Name: _____ Period: ____ Date: _____

MEASUREMENT AND MATTER NOTES
HONORS CHEMISTRY

Directions: This packet will serve as your notes for this unit. Follow along with the PowerPoint presentation and fill in the missing information. Important terms / ideas are in all capitals and bolded!

- **CHEMISTRY**:

  **ALL _____ AND _____ THINGS ARE MADE OF _____…
  CHEMISTRY AFFECTS _____!!!

- Branches of Chemistry

  -**ORGANIC**:

  -**INORGANIC**:

  -**ANALYTICAL**:

  -**BIOCHEMISTRY**:

  -**PHYSICAL**:

- Types of Chemistry

  -**PURE CHEMISTRY**:

  -**APPLIED CHEMISTRY**:

- Observations

  -**QUALITATIVE**:

  -**QUANTITATIVE**:

- Scientific Notation

  -Short cut for writing _____ or _____ numbers

  -Always contains a number greater than ___ and less than ____ followed by X 10^{N} (N = a _____)

  -Move the _____ (left or right) until the number is between 1 and 10 AND the number of _____ moved will = ____

  -If no _____ is present, assume it is at the _____!

Move _____: N is _____

Move _____: N is _____

*Example:

-Need to move decimal until number is between ___ and ____

-Which way is it moving?:

-Count the number of _____ moved (___) to give X 10^N

-More Examples:

a) 0.00002789
b) 1,230
c) 99,800,000,000
d) 0.0071

-Express _____ in STANDARD NOTATION:

Move decimal _____ as before!

- Accuracy vs. Precision

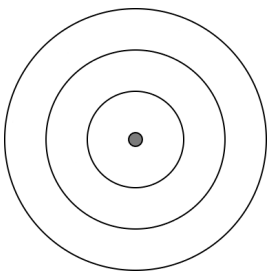
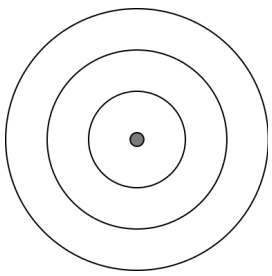
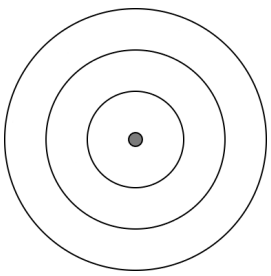
-**ACCURACY**:

-**PRECISION**:

*Tools with _____ numbers after the decimal = _____ precise

**WHEN MAKING _____, IT'S GOOD TO HAVE _____!!

-Dartboards: (draw the darts for each AND label the type):

- Precise vs. Imprecise

  -Example:

  Mass of silver = _____ g
  Mass of silver = _____ g

  -_____ precise measurement will have _____ after the decimal, this means the _____ is more _____!

  -Which is the _____ measurement?

  4.609 Liters 4.6 Liters 5 Liters

- **PERCENT ERROR**:

  -Equation:

  -Example: Sally found the mass of a _____ sample to be _____. What is the % error in her measurements?

- Measurements

  -Quantities that have both a _____ and a _____

  -Fundamental to _____ so it is important to _____ measurements and determine if a measurement is _____

  WITHOUT _____ MEASUREMENTS, THE _____ OBTAINED IN THE LAB WILL BE _____!!

- Making Measurements

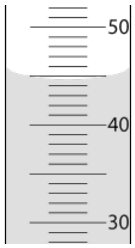
  -In making a measurement, write down all of the _____ (exact) digits that the _____ gives and also one _____ digit that you _____

  -Why would any digits be uncertain?

  1) Instruments are _____ free of _____

  2) Measuring _____ involves some _____

- Estimating Digits



-**Digital Displays**: _____ on the display is the _____ digit

-**Scales**: With _____ the bottom of the _____ surface (_____) is where the reading is taken… estimate the _____ digit

*MUST READ THE _____ AT _____ FOR AN _____ READING IN LAB!!

