Name: _____ Block:_____

Unit 1

Foundations, Measurement, Safety and Matter

Major Objectives: At the end of this unit, you should be able to:

1. Name and give the uses of ordinary laboratory equipment.
2. State the location of and proper use of our laboratory safety equipment.
   IT IS REQUIRED THAT ALL STUDENTS WILL PASS A LAB TEST WITH A GRADE OF "B" OR BETTER BEFORE PERFORMING ANY CHEMICAL LAB IN THIS COURSE.
3. Recognize the general steps scientists use in solving problems
4. Illustrate the scientific method
5. Show how numbers can be expressed in scientific notation.
6. Learn the metric system to measure length, volume, and mass
7. Learn to determine percent error
8. Learn to determine the number of significant figures in a calculated result
9. Learn how dimensional analysis can be used to solve various types of problems
10. Learn to determine density

Day	Page #	Description	IC/HW	Due Date	Completed ?
1	X	Signed Safety Agreement	HW	**9/2-3**	
1	X	Signed Parent Letter	HW		
1	X	Element Flash Cards	HW		
2	3-8	Significant Figures	IC/HW	**9/4-5**	
3	**X**	**Diagnostic Math Test**	**IC**	**9/8-9**	
3	9-10	Equipment Scavenger Hunt	IC		
3	11-13	Lab Safety Notes	IC		
4	**X**	**Lab Safety Test**	**IC**	**9/10-11 Must get at least an 85%!**	
4	14-15	Safety in the Lab Video	IC		
4	X	Lab: Accuracy vs. Precision (Long Pants and Closed Toed Shoes Required!)	IC/HW		
4	14-15	MSDS Challenge	IC		
4	16-17	MSDS Explanation	IC		
4	**X**	Physical/Chemical Properties Pre-Lab "Quiz"	HW	**Due by the beginning of class Day 6**	
5	**X**	**QUIZ: Elements and Symbols**	**IC**	**9/12-15**	
5	20-22	SI Units and Dimensional Analysis Notes	IC	9/11-12	
5	22-24	Unit Conversion and Dimensional Analysis Practice	IC		

Day	Page #	Description	IC/HW	Due Date	Completed
5	25-26	Conversions and Dimensional Analysis Homework Worksheet	HW		
5	**X**	Unit Conversions HW	HW	**Due: by 9/23/13**	
6	X	Lab: Physical and Chemical Properties (Long Pants and Closed Toed Shoes Required!)	IC/HW		
6/7	27-30	Physical/ Chemical Properties and Changes Notes	IC		
6	30	Chemical and Physical Properties Worksheet	IC/HW		
6	**X**	Polyatomic Ions HW	HW	**Due by 9/27/13**	
7	31	Law of Conservation of Mass	IC		
7	32-33	Classification of Matter Worksheet	HW		
7	34-37	Unit 1 Review	HW		

Learn the following symbols and the names of the elements which they represent. This is the first step in learning to speak the language of Chemistry.

****QUIZ: Day 5 of Unit 1****

Ag	**Al**	**Ar**	**As**	**Au**	**B**	**Ba**	**Be**	**Bi**	**Br**
C	**Ca**	**Cd**	**Co**	**Cr**	**Cs**	**Cu**	**F**	**Fe**	**Fr**
Ga	**H**	**He**	**Hg**	**I**	**K**	**Kr**	**Li**	**Mg**	**Mn**
Mo	**N**	**Na**	**Ne**	**Ni**	**O**	**P**	**Pb**	**Ra**	**Rb**
Rn	**S**	**Sb**	**Se**	**Si**	**Sn**	**Sr**	**Xe**	**Zn**	**Cl**
W	**Y**								

Unit 1: Significant Figures and Scientific Notation

Scientific Notation Notes

To put numbers in scientific notation:

1. Place the decimal after the _____.
2. Rewrite the number and multiply it by 10^{x}.
3. Count the number of spaces you moved the decimal. This number is *x* (the exponent for the ten).
4. If the original number was less than one, the exponent is _____.

Practice Problems

5) 0.000 000 000 000 615 g

6) 98 000 000 000 m

7) 0.000 104 s

8) 407 302 000 000 000 Pa

9) 4.38×10^{-7} km

10) 1.89×10^{4} L

11) 7.4×10^{-4} g

Percent Error Notes

Accuracy, Precision, and Error

Accuracy – the _____of a measurement to the_____ value of what is being measured

- accuracy can be determined by _____ measurement
- depends on the _____of the _____

Precision – describes the closeness, or _____, of a set of measurements taken under the _____ conditions

- precision is determined by _____measurement
-depends on the _____of the person measuring

Accepted (or theoretical) value – a quantity used by general agreement of the scientific community

Experimental (or actual) value – a quantitative value measured during an experiment

Error – the _____ between the_____ value and the_____ value

Error =
Error = E - A

Percent error = the percent that a measured value differs from an accepted value

$$\boldsymbol{E = \frac{|E - A|}{A}\ x\ 100}$$

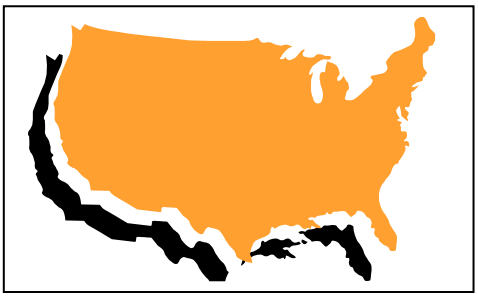
Example:

Peter measured the volume of a 2 liter bottle of soda. The actual volume of the soda was 1.87 Liters. What is the percent error of the volume of soda?

