away.

_____ 21) Broken glass should be thrown away in the regular trash can.

_____ 22) Safety equipment, such as safety goggles and aprons, is worn to protect you and your clothing from spills.

_____ 23) When heating something in a test tube you should point the tube at your partner.

_____ 24) Long hair should be tied back during an experiment.

_____ 25) It does not matter what the instructions say, you can perform an experiment any way you want to.

_____ 26) When lighting a burner, you should turn on the gas and then light the match.

_____ 27) Glassware can be handled as soon as you take it away from the flame.

_____ 28) Everyone should know the locations of all the safety equipment.

_____ 29) If you took too much of a chemical, you should not put the extra back into the stock bottle.

Lesson 1: Scientific Argumentation

Objective:
Differentiate between a claim, evidence, and reasoning
Construct a scientific argument

Scientific Argumentation:

1. Why do scientists make arguments?

2. What are the 3 parts of a Scientific Argument?

3. What is a claim?

4. What is evidence?

5. What is reasoning?

6. Reasoning links the _____ (data) to the _____.

7. *Is the data appropriate and sufficient to support*

8. *The claim that Mr. Cabasino is a good basketball player? Complete the chart below.*

Evidence	Appropriate	Not Appropriate
He likes basketball		
He plays basketball every weekend		
He is tall		

8. Do you think this is sufficient evidence to support the claim? Explain.

Constructing a Scientific Argument

You perform an investigation to determine if ice floats in rubbing alcohol. First you make a prediction (what you think will happen based on prior knowledge/experiences).

I predict that ice will ***sink/float*** in alcohol.

Now determine how you will conduct your experiment. Once your group has decided how you will proceed you can start your investigation and collect your evidence. Record your data below.

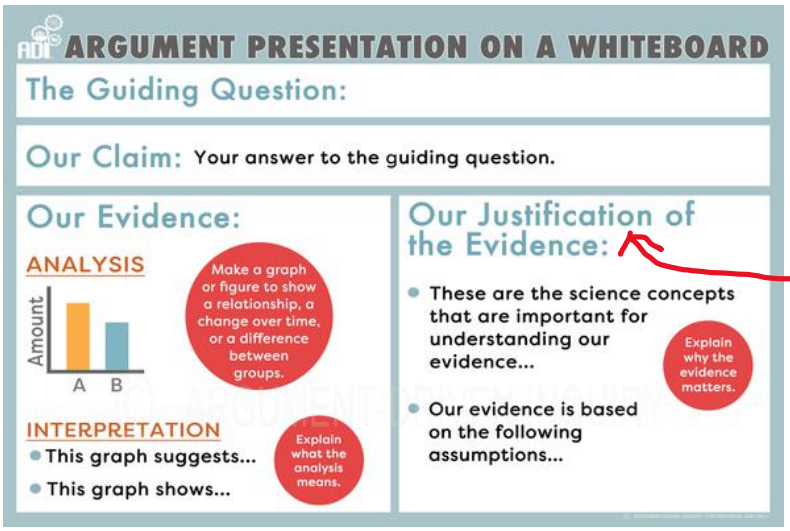
Evidence:

Now that you have your evidence, make a claim regarding the initial question "*does ice float or sink in rubbing alcohol?*"

Claim:

Lastly, provide scientific reasoning as to why the ice floats or sinks in the alcohol. Just like a DBQ in social studies, this is where you justify why the claim is supported by the evidence using accepted scientific principles.

Reasoning:



Lesson 2: Metric Conversions

Objective:

- ***Define chemistry, matter and differentiate how matter can be described.***
- ***Convert between units of measurement***

1. Complete the following number line by adding the prefixes that pertain to the marked values:

2. If a substance weighs 2.00 grams and you need the mass in kilograms, will the number appear to become smaller or larger? Explain your answer.

3. If a liquid has a volume of 5800 mL and you need the mass in Liters, will the number appear to become smaller or larger? Explain your answer.