- **SIGNIFICANT FIGURES ("SIG FIGS")**:

  -Rules:

  1) All _____ digits are significant

  2) Zeros _____ other sig figs _____
     Ex:

  3) Zeros at the ____ before an implied _____ don't count (if it's there then they do)
     Ex:

  4) When a number is _____ than one, zeros before the _____ S.F. don't count
     Ex:

  5) Zeros after a _____ do count (once you have a S.F.)
     Ex:

- Rounding with Sig Figs

  -If digit to the right is **LESS** than 5… _____!!

  (Ex: 56.43 with 3 Sig Figs would be _____)

  -If digit to the right is **GREATER** than 5… _____!!

  (Ex: 67.39 with 3 Sig Figs would be _____)

  -If digit to the right **EQUALS** 5… _____!!

  (Ex: 94.65 with 3 Sig Figs would be _____, while 94.75 with 3 Sig Figs would be _____)

- Math with Sig Figs

  -**Multiplication and Division**: Count SIG FIGS in each separate term and use the _____ amount in the answer!

  Ex: 3.052 X 2.10 X 0.75 =
  CORRECT SIG FIGS =

-**Addition and Subtraction**: Count DECIMAL PLACES in each separate term and use the _____ amount in the answer!

Ex: 3.45645 mL – 2.43 mL =
CORRECT SIG FIGS =

- Sig Fig Practice

-How many _____ are in these numbers?

1) 91,600

2) 0.003005

-Calculate and _____ using the appropriate rule:

3) 0.04216 + 0.0004134 =

4) (5.610) X (34.908) X (2.30) =

- SI Units

-English system is not used in _____, instead we will use the International System of Units (_____)

-Decimal based system (_____ conversions)… makes sharing _____ easier

-Seven Base Units are used (only look at five for now)

Mass ➔ _____
Length ➔ _____
Temperature ➔ _____
Time ➔ _____
Amount ➔ _____

- Non SI Units

-Two units used in _____ that are _____ SI units

Volume ➔ _____
Temperature ➔ _____

-To these base units (grams, liters, seconds, meters) _____ are attached to make the new unit _____ or _____ than the base unit…

- Prefixes

M (mega) = _____ c (centi) = 10^{-2}

k (kilo) = 10^{3} m (milli) = _____

D (deka) = 10^{1} μ (micro) = 10^{-6}

d (deci) = _____ n (nano) = _____

Positive exponents are _____ than the base unit, while negative are _____!!

-Ex: 1 km = _____ m (KILO is _____!)

-Ex: _____ mm = 1 m (MILLI is _____!)

- **DERIVED UNITS**:

-Examples:

- Which Unit Should Be Used?

a) Length of an _____ (mm or km)

b) Amount of water contained in a _____ (μL or kL)

c) Mass of piece of _____ (dg or mg)

d) Time it takes to _____ your eye once (ks or ms)

- **TEMPERATURE**:

-Use a _____ to measure

-Water **FREEZES** at _____ and **BOILS** at _____

-Zero point on the _____ scale is **ABSOLUTE ZERO** (_____)

- Temperature Conversions

-Equations to know:

FAHRENHEIT TO **CELSIUS**	**CELSIUS** TO **FAHRENHEIT**	**CELSIUS** TO **KELVIN**
$C = .56 \times (F - 32)$	$F = (1.8 \times C) + 32$	_____

-Example: What is _____ expressed in Kelvin?

- Conversion Factors

  -Amounts can be expressed in different _____ ways

  -Some Common Conversions:

1 in = 2.54 cm	1 m = 1000 mm	1 mL = 1 cm^3
1 ft = 12 in	_____ = 1 km	1000 mL = _____
1 yd = _____	1 g = _____	1 min = 60 s
1 mi = 5280 ft	1 g = 100 cg	1 hr = _____
1 m = 10 dm	1 g = 1000 mg	1 day = 24 hr
1 m = _____	1000 g = _____	365 days = _____

- Dimensional Analysis: Way to analyze and solve problems using the units of the measurements (conversion factors)

  -Steps:

  1) Start with what is _____

  2) Determine what _____ you must end up in

  3) Multiply what is given by a _____ that will _____ out the starting unit

  4) Continue _____ by conversion factors until the desired unit is reached

  5) Do the _____… multiply across the top, then divide

  In these problems, the UNITS ARE YOUR _____… LET THEM _____ THE WAY!!!