Significant Figures

The Atlantic/Pacific Rule for Determining Significant Figures

PACIFIC
(**P**resent)



ATLANTIC
(**A**bsent)

1) look for the presence, or not, of a decimal point
   - this will tell you which side to start counting from
   - Pacific: left
   - Atlantic: right
2) if there is a decimal point you start counting from the left side of the number
   - starting from the very left side of the number, look for the first non-zero number
   - count the first non-zero number and every number (0-9) after that

   - example: 0.00010

   - because there is a decimal point, we start from the left side of the equation L0.00010, and look for the first non-zero number

   0.0001**1**0

   - count that number and every number after that regardless of what the number is (0-9)
   - in this case there are 2 significant figures

   - 0.000**10**

3) if there is **not** a decimal point you start counting from the right side of the number
   - starting from the very right side of the number, look for the first non-zero number
   - count the first non-zero number and every number (0-9) after that

   - example: 721000

   - because there is a decimal point, we start from the right side of the equation 7210007, and look for the first non-zero number

   721000

   - count that number and every number after that regardless of what the number is (0-9)
   - in this case there are

Significant Figures: All exact digits of a measurement plus one estimated digit.

Brief determination of the number of significant digits

Rule #1: All non-zero numbers are significant 732 g

Rule #2: Any zero's between non-zero numbers are significant 301 cm

Rule #3: If there is a decimal point, any zero's to the right of the last non-zero are significant

a. 320. kg
b. 320 kg
c. 0.70 m
d. 0.070 m

Rule #4: Any number that is used to count things or is a direct conversion has infinite significant figures.

a. 45 desks
b. 60 s = 1 minute
c. 10 pennies = 1 dime
d. 4 beakers

Helpful Hint

If the value _____ with a visible decimal point, then go to the_____ end of the value. Moving right, find the first non-zero number; count it and every number to the right.

If the decimal point is _____you start on the _____side of the equation.

⟶0.0012040

If the value is not _____ with a visible decimal point, go to the _____end of the value. Moving to the left find the first non-zero number; count it and every number to the left.

If the decimal point is _____you start on the _____side of the equation.

7201000 ⟵

Rounding off numbers

Rule #1: If the number after the number to be rounded is less than 5, round down.

Rule #2: If the number after the number to be rounded is greater than or equal to 5, round up.

<u>In a series of calculations, carry extra digits through to the final result and then round off</u>. This means that you should carry all of the digits that show on your calculator (or most of them) until you arrive at your final answer and then round off.

Note: Don't forget significant zeros when writing in scientific notation (ex: 20.0 is 2.00 x 10). Do not write INsignificant zeros when writing in scientific notation (ex: 6 000 000 is 6×10^6, not $6.000\,000 \times 10^6$ – this number would have 7 sig figs).

Addition and Subtraction

Rule: Complete the desired calculation and then round off the answer to the number of decimal places as the value from the problem with the _____ NUMBER OF **DIGITS** _____ THE DECIMAL.

a)
```
  12.72
  34.1
+  0.463
  47.283
  47.3
```
all numbers are significant to the tenths place.

b)
```
  900
  370
+ 101.037
```
All numbers are significant to the _____ place.

c)
```
  790.
  330
+  54.8
```
All numbers are significant to the _____ place.

Multiplication and Division

Rule: Complete the desired mathematical calculation and then round off the answer to the same number of significant figures as the value from the problem with the _____ NUMBER OF SIGNIFICANT FIGURES.

34.91 x 0.0053 = 0.185023 **Rounds to** 0.19

four sig figs | two sig figs | two sig figs

Because 0.0053 has only two significant figures, it limits the answer to two significant figures.

3. 102 ÷ 0.0097 = **Rounds to**

Combination of operations

Complete mathematical calculations in correct order and use correct number of significant figures after each step.

Example: (5.2 – 0.2) x 7.00 x 1.00 = 35.00

The difference of 5.2 and 0.2 is 5.0 which is precise to the nearest tenth and has 2 sig. figs. Since 7.00 and 1.00 have 3 sig. figs. The least number of sig figs in the multiplication operation is 2 from the 5.0 difference. The final answer has 2 sig figs. **Answer = 35**

Pacific – Atlantic Rule

If the decimal is **PRESENT**, start on the **PACIFIC** side or _____.

14.020 0.00235 $1.04 * 10^5$

If the decimal is **ABSENT**, start on the **ATLANTIC** side or _____.

7300200 1200 839

Underline the significant figures in the following measurements and put the number in scientific notation:	Round the following measurements to the requested number of significant figures and put the number in scientific notation:	Put the following measurements in scientific notation and put the number in scientific notation:
1. 0.00325 m	1. 0.003256 m → 2 sig. figs.	1. 0.000000586 m
2. 12500 s	2. 564025000 g → 3 sig. figs.	2. 5620000 g
3. 304.00 g	3. 78265 ns → 1 sig. fig.	3. 85000 L
4. 0.00256 kg	4. 0.236578 Pa → 4 sig. figs.	4. 0.00236 km
5. 0.0030600 J	5. 0.008596 ng → 3 sig. figs.	5. 25640000000 Pa
6. 6.0250 Mm	6. 15.349 mg → 4 sig figs.	6. 0.000001524 s

Perform the following calculations and write the answer with the appropriate number of sig figs AND in scientific notation.