Metric System

In chemistry we measure matter using SI units. This is an abbreviation for System International.

SI BASE UNITS (AKA Base Units):

**If you forget, use Tables C and D in your Reference Tables!

Table C
Selected Prefixes

Factor	Prefix	Symbol
10^{3}	kilo-	k
10^{-1}	deci-	d
10^{-2}	centi-	c
10^{-3}	milli-	m
10^{-6}	micro-	μ
10^{-9}	nano-	n
10^{-12}	pico-	p

Table D
Selected Units

Symbol	Name	Quantity
m	meter	length
g	gram	mass
Pa	pascal	pressure
K	kelvin	temperature
mol	mole	amount of substance
J	joule	energy, work, quantity of heat
s	second	time
L	liter	volume
ppm	part per million	concentration
M	molarity	solution concentration

*Example: In the word kilometer, the root word (base unit) is "meter" and the prefix is "kilo." Kilo means multiply the root word by 1000. Therefore, one kilometer is 1000 meters (1 km = 1000 m).

Conversion Factors – a mathematical expression that relates two units that measure the same type of quantity.

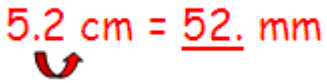
Examples: 1 min = 60 sec 1000 g = 1 kg 1 L = 1000 mL

Using TABLE C in your reference table you can do simple metric conversions without having to memorize anything.

1. Locate the prefix assigned to the measurement unit that you are starting with and then find the prefix that you want to convert to.
2. Count the number difference between the factors and then move your decimal that many places

Example:

- The factor for centi is -2 and the factor for milli is -3.
- The difference between the two factors is 1.
- Since you are moving down the chart you move the decimal one place to the right.



Metric Practice

Complete all of the following conversions. **Please *show all work* and report the answer with the *proper units*.**

1. How many milliliters are there in 21.59 L?

2. Convert 1.62 m into centimeters.

3. Convert 15 g to kilograms.

4. How many kilograms are in 2648 grams?

5. Convert 253 mL to liters.

6. Convert a measurement of 100 cm to its equivalent in m.

7. Convert a measurement of 0.001 m to its equivalent in mm.

8. Convert a measurement of 10. L to its equivalent in mL.

9. Convert a measurement of 1000 g to its equivalent in kg.

10. Convert a measurement of 50 cm to its equivalent in m.

11. Convert 24 mg to g.

12. Convert a measurement of 36 mL to its equivalent in L.

13. Convert a measurement of 0.00883 km to its equivalent in m.

14. Convert a measurement of 350.0 g to its equivalent in kg.

15. How many mL are in 0.0895 L?

16. Convert 1258 cm to meters.

17. Convert 2500 mL to liters.

18. Convert 0.0290m to millimeters.

More Metric Practice

Write the "King Henry" shortcut below:

Convert the following: Show your work!!

900 km = _____ m

568 mm = _____ m

200 kg = _____ g

52 mg = _____ g

5.00 m = _____ km

0.025 J = _____ mJ

7000 J = _____ kJ

0.859 s = _____ ms

800 cm = _____ m

0.0256 m = _____ um

20 cg = _____ g

0.000589 g = _____ ng

2.0L = _____ cL

5. How many Celsius degrees separate the freezing and boiling points of water? _____

   What are these two temperatures? _____ & _____

6. What is the lowest possible temperature in °C? _____

7. How many Kelvin separate the freezing and boiling points of water? _____

   What are these two temperatures? _____ & _____

8. What is the lowest possible temperature in Kelvin? _____

9. Convert the following temperatures:

	383 K
80 °C	
	323 K
10 °C	
-10°C	
	243 K

10. Using Table S in your reference table what temperature does Sulfur *melt* at?

11. What temperature does Sulfur freeze at?

REGENTS PRACTICE

1. Which quantity of heat is equal to 400. joules?
   a. 40.0 kJ
   b. 4.00 kJ
   c. 0.400 kJ
   d. 0.0400 kJ

2. Which Kelvin temperature is equivalent to −24°C?
   a. 226 K
   b. 249 K
   c. 273 K
   d. 297 K

3. Which Celsius temperature is equivalent to 150K?
   a. -123 °C
   b. 423 °C
   c. -50 °C
   d. 50 °C

4. What volume is equal to 500 mL?
   a. 0.500 L
   b. 50.0 L
   c. 500,000 L
   d. 5

ASSESS YOURSELF ON THIS LESSON:

If you missed any regents practice questions you should see me for extra help and/or re-watch the lesson video assignment

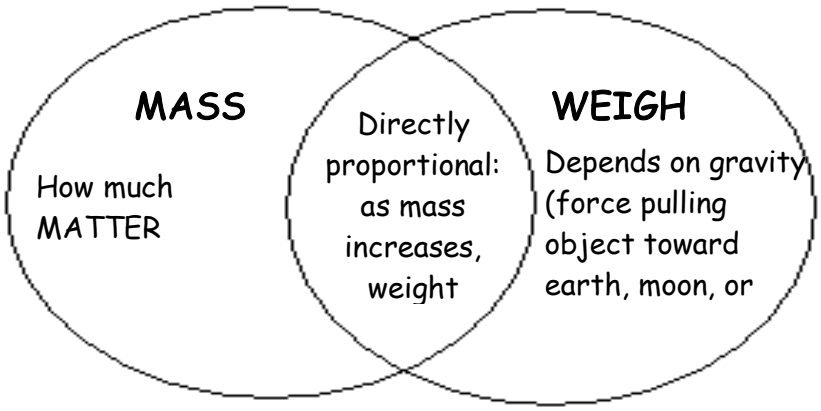
Lesson 4: Density

Objective:

- ***Determine the volume of a substance***
- ***Calculate Density/Mass/Volume***

Measuring Matter

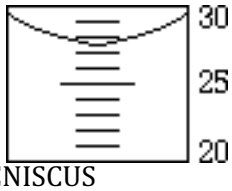
1. **Mass vs. Weight**



*We really only work with MASS in chemistry class!
** We have the same MASS whether we are on earth or on the moon. The different forces of gravity on each cause us to weigh more on earth than on the moon though (this is why we float on the moon!)

2. **Volume** - amount of SPACE an object takes up
   - Techniques:

     Liquids → use graduated cylinder



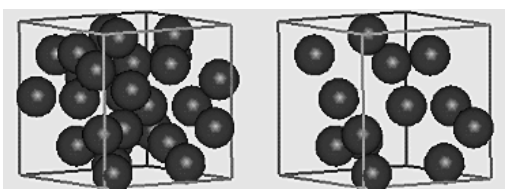
Measurements are read from the bottom of the MENISCUS

Regular Solids → measure dimensions and use l x w x h formula
***you need to MEMORIZE:

1 cubic cm (1cm x 1cm x 1cm) = 1 cm^3 = 1 milliLiter (mL)

Irregular Solids → Displacement method
Intial volume-final volume

3. **Density**: amount of mass in a given volume (space); ratio of mass to volume
   Formula (Table T): D = m/V



BOX A BOX B

Which box has a higher density? Explain your answer.

Density Practice

1. What is the difference between mass and weight?

2. Calculate the density of a cube that is 5 cm by 2 cm and is 2 cm tall. The mass of the cube is 10 grams. SHOW ALL WORK!!

3. When reading any volume in the laboratory, we always read where the bottom of the water curve falls. This is called the _____.

4. What is the density of an object with a mass of 60 g and a volume of 2 cm^3?

5. If you have a gold brick that is 2 cm x 3 cm x 4 cm and has a mass of 48 g, what is its density?

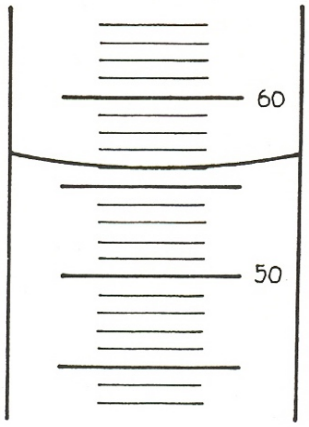
6. If a block of wood has a density of 0.6 g/ cm^3 and a mass of 120 g, what is its volume?