1. 6.23×10^6 kL + 5.3×10^6 kL

2. 7.525×10^5 kg - 5.43×10^2 kg

3. 4.8×10^5 km x 2.02×10^3 km

4. 8.45×10^2 g ÷ 7.901×10^3 cm^3

5. 2.45×10^{-15} J ÷ 3.4×10^{-19} J

6. $20.05 \times 10^{343} - 15.9 \times 10^{341}$

Name_____

Partner(s): _____

Equipment Scavenger Hunt

Find the following items and write the location in the space provided. If there is a number next to an item, that is how many locations you must find. Use descriptive words when describing the areas of the classroom, and tell what the item is next to.

Item	Location
Eye Wash	_____
Exits (2)	_____
Fire Blanket	_____
Fire Extinguisher	_____
Fume Hood	_____
Goggle Cabinet	_____
Hole Punch (2)	_____
In Bins	_____
Out Bins	_____
Pencil Sharpener	_____
Recycling Bin	_____
Safety Shower	_____
Sign In/Out	_____
Wastebasket (3)	_____

Equipment Scavenger Hunt:

On the lab bench there is equipment laid out for you to identify. While you may not know all of the equipment, try your best to identify all of it. Write the letter on the equipment next on the line next to the name.

1. Beaker _____
2. Beaker Tongs _____
3. Bunsen Burner _____
4. Buret _____
5. Buret Clamp _____
6. Clay Triangle _____
7. Crucible _____
8. Crucible Tongs _____
9. Erlenmeyer Flask _____
10. Evaporating Dish _____
11. Forceps _____
12. Funnel _____
13. Graduated Cylinder _____
14. Striker _____
15. Ring Clamp _____
16. Test Tube _____
17. Volumetric Flask _____
18. Wash Bottle _____
19. Watch Glass _____
20. Wire Gauze _____

Map of Key Safety Equipment in the Room

Draw the following pieces of safety equipment in the room map below. Be sure to label all of the items below using their designated letter.

A. Eye Wash
B. Exits (2)
C. Fire Blanket
D. Fire Extinguisher
E. Fume Hood
F. Goggle Cabinet
G. Safety Shower
H. Window
I. Lab Stations

Lab Safety Notes

- _____ should be worn at all times when in the lab.
- _____ can never be worn in the lab. All shoes must have _____.
- If your lab partner is on fire, you should _____ _____.
- If you get chemicals in your eyes you should use the eye wash station for _____ minutes.
- The _____ is used to remove noxious fumes and vapors.
- If you spill a large amount of chemical on you, you should _____ _____.
- When heating a test tube, you should always _____ _____.
- Wafting is a method of smelling chemicals by _____ _____.
- You should never _____ or _____ in the lab.
- You must complete the _____ if you want to participate in the lab. You MUST read the _____ before you enter the lab.
- Contact lenses should _____ be worn in the lab area.

MSDS (Material Safety Data Sheet) Challenge

Determine the identity of the unknown chemical that was used in the demonstration.

1. What factors can be used to determine which chemical was used?

2. Where can you find flammability information on the MSDS Sheet? Determine which chemicals are flammable from the MSDS Sheets and fill in the Flammability Column on the table below.

3. Fill in the following table with the information from the MSDS sheets given:

Chemical	Physical Properties	Flammability	Melting Point	Soluble in Water?	Specific Density
Cyclohexane					
Ethylene Dichloride					
Glycerin					
Isopropyl Alcohol					
Succinic Acid					
Water					

4. What is the identity of the unknown substance? Explain

Select of the substances from the MSDS Sheets and answer the following questions (**Do NOT select water**):

5. Chemical Identity

6. What may happen if you inhale your substance?

7. What chemicals should not be stored with your chemical?

8. How do you clean up a spill of your chemical?

9. List any special protection or precautions.

"Accident at Jefferson High" Safety Video Questions

Complete the following questions individually as you watch the video:

1. Accidents always occur because of _____

2. List some of the typical hazards in a science lab.

   _____

   _____

3. List several possible accidents which may occur during a laboratory activity.

   _____

   _____

4. List some things that should be done to prepare for a lab.

   _____

   _____

   _____

   _____

5. To dilute an acid, always add the acid _____

6. Never _____ or _____ chemicals.

7. How can one avoid "mix-ups"? _____

8. Acid spills are best neutralized with _____

9. Base spills are best neutralized with _____

10. How would you treat an acid or base spill on the skin or into the eyes?

Skin:

_____

Eyes:

_____

11. When lighting the burner, always turn on the gas

_____

12. What do you use to tell the difference between hot and cool glass?

_____

13. List some safety considerations for heating liquids in a test tube.

_____

_____

14. Flammable liquids should be extinguished by _____

Answers to Lt. Grumman's Safety Test (True/False)

1.	8.
2.	9.
3.	10.
4.	11.
5.	12.
6.	13.
7.	14.

Section I - Product Identification:

Manufacturer's Name: The manufacturer of the product is listed along with the manufacturer's address.

Emergency Telephone Number: The telephone number of people other than the manufacturer who may provide information for a chemical emergency; a spill, explosion, fire, etc.

Chemical Name and Synonyms: Chemical name of the material, if it is a single element or compound, along with other terms for the substance.

Trade Name and Synonyms: The name the product is sold by along with other terms for the formulation.

Chemical Family: General class of compounds to which a material belongs (e.g. ether, mineral acid, ketone, etc.).

Formula: Formula for the number and types of atoms contained in the substance if it is a single element or compound.

Section II - Hazardous Ingredient Information:

Hazardous Ingredients: Listed by chemical name in one of three divisions (paints, preservatives and solvents; alloys and metallic coatings, or hazardous mixtures of other liquids, solids, or gases) unless the product is a bona fide trade secret.

Percentage: Percent by weight or volume of each ingredient.

PEL: Term used by the Occupational Safety and Health Administration (OSHA) to express the legal airborne concentration of a material to which persons can be exposed day after day. Usually stated in parts per million (ppm) or milligrams per cubic meter (mg/M3).

TLV: Term used by the American Conference of Governmental Hygienists (ACGIH) to express the airborne concentration of a material to which nearly all persons can be exposed day after day, without adverse health effects.

Section III - Physical Data:

Boiling Point: Temperature at which a liquid changes to a vapor at a given pressure, usually stated in of at one atmosphere pressure. For mixtures, the initial boiling point or boiling range may be given.

Vapor Pressure: Pressure exerted by a vapor above its own liquid in a closed container, usually stated in millimeters of mercury (mm of Hg) at 20^{o}C (unless stated otherwise).

Vapor Density: Relative density or weight of a vapor or gas compared to an equal volume of air. Air is rated as 1.0.

Solubility in Water: The amount of a substance which can be dissolved in a given volume of water. Expressed usually in terms of milligrams per liter or in general terms such as "negligible."

Appearance and Odor: Brief description of the substance at normal room temperature and atmospheric conditions (e.g. viscous, colorless liquid with an aromatic hydrocarbon odor).

pH: An expression of the acidity or alkalinity of an aqueous solution by the logarithm of the reciprocal of the hydrogen ion concentration.

Specific Gravity: Weight of a volume of substance to an equal volume of water. A ratio of less than one means the material is lighter than water and vise versa.

Percent Volume by Weight: Percent of a liquid or solid (by volume) that will evaporate at an ambient temperature of 70^{o}F.

Evaporation Rate: Rate at which a material is converted to the vapor state at any given temperature and pressure.

Section IV - Fire and Explosion Hazard Data:

Flash Point and Method Used: Lowest temperature at which a liquid will give off enough flammable vapor to ignite.

Flammable Limits: Range of concentrations over which a flammable vapor mixed with air will flash or explode if an ignition source is present.

Extinguishing Media: Fire-fighting material for use on substance that is burning, Fire-fighting material should be indicated by its generic name (e.g. water, foam, dry chemical, etc.).

Special Fire Fighting Procedures and Precautions: Listing of certain fire-fighting materials unsuitable or unsafe to use on the burning substance. Also, a listing of special handling procedures and personal protective equipment.

Unusual Fire and Explosion Hazards: Hazards which might occur from overheating or burning of substance, including any chemical reactions or changes in chemical form or composition. Also, any special hazards which may need to be considered while extinguishing a fire.

Section V - Health Hazard Data:

Threshold Limit Value: Explained previously in Section II.

Effects of Overexposure: Covers immediate (acute) and long-term (chronic) effects of overexposure to the substance. May include information from human experience and animal tests. Toxicity data may also be provided in the form of average lethal dose or concentration (LD_{50} or LC_{50}, respectively).

Emergency and First-Aid Procedures: Emergency information and first aid instructions for treatment of acute inhalation, ingestion, and skin or eye contact.

Section VI - Reactivity Data:

Stability: Indication of whether the substance is susceptible to dangerous decomposition and under what conditions it might occur.

Conditions to Avoid: Conditions which may cause hazardous consequences or damage to the substance (e.g. heat, shock, cold, light).

Incompatibility: Common materials or contaminants with which the specific substance may come in contact and release large amounts of energy, flammable vapor or gas, or produce toxic vapor or gas.

Hazardous Decomposition Products: Hazardous materials that may be produced in dangerous amounts if the substance is exposed to burning, oxidation, heating or allowed to react with other chemicals.

Hazardous Polymerization: Polymerization is a chemical reaction in which two or more small molecules combine to form larger molecules that contain repeating structural units of the original molecules. A hazardous polymerization is an unintended and uncontrolled polymerization reaction that may create a great deal of heat and may release a hazardous substance.

Section VII - Spill or Leak Procedures:

Spill and Leak Procedures: Immediate steps to be taken to assure safety to people and property in the event of a spill or leak of the substance including equipment and personal protective equipment. Methods for control and clean-up are described.

Waste Disposal Method: May describe a method for disposing of excess, used, or spilled material.

Section VIII - Special Protection Information:

Respiratory Protection: Requirements for respiratory protection should ventilation recommendations not be feasible.

Ventilation: Type of ventilation, if needed when working with the substance.

Protective Gloves: The appropriate gloves, if needed, to prevent hand contact (e.g. rubber, vinyl, neoprene).

Eye Protection: Type of eye protection device to be worn when working with the substance.

Other Protective Equipment: Additional protective measures or equipment recommended when working with the substance (e.g. apron, boots, glove box)

Section IX - Special Precautions:

Precautions to be Taken in Handling and Storage and Other Precautions: Describes additional precautions to be considered or may give special emphasis to information or warning stated in other sections of MSDS.