7. Look up the density of the element sodium on Table S. If I gave you a slice of sodium metal that had dimensions of 3.0 cm by 2.0 cm by 0.25 cm, then what would its mass be?

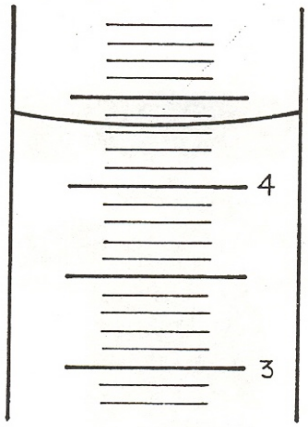
MEASURING LIQUID VOLUME

Name _____

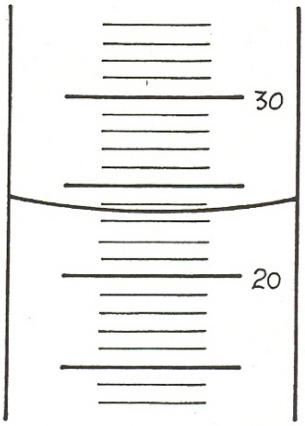
What volume is indicated on each of the graduated cylinders below? The unit of volume is mL.



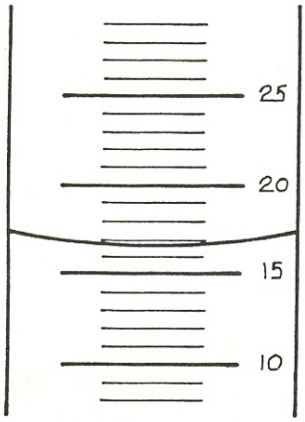
a) _____



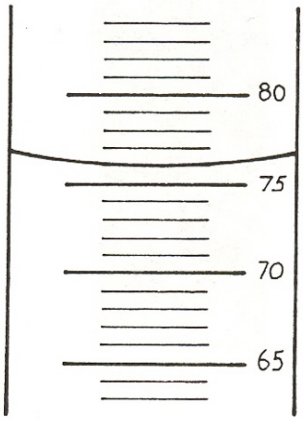
b) _____



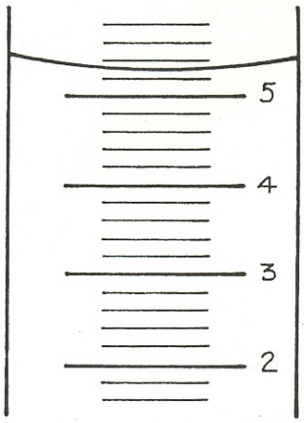
c) _____



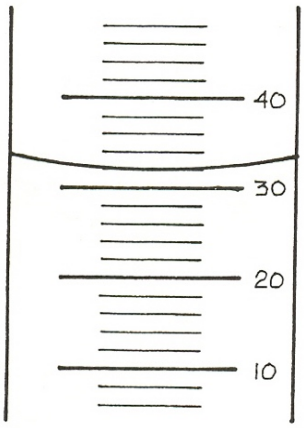
d) _____



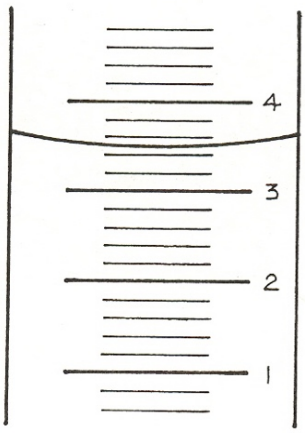
e) _____



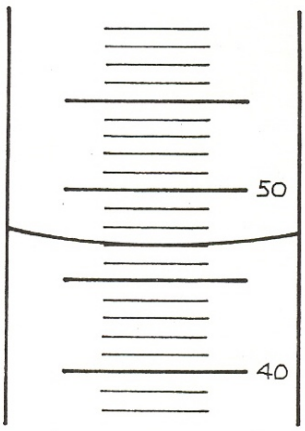
f) _____



g) _____



h) _____



i) _____

More Density Practice

For each problem below, write the equation and show your work. Always use units and box in your final answer.