SI Unit Notes

Dimension	Base Unit	Symbol
Length/Distance	Meter	m
Mass	kilogram	kg
Temperature	Kelvin	K
Volume	Decimeter cubed	dm^3
Time	second	s
Energy	Joule	J
Speed	meter per second	m/s
Frequency	1/second = Hertz	Hz
Density	Gram/centimeter^3	g/cm^3
Pressure	Pascal	Pa

Temperature:	**Equal Units of Volume:**
Density:	

Theory	Law
- Explains a scientific Relationship - Must be testable - Must be falsifiable - Cannot be proven true, can be proven wrong - Can be modified to incorporate new data - Can be used to make accurate predictions	-State a scientific relationship -must be verified by data - Modified as conflicting data is gathered -Can be used to make accurate predictions -Can be expressed mathematically

Observation:

Inference:

Hypothesis:

Accuracy:

Precision:

SI Unit Prefixes

Prefix	Symbol	Meaning
Mega	M	10^{6}
Kilo	k	10^{3}
Deca	D	10^{1}
Base	--	10^{0}
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}
pico	p	10^{-12}

You must memorize these prefixes, symbols and meanings!

Remember, when you are dividing exponents, you subtract.

$10^{3} \div 10^{6} = 10^{-3}$ because (3 – 6 = -3)

Remember, when you are multiplying exponents, you add.

$10^{2} \times 10^{3} = 10^{5}$ because (2 + 3 = 5)

Steps for SI Conversions

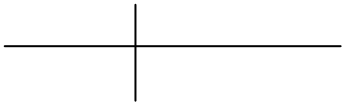
1. Write down the starting measurement
2. Put the units of the starting measurement into the denominator to cancel
3. Put units you want on the top
4. Put a 1 with the larger unit
5. Determine relationship between the two units (MEMORIZE prefix chart) by finding the **absolute value** of the difference in exponents.
6. Solve. Cancel units. If exponent jumps the line then change the sign (10^5=1/10^-5)
7. If needed put the number into scientific notation.

SI Conversions Example 1:

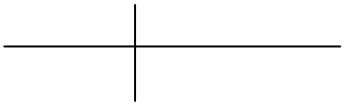
63 200 centiliters → microliters

SI Unit Conversions Practice:

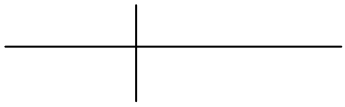
1. 89.3 kilometers → nanometers



2. 5.32×10^{8} picograms → milligrams



3. 26.60 millipascals → megapascals

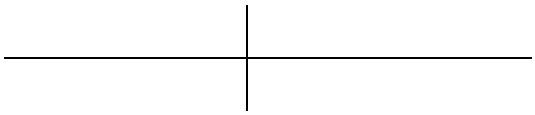


DIMENSIONAL ANALYSIS NOTES:

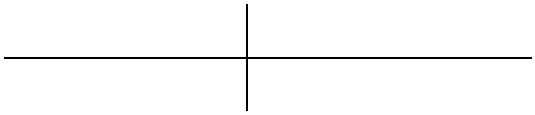
If light from the sun takes 8.11 minutes to get to the Earth, how far away is the sun in km? (speed of light is $3.0x10^{8}$ m/s and there are 1000 m in one km)

1. Identify the values in the problem, include units

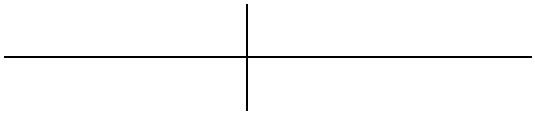
2. Start with the value with only one unit



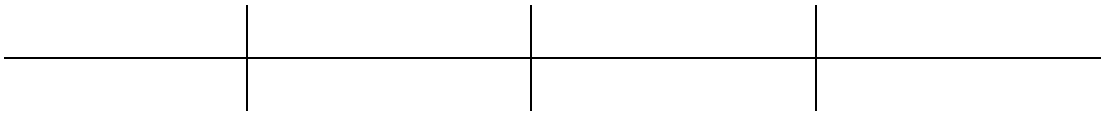
3. Put that starting unit into the denominator to cancel units out



4. Find the value OR conversion to a given value with the same unit and place it into the problem



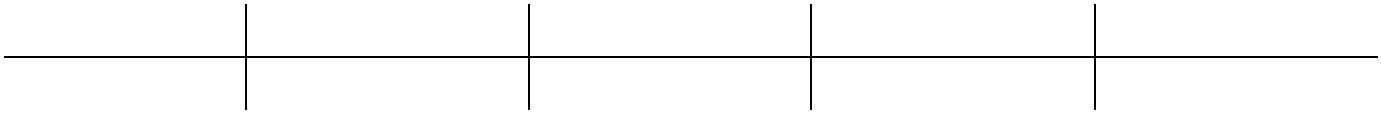
5. Repeat until you get to the desired units, cross out units which cancel



6. Solve and put into correct scientific notation (multiply numerator and divide denominator)

DIMENSIONAL ANALYSIS PRACTICE PROBLEM:

If you live 3.2 miles from your best friend and the speed limit is 25 miles/hour, how many seconds will it take you to drive from your house to your friend's house?



SI Unit Conversions Practice

1. Convert 0.0036 g to mg

2. Convert 8.9×10^{-8} s to ps

3. Convert 8200000nPa to MPa

4. Convert 3.26 L to cm^3

5. Convert 0.0012 cm^3 to mL

6. Convert 0.29 L to cm^3

Dimensional Analysis Practice Problems:

Remember - The numbers in conversion factors are considered to be exact. Be sure to include units where appropriate, and round your answers according to the number of digits in the original problem.

1. Convert 2.44 L to cm^3	2. Convert 45 654 mg to kg
3. Convert 4.7 km/hr to m/s	4. Convert 4.00 g/cm^3 to kg/dm^3
5. Convert 6.72 dm^3/s to L/min	6. Convert 0.0598 mg/cm^3 to g/cm^3
7. Convert 2.7 dm^3 to mL	8. Convert 0.90 kg/cm^3 to mg/mm^3

Dimensional Analysis Word Problems Practice

1. You want to earn $600.00 to buy a new bicycle. You have a job that pays $8.75/hour, but you can work only 3 hours/ day. How many days before you will have enough to buy the bike?

2. Someone that never learned dimensional analysis went off to work at a fast food restaurant for the past 35 years wrapping hamburgers. Each hour you wrap 184 hamburgers. You work 8 hours per day. You work 5 days a week. You get paid every 2 weeks with a salary of $840.34. How many hamburgers will you have to wrap to make your first one million dollars?

3. In 1973 the Emergency Highway Energy Conservation Act instituted a National Maximum Speed Law of 55 mph. How many minutes would it take to travel 16 kilometers? (1 mile = 1.6093 km)?

Conversions and Dimensional Analysis Homework Worksheet

Metric Conversions:

1. Convert 2.5 cm to m
2. Convert 3.87 m to cm
3. Convert 25 mm to m
4. Convert 105 m to mm
5. Convert 1.8 km to m
6. Convert 2.38×10^2 m to km
7. Convert 40.0 m to mm
8. Convert 8.0 cm to mm
9. Convert 0.02 mm to cm
10. Convert 57.2 mm to km

Dimensional Analysis Problems:

11. Convert 2.05×10^5 seconds into years.

12. Traveling at 65 miles/hour, how many minutes will it take to drive 125 miles to San Diego?

13. Convert 50 years into seconds. Express your answer in scientific notation.

14. Traveling at 65 miles/hour, how many feet can you travel in 22 minutes? (1 mile = 5280 feet)

15. In Raiders of the Lost Ark, Indiana Jones tried to remove a gold idol from a booby-trapped pedestal. He replaces the idol with a bag of sand. If the idol has a mass of 2.00 g, how many liters of sand must he place on the pedestal to keep the mass sensitive booby-trap from activating? (Density of sand is 3.00 g/cm^3)

Physical/Chemical Properties and Changes Notes

- What is matter?

- Physical Properties: Properties of a substance that can be measured without changing the chemical nature of the substance.
    - Examples:

    - Intensive Properties: are _____ of the amount of matter present.
        - Examples:

    - Extensive Properties: are _____ on the amount of matter present.
        - Examples:

- Chemical Properties: Properties of a substance that cannot be measured without changing the chemical nature of the substance.
    - Examples:

- Physical Changes: Changes that do not alter the chemical composition of a substance.
    - Examples:

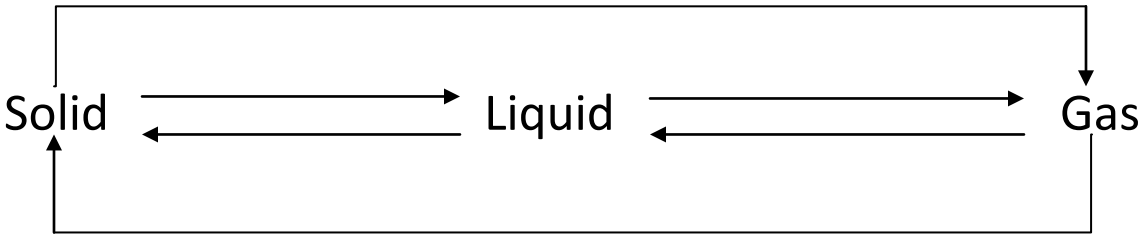
- Chemical Changes: Changes that alter the chemical composition of a substance.
    - Examples:

    - Indications of a chemical change:

Matter Notes

Solid	Liquid	Gas

- Vapor: is not the same as gas. Vapor refers to the gaseous phase of a substance that is a liquid or solid under standard conditions.
- Alloy: A metallic solid solution composed of two or more elements.



- Plasma: high temperature, low pressure; electrons separate from nucleus; most common in the universe

Elements, Compounds, Mixtures and Solutions

- Elements: a pure substance that is made up of only one type of atom and cannot be broken down by physical or chemical means.
    - Examples:

- Compounds: a combination of two or more different elements that are combined chemically.
    - Examples:

- Mixture: a combination of two or more pure substances in which each pure substance retains its physical properties.
    - Examples:

    - Homogeneous mixture: Mixtures in which the composition is uniform throughout. Also called a SOLUTION.
        - Examples:

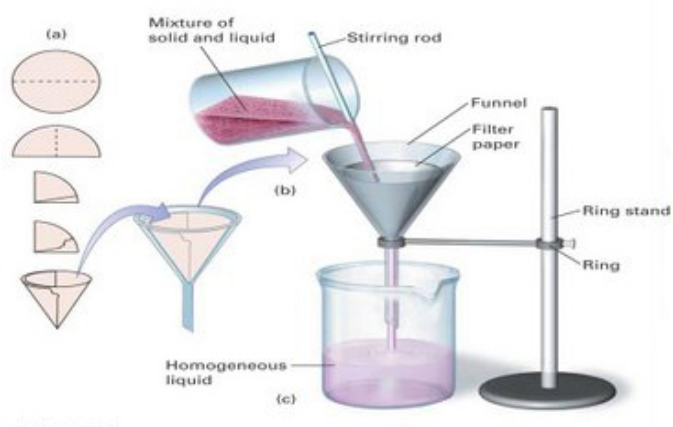
    - Heterogeneous mixture: Mixtures in which the composition is not uniform throughout. You can distinguish the different parts.
        - Examples:

Separation of Matter

- Elements- can only be broken down by nuclear reactions.
- Compounds- can only be broken down by chemical reactions
- Mixtures- can be broken down by physical means.