1. Generally, what phase of matter (solid, liquid or gas) has the lowest density? Highest?

2. Bubbles in soda rise to the surface. Explain this in terms of density.

3. The density of silver (Ag) is 10.5 g/cm^3. Find the mass of Ag that occupies 965 cm^3 of space.

4. A 2.75 kg sample of a substance occupies a volume of 250.0 cm^3. Find its density in g/cm^3.

5. Under certain conditions, oxygen gas (O_2) has a density of 0.00134 g/mL. Find the volume occupied by 250.0 g of O_2 under the same conditions.

6. Find the volume that 35.2 g of carbon tetrachloride (CCl_4) will occupy if it has a density of 1.60 g/mL.

7. The density of ethanol is 0.789 g/mL at 20°C. Find the mass of a sample of ethanol that has a volume of 150.0 mL at this temperature.

8. A rectangular block of lead (Pb) measures 20.0 mm X 30.0 mm X 45.0 mm. If the density of Pb is 11.34 g/cm^3, calculate the mass of the block.

9. An irregularly-shaped sample of aluminum (Al) is put on a balance and found to have a mass of 43.6 g. The student decides to use the water-displacement method to find the volume. The initial volume reading is 25.5 mL and, after the Al sample is added, the water level has risen to 41.7 mL. Find the density of the Al sample in g/cm^3. (Remember: 1 mL = 1 cm^3.)

REGENTS PRACTICE

1. A cube of gold (Au) has a side length of 1.55 cm. If the sample is found to have a mass of 71.9 g, find the density of Au.

2. The mass of a solid is 3.60 grams and its volume is 1.8 cubic centimeters. What is the density of the solid, expressed to the correct number of significant figures?

   a. 5 g/cm^3
   b. 2.0 g/cm^3
   c. 0.5 g/cm^3
   d. 0.05 g/cm^3

3. In the solid phase, arsenic occurs in two forms. One form, yellow arsenic, has a density of 1.97 g/cm^3 at STP. The other form, gray arsenic, has a density of 5.78 g/cm^3 at STP. In the 2 boxes below, model what each would look like on the molecular level. Be sure to label which box represents which form of arsenic.

Lesson 5: Accuracy, Precision, % Error & Significant Figures in Measurement

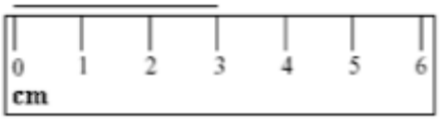
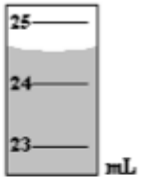
Objective:

- ***Determine the accuracy of a measurement***
- ***Identify the precision of a measuring device.***
- ***Identify the amount of significant figures in a number***

1. The following pictures represent dartboards. ***Label each as accurate, precise, both, or neither.***

2. Working in the laboratory, a student finds the density of a piece of pure aluminum to be 2.85 g/cm^3. The accepted value for the density of aluminum is 2.699 g/cm^3. Determine the percent error.

3. Determine the measurement and the precision for each example.

Example	Measurement	Precision (what place value did you estimate to?)
		