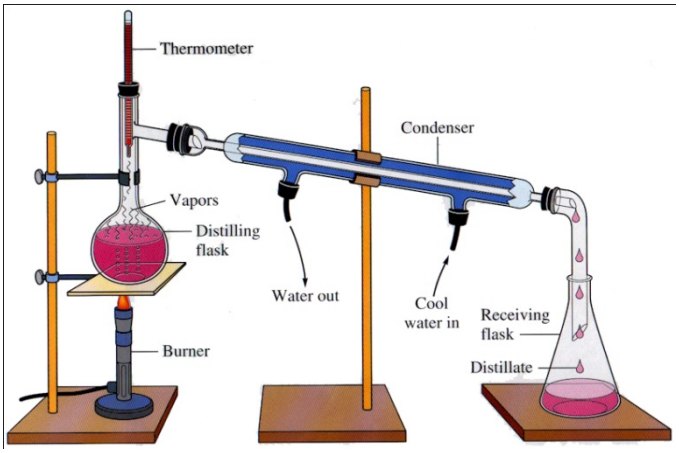
Physical Separation Methods

- Filtration



http://aphschem.blogspot.com/2009_10_01_archive.html

Distillation



http://oz.plymouth.edu/~wwf/distillation.htm

- Chromatography- physical separation based on attraction to liquid or solid.
    - Paper Chromatography- paper is the stationary phase and liquid is the mobile phase.
    - Column Chromatography- beads are the stationary phase and liquid is the mobile phase.

Chemical and Physical Properties Worksheet

1. Classify the following materials as heterogeneous mixtures (M), homogeneous mixtures/solution (S), compounds (C) or elements (E).

a) air
b) ink
c) paper
d) salt
e) ethyl alcohol
f) apple
g) water
h) plutonium
i) deionized water
j) ice
k) shaving cream
l) paint
m) granite
n) 24 carat gold
o) orange juice
p) carbonated beverage
q) zinc sulfate
r) dirt
s) river water
t) milk

2. Classify the following properties as chemical (C) or physical (P).

a)	color	b)	reactivity	c)	flammability
b)	odor	e)	porosity	f)	stability
g)	ductility	h)	solubility	i)	expansion
k)	rusting	l)	reacts with air	m)	feel

3. Classify the following as chemical (C) or physical (P) changes.

a)	digestion of food	b)	boiling water
c)	growth of a plant	d)	explosion of gasoline
e)	cloud formation	f)	healing a wound
g)	burning of coal	h)	kicking a football
i)	contracting a muscle	j)	distilling water
k)	melting silver	l)	rusting iron
m)	subliming of iodine		

4. Determine the physical process to separate the following mixtures

a) ethyl alcohol and water
b) ink in a pen
c) Sand and water
d) water and minerals

Law of Conservation of Mass- mass can neither be gained nor lost in a chemical reaction.

- Chemical Reaction- creates a substance or substances known as the product(s).
- Reactants → Products

- In the complete reaction of 22.99 g of Sodium with 35.45 g of chlorine. What mass of sodium chloride will be formed?

- A 12.2 g sample of X reacts with sample of Y to form 78.9 g of XY. What is the mass of Y that reacted?

Practice Problems

1. Identify the reactants and products in the following reaction.

$4Fe + 3O_2 \rightarrow 2Fe_2O_3$

2. If 112 g of Iron reacted to produce 160 g of Iron (III) Oxide, how much oxygen was involved in the reaction?

3. When 16 grams of methane gas combine with 64 grams of oxygen, 44 grams of carbon dioxide form along with water. What mass of water was produced?

4. When 400 grams of wood are burned, 30 grams of ash remain. Explain what may have happened to the other 370 grams of wood.

5. If 80.0 grams of aluminum combine with 92.5 grams of chlorine, how many grams of aluminum chloride will be formed?

Classification of Matter

Choose words from the list to fill in the blanks in the paragraphs.

Word List

chemical property	intensive property	extensive property
compound	mixture	heterogeneous matter
element	physical property	homogeneous matter
substance	property	

Matter that has uniform characteristics throughout is called __(1)__. Matter that has parts with different characteristics is called __(2)__. A characteristic by which a variety of matter is recognized is called a(n) __(3)__. A characteristic that depends upon the amount of matter in the sample is called a(n) __(4)__. A characteristic that does not depend upon the amount of matter is called a(n) __(5)__. A characteristic that can be observed without producing new kinds of matter is called a(n) __(6)__. A characteristic that depends on how a kind of matter changes during interactions with other kinds of matter is called a(n) __(7)__.

Matter can also be classified according to the basic types of matter it contains. A simple substance that cannot be broken down into other substances by chemical means is called a(n) __(8)__. A chemical combination of different substances that retain their individual properties is called a(n) __(9)__. A physical combination of different substances that retain their individual properties is called a(n) __(10)__. Either an element or a compound may be referred to as a(n) __(11)__.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

Classify each of the following as an *element, compound, heterogeneous mixture, or homogeneous mixture.*

12. Water
13. Carbon
14. Air
15. Table salt
16. Sugar dissolved in water
17. Homogenized milk
18. Granite
19. Oxygen
20. Sand in water

12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Properties

Recall that *physical properties* can be observed without producing new substances. *Chemical properties* describe how a substance interacts (or fails to interact) with other substances to produce new substances. *Extensive properties* depend upon the amount of matter in the sample; *intensive properties* do not.