		
		

Sig Fig Practice

Determine the number of sig figs:

4. 1.0 cm _____
5. 3.05 mm _____
6. 0.505 pm _____
7. 500 mL _____
8. 4.050 g _____
9. 2.500 kg _____
10. 0.0008 µg _____
11. 0.12 g _____
12. 0.000084 g _____
13. 9.9 g _____
14. 1000mL _____
15. 4,100,000 mm _____
16. 3.020g _____
17. $6.02 \times 10_{23}$ m _____
18. 0.0000098kg _____
19. 23.5 C _____
20. 9,001,000 µm _____
21. 12.560 g _____
22. 0.02300 kJ _____

Round each number to 3 sig figs

23. 98.473 L _____
24. 0.00076321 g _____
25. 57.048 m _____
26. 12.17 C _____

REGENTS PRACTICE

1. Which mass measurement contains four significant figures?

   a. 0.086 g
   b. 0.431 g
   c. 1003 g
   d. 3870 g

2. Which measurement contains three significant figures?

   a. 0.08 cm
   b. 0.080 cm
   c. 800 cm
   d. 8.08 cm

3. Which measurement has the greatest number of significant figures?

   a. 6.060 mg
   b. 60.6 mg
   c. 606 mg
   d. 60600 mg

4. Which measurement contains the least number of significant figures?

   a. 0.4500
   b. 45.00
   c. 4500
   d. 4.500

ASSESS YOURSELF ON THIS LESSON:

If you missed any regents practice questions you should see me for extra help and/or re-watch the lesson video assignment

Lesson 6: Rounding with Sig Figs

Objective:

- ***Round answers to proper sig figs in calculations***

If a piece of glassware is very precise it may have a lot of sig figs, as many as 4. A less accurate piece of glassware such as a beaker will only have 1 sig fig. If both pieces of glassware are used to measure quantities in a lab we have to round our results to the least precise measurement. When working with measurements the quantity with the least decimal places is the least precise. For example, if the beaker measures 10mL and a cylinder measures 10.1mL the cylinder is more precise. If the two quantities are added together the new volume is 20mL. The decimal must be rounded to make our answer to one sig fig. Therefore the rule is:

Addition/Subtraction Rule:

- **When adding or subtracting measurements, round your answer to the lowest number of decimal places given.**

Complete the following operations and report to the correct number of significant figures.

1. 10.2 + 21 _____
2. 31.3 + 54.45 _____
3. 22.59 + 21 _____
4. 1.023 + 20.1 _____
5. 0.023 - 0.0004 _____
6. 5.068 - 0.1 _____
7. 45.6 - 22.12 + 11 _____
8. 0.0123 +5.689 – 0.014 _____

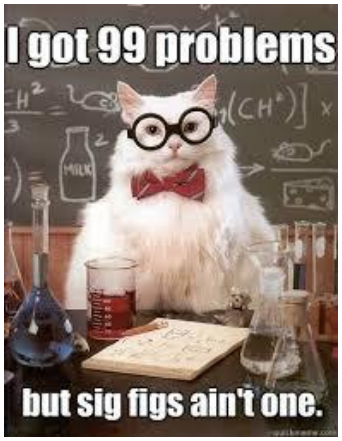
When performing calculations with our data sometimes we have to multiply and divide our data. In this case, the most precise answer is the one with the most sig figs. Since we need to round to our least precise measurement, we should round to the least number of sig figs given. For example, if the mass of a substance is 10.0 grams (3 sig figs) and the volume is 2 mL (1 sig fig) the density is 5 g/mL also (1 sig fig). The rule is:

Multiplication/Division Rule:

- **Round your answer to the least number of significant figures given**

Complete the following operations and report to the correct number of significant figures.

9. 5.87 * 2.1 _____
10. 4*78 _____
11. 0.0235 * 9 _____
12. 0.014 * 0.01 _____
13. 589 / 12 _____
14. 78.632 / 52.3 _____



REGENTS PRACTICE

1. An aluminum sample has a mass of 80.01 g and a density of 2.70 g/cm3. According to the data, to what number of significant figures should the calculated volume of the aluminum sample be expressed?

a. 1
b. 2
c. 3
d. 4

2. A sample of an element has a mass of 34.261 grams and a volume of 3.8 cubic centimeters. To which number of significant figures should the calculated density of the sample be expressed?

a. 5
b. 2
c. 3
d. 4

3. A student calculates the density of an unknown solid. The mass is 10.04 grams, and the volume is 8.21 cubic centimeters. How many significant figures should appear in the final answer?

a. 1
b. 2
c. 3
d. 4

4. Expressed to the correct number of significant figures, the sum of two masses is 445.2 grams. Which two masses produce this answer?

a. 210.10 g + 235.100 g
b. 210.100 g + 235.10 g
c. 210.1 g + 235.1 g
d. 210.10 g + 235.10 g

ASSESS YOURSELF ON THIS LESSON:

If you missed any regents practice questions you should see me for extra help and/or re-watch the lesson video assignment

Lesson 7: Scientific Notation

Objective:

- ***Convert numbers into scientific notation and standard notation***
- ***Calculate mathematical operations using scientific notation***

Convert each of the following to scientific notation

Number		Scientific Notation
1.)	200	
2.)	250.	
3.)	1000	
4.)	200, 000	
5.)	2100.	

Convert each of the following to standard notation

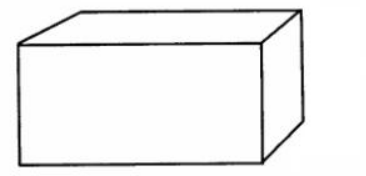
Scientific Notation		Standard Notation
6.)	3.56×10^{3}	
7.)	7.982×10^{11}	
8.)	8.3400×10^{15}	
9.)	7.02×10^{-4}	
10.)	6.6×10^{34}	

	Calculation	*Answer in standard notation*	*Answer in scientific notation*
11)	$(8.97 \times 10^{4}) - (2.62 \times 10^{3}) =$		
12)	$(4.215 \times 10^{-2}) + (3.2 \times 10^{-4}) =$		
13)	$(3.4 \times 10^{6})(4.2 \times 10^{3}) =$		
14)	$(6.73 \times 10^{-5})(2.91 \times 10^{2}) =$		
15)	$(6.4 \times 10^{6})/(8.9 \times 10^{2}) =$		
16)	$(3.2 \times 10^{3})/(5.7 \times 10^{-2}) =$		

REGENTS PRACTICE

1. Which quantity is equivalent to 50 kiloJoules?
   a. 5000 J
   b. 0.05 J
   c. $5\times10_{3}$J
   d. $5\times10_{4}$J

2. What is the volume of the of the rectangle below if the length is 2.54×10^{-3} m the width is $2.23 \times 10_{-4}$ m and the height is $1.35 \times 10_{-3}$ m?



ASSESS YOURSELF ON THIS LESSON:

If you missed any regents practice questions you should see me for extra help and/or re-watch the lesson video assignment

Unit Review

The New York Times **Health**

Baby Dies In Hospital, And Parents Plan to Sue

By BRUCE LAMBERT Published: February 09, 2002

He was their first child, and Ana and Giovanni Vargas feared they might lose him even before birth. Doctors discovered a heart valve defect and called the pregnancy high-risk. But little Gianni was born full-term by Caesarean section on Jan. 30, weighing almost 8 pounds.

Then his parents worried about whether he would survive delicate corrective heart surgery last Saturday. They were thrilled when the operation was declared a success and doctors said he would go home in a week or so.

But then a seemingly tiny mistake occurred while Gianni was recuperating in the neonatal intensive care unit of Stony Brook University Hospital in Stony Brook, N.Y. A missing decimal point in a prescription resulted in a tenfold overdose of intravenous potassium chloride, the Vargases said they were told by hospital officials, and Gianni died early Tuesday.

Only after Gianni's death did his mother and father hold him in their arms for the first time. ''I am angry because I was so close to bringing him home,'' Mr. Vargas said yesterday at a news conference. His wife, a native of the Dominican Republic who spoke through an interpreter, said she could not explain how she felt.