Classify each of the properties listed below as *extensive physical, intensive physical, or chemical.*

1. Color 1. _____
2. Combustibility 2. _____
3. Hardness 3. _____
4. Density 4. _____
5. Mass 5. _____
6. Melting point 6. _____
7. Ductility 7. _____
8. Volume 8. _____
9. Failure to react with other substances 9. _____
10. Odor 10. _____
11. Weight 11. _____
12. Malleability 12. _____
13. Tendency to corrode 13. _____

Some of the measured properties of a given substance are listed below. Write the general name describing each property. Select the names from the properties listed for Exercised 1-13 above.

14. 15 dm^3 14. _____
15. Can easily be hammered into sheets. 15. _____
16. 2.8 g/cm^3 16. _____
17. Burns when heated in the presence of O_2. 17. _____
18. Stinks when heated. 18. _____
19. Can be scratched by a diamond. 19. _____
20. 500°C 20. _____
21. Can easily be drawn into a wire. 21. _____

Unit 1 Review

Complete the following calculations and report your answer with the correct number of significant figures and with proper units.

1. 1.2 m + 2.35 m = _____
2. 2.6538 cm x 2.1 cm = _____
3. 5.681 dm – 2 dm = _____
4. 3845.2 m^3 ÷ 25.2354 m = _____
5. 25 cm + 3 cm = _____
6. 1.2 m x 2 m^2 = _____
7. 859678.2354 cm – 568426.1 cm = _____
8. 5.3 m x 5.2398 m x 2 m = _____
9. 45.25252 nm + 45.8563 nm = _____
10. 68.23 L ÷ 38.255 L = _____

Convert the following measurements; write your answer in standard notation or scientific notation.

Measurement	Conversion (Standard Notation)	Conversion (Scientific Notation)
155 cm	nm	nm
155 cm	Km	Km
2.77 x 10^{-7} kg	mg	mg
867 x 10^4 µL	cL	cL
0.000876 Ks	ds	ds

Estimate the number of significant figures in each of the following measurements. Write the measurement using Scientific Notation.

Measurement	How many significant figures?	Measurement in Scientific Notation
A) 10046 m		
B) 500 m		
C) 500. m		
D) 510 m		

Round each of the measurements off to 3 significant figures. Write your answer in decimal notation and scientific notation.

Measurement	Decimal Notation	Scientific Notation
A) 7534 L		
B) .002346 mL		
C) 16.18 cm		
D) 1504 mL		

Complete the following Conversions:

1. Convert 16 years to days

2. How many km/hr is 30 m/s?

3. Sally Leadfoot was pulled over on her way from Syracuse to Ithaca by an officer claiming she was speeding. The speed limit is 65 mi/hr and Sally had traveled 97 km in 102 minutes. How fast was Sally's average speed? Does she deserve a ticket?

Physical or Chemical Properties: *Indicate with a **P or a C** which type of change is taking place**.** For those labeled with a P, identify them as Intensive (**I**) or Extensive (**E**).*

1. _____ Strength
2. _____ Color
3. _____ Reacts with Cl
4. _____ Volume
5. _____ Corrodes
6. _____ Mass
7. _____ Toxicity
8. _____ Density
9. _____ Boiling Point
10. _____ Flammability
11. _____ Boiling Point
12. _____ Stability

Physical or Chemical Change?

1. _____ glass breaking
2. _____ hammering wood together
3. _____ a rusting bicycle
4. _____ melting butter
5. _____ bleaching your hair
6. _____ frying an egg
7. _____ squeeze oranges for juice
8. _____ melting ice
9. _____ mixing salt and water
10. _____ mixing oil and water
11. _____ water evaporating
12. _____ cutting grass
13. _____ fireworks exploding
14. _____ cutting your hair
15. _____ crushing a can
16. _____ boiling water

Label each process as a physical or chemical change:

a. Moth balls gradually vaporize in a closet

b. hydrofluoric acid attacks glass (used to etch glassware)

c. Chlorine gas liquefies at -35 °C under normal pressure

d. hydrogen burns in chlorine gas

Label the following as an Element (E), Compound (C), Solution (S) or Mixture (M)

a. Helium
b. Brass
c. Sodium chloride
d. Air
e. Oily water
f. Dirt
g. Wood
h. Steel
i. Iron
j. Calcium carbonate
k. Aluminum Foil
l. Glucose (a type of sugar)

Use the best physical means of separation for the following problems.

1. You are given a mixture of acetone and water, acetone has a lower boiling point than water, what method would work best to separate them?

2. Given a mixture of pepper, sand and salt, propose how you would separate the substances.

3. You are given the task of separating ink in a pen, what method would work best to separate the components of ink.

Answer the question using the data to support your answer.

4. Which student's date is both accurate and precise when measuring 1.00 L of sodium chloride solution? Explain your answer. Also include in your answer which student was the most precise.

Student:	A	B	C	D
Trial 1	1150 mL	1030 mL	850 mL	950 mL
Trial 2	1140 mL	1090 mL	1020 mL	1140 mL
Trial 3	1170 mL	1060 mL	1110 mL	1370

Matching: Match the following terms with the appropriate letter:

1. Solid _____
2. Liquid_____
3. Gas_____
4. Matter_____
5. Pure Substance_____
6. Compound _____

m. A sample that can be separated only with chemical means
n. Anything that has mass and volume
o. An object that has a definite volume but not a definite shape
p. An object that has both definite volume and shape
q. Made up of 2 or more elements
r. An object that has neither a definite shape nor volume