The couple, who live in Brentwood, appeared in the Lake Grove office of their lawyer, David Raimondo, and announced that they were filing a notice of claim as a prelude to a malpractice lawsuit for wrongful death.

The hospital acknowledged the infant's death, which Newsday reported yesterday, and ordered an immediate internal investigation. As required, it also notified the State Health Department, which started its own inquiry.

''We are sincerely sorry and extend to the grieving family our heartfelt condolences,'' said the hospital's director, Bruce Schroffel. ''We are conducting a thorough investigation of this baby's death to determine what steps are necessary to ensure that this will never happen again.''

Experts say that poorly written or carelessly read prescriptions are a common source of medical mistakes that harm patients. And among wrongly administered medications, potassium chloride is one of five most frequently involved, they say.

Gianni's prescription was supposed to be for 3.5 units of potassium chloride but instead was written as 35, the Vargases said they were told. They said they did not know who wrote the prescription.

Recommended preventive measures include the preparation of potassium chloride by hospital pharmacists instead of by nurses, and the use of computerized systems that automatically challenge prescriptions that appear to be inappropriate.

Stony Brook hospital declined to comment on whether it uses pharmacists to prepare potassium chloride and if it has a computerized prescription system. It did say that its procedures had called for checking medications at three different steps, and that in the aftermath of the fatality, hospital administrators doubled the number of staff members involved. The hospital would not say how many people that is.

''Medication errors are fixable, and there is no excuse for them occurring at the rate they are,'' said Arthur A. Levin, who was on the committee that wrote ''To Err Is Human,'' a 1999 report on medical mistakes written for the Institute of Medicine at the National Academy of Sciences..

The national group that reviews hospitals, the Joint Commission on Accreditation of Healthcare Organizations, named potassium chloride as a problem-prone medication in 1999. In another report last year on prescriptions, the group stressed the critical importance of the decimal point, especially in handwritten documents.

''Misinterpretation of such orders could lead to a tenfold dosing error,'' the report said.

Mr. Vargas married Ana after meeting her at their church. He said he is a construction union member and worked at ground zero from Sept. 15 until he was laid off on Dec. 17.

He and his wife chose Stony Brook because of its reputation for quality, he said. Many relatives have been treated there, including his sister, who gave birth a few weeks ago. But Mr. Vargas said that he and his wife do not intend to return.

1. What is believed to be the underlying cause of administering the wrong dosage?

2. Do you think leaving the units off the prescription could result in a similar tragedy?

3. Can you think of an over-the-counter medication that you take that could result in major medical problems or even death by mistakenly doubling or tripling the dosage? Give an example.

More Unit Review

METRIC

Using tables on page one of your reference table you should be able to identify which unit is used to measure each quantity and you should be able to convert between units using the prefixes. Locate the prefix assigned to the measurement unit that you are starting with and then find the prefix that you want to convert to. Count the number difference between the factors and then move your decimal that many places.

a. identify the unit used for each quantity:

(1) mass _____ (4) temperature _____

(2) volume _____ (5) length _____

(3) energy _____ (6) time _____

b. Convert the following:

(1) 568 mL to L _____

(2) 0.00897 g to mg _____

(3) 45700 mm to km _____

DENSITY

Density is the measurement of mass divided by volume. A substance's density can help identify it. For example, water's density is 1.00g/mL. Substances float in water of they have low densities, and sink when their densities are greater than 1.00 g/mL.

a. Calculate the density of 5.00 gram sample of an unknown substance, which has a volume of 5.15mL.

b. Using table S, identify the unknown substance in question (a) above. _____

c. Calculate the mass of a substance with a density of 2.50 g/mL and a volume of 23.0mL.

d. Calculate the volume of a metal rectangle with a height of 2.0cm, a length of 3.0cm, and a width of 1.0 cm.

e. If the metal in question (d) above is iron, calculate the mass. (Hint: density is on table S)