  -Example: What is _____ expressed in meters?

  **In order to cancel a unit, one must be on the "_____" and the other must be on the "_____" (immediately write the top unit on the _____ for the conversion factor)!!

  -More Examples: (SHOW ALL WORK!)

  a) 3.48 g to ____

b) _____ L to mL

c) 66 mm to _____

d) 1.130 days to ____

- **DENSITY**:

-Which is heavier a pound of _____ or a pound of _____?

-People say "_____" because they are confusing _____ with _____

D =

-Units are _____ or _____

-**INTENSIVE PROPERTY**:

-If _____ is given, mass or volume could be determined…

M = **V** =

-Practice:

a) A piece of wood has a mass of _____ and a volume of 23 mL. What is the density?

b) Mercury metal is poured into a graduated cylinder that holds _____. The mercury used to fill the cylinder weighs 0.3060 kg. Calculate the density (in g/cm^3) of mercury.

c) A piece of wood has a density of 0.82 g/mL and a volume of _____. What is the mass of the wood in mg?

d) Aluminum has a density of _____ g/cm^3. What is the mass (in kg) of a cube with a side of 6.78 cm?

- Density of Water

  -Liquid water at room temperature will have a density of _____

  -When water becomes ice it's density actually _____ (0.92 g/cm^3)… due to the shape the crystals form that trap _____ inside (about _____ of ice is below water and the rest is above)

- How Does Something Float?

  -Lower density items _____ on higher density items… ice is _____ than water!

  -Most _____ is less dense than water

  -Helium is less dense than _____

  -A _____ is less dense than water

- Density and Temperature

  -If temperature _____, density will _____

  -If temp _____, generally density will _____

- Lava Lamp Density

  *LABEL THE DIAGRAM WITH EACH STEP NUMBER!

  1) Heat from _____ transferred to the coil and _____ the "lava"

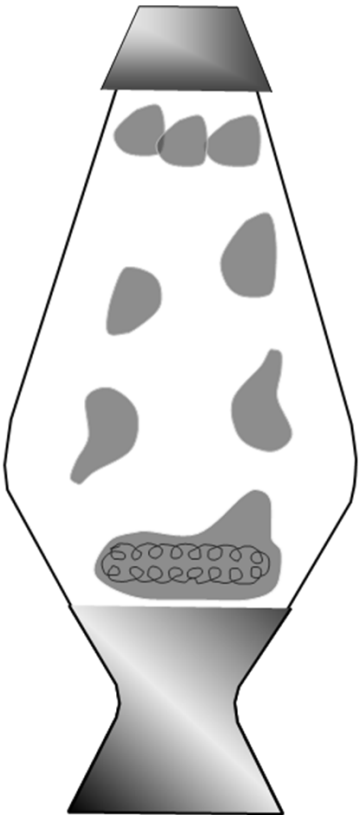
  2) As the temperature _____, the lava density _____ BELOW the density of the liquid, making it _____ up

  3) At the top away from the _____, the temperature of the lava begins to _____

  4) As the temperature _____, the lava density _____ ABOVE the density of the liquid, making it _____ down

  5) Lava _____ the coil and the process _____

  ****THE LAVA LAMP _____ BECAUSE OF _____!!!**



- **MATTER**:

  -**MASS**:

  -**WEIGHT**:

  *MASS _____ WEIGHT!

  -Three States of Matter

  - **SOLID**: definite _____, definite _____, high _____, not easily _____, _____ moving particles
  - **LIQUID**: _____ shape, _____ but has a definite volume, not easily compressed
  - **GAS**: _____ shape, _____ volume (takes the shape of the container), _____ density, easily compressed, _____ moving particles (**VAPOR** = _____ state that is liquid or solid)

  -**KINETIC MOLECULAR THEORY**:

- Phase Changes

***Substances can change phase by _____ or _____ energy!!!**

-**MELTING**:

-**FREEZING**:

-**EVAPORATION**:

-**CONDENSATION**:

-**SUBLIMATION**:

- Describing Matter

  -**INTENSIVE PROPERTY**:

  Ex:

  -**EXTENSIVE PROPERTY**:

  Ex:

- Types of Properties

  -**PHYSICAL PROPERTY**:

  Ex:

  -**CHEMICAL PROPERTY**:

  Ex:

- Types of Changes

  -**PHYSICAL CHANGE**:

  Ex:

  -**CHEMICAL CHANGE**:

  Ex:

- **MIXTURE**:

  -Two Types

  - **HOMOGENEOUS**:

    Ex:

  - **HETEROGENEOUS**:

    Ex:

- **SOLUTION**:

  -**SOLUTE**:

  -**SOLVENT**:

Solution	Solute	Solvent
Lemonade		
Soda pop		
Ocean water		

-**INSOLUBLE**:

-**SOLUBLE**:

- What Affects Solubility Rate?

  1) _____: increasing the _____ will _____ the dissolving rate

  2) _____: _____ will increase dissolving rate

  3) _____: the greater amount of _____ that is added, the _____ soluble it will become

  4) _____: more surface area a solute has, the _____ its dissolving rate will be

- Separating Mixtures

  -Differences in _____ properties can be used to separate mixtures

  1) **DECANT**: _____ one layer leaving behind another layer of a mixture (_____)

  2) **FILTRATION**: separates a _____ from the _____

  3) **MAGNET**: removes substances that are _____ (ex: _____ filings)

  4) **CHROMATOGRAPHY**: separates _____

  5) **DISTILLATION**: uses a difference in _____ of two substances to separate them

- **PURE SUBSTANCE**:

  -Two Types

  - **ELEMENT**:

    Ex:

  - **COMPOUND**:

    Ex:

- Chemical Symbols

  -Each element has a _____ or _____ letter symbol

  -First letter is always _____ and the second letter (if present) is _____

  -Ex:

  -Sometimes the symbols come from the _____ name (ex:_____)

- **CHEMICAL REACTION**:

  ***Basically, a _____ has taken place…**

  -**REACTANTS**:

  -**PRODUCTS**:

  -Examples:

- Chemical Reaction Indicators

  1) Energy Transfer ➔

  Ex:

  2) Color Change ➔

  Ex:

  3) Production of Gas ➔

  Ex:

  4) **PRECIPITATE ➔**

  Ex:

  ***ONLY CAN BE _____THAT A _____ TOOK PLACE, IF THE SUBSTANCE _____!!**

- Reaction Laws

  -**LAW OF CONSERVATION OF ENERGY**: Energy can neither be _____ nor _____… only changed from one _____ to another!

  Ex:

-**LAW OF CONSERVATION OF MASS**: Mass can neither be _____ nor _____… Total mass in the universe is _____!

Ex:

-**LAW OF CONSERVATION OF MASS / ENERGY**: Total _____ of mass and energy in the universe is a _____!

Ex:

- **ENERGY**:

-_____ is the SI unit for energy

-Another common unit is _____

-1 calorie = _____ Joules

-1 kilocalorie = _____ calories

- **THERMODYNAMICS**:

-Energy is _____ in a chemical reaction (_____ to _____)

-**HEAT** (_____) is also usually produced or absorbed

  - **SYSTEM**:
  - **SURROUNDINGS**:

- Heat Transfer

-**EXOTHERMIC**:

Ex:

-**ENDOTHERMIC**:

Ex:

- **HEAT CAPACITY**:

-_____ Property… depends on how much! (Ex: _____ vs. _____)

-**SPECIFIC HEAT CAPACITY** (*C* or *Cp*):

-Water has a _____ *Cp* (4.184 J/g°C)… need _____ heat to raise the temperature

-Metals have a _____ *Cp*… _____ heat needed to raise the temperature

- Specific Heat Problems

  -Units are usually _____ or _____

  -Equation:

  q = _____ (Joules)

  m = _____ (grams)

  c = _____

  ΔT = _____ Temp – _____ Temp (°C)

  -Example: When _____ of heat is added to _____ of olive oil at 21°C, the temperature increases to 85°C. What is the specific heat of the olive oil?

  -Example: How many calories does _____ of water absorb when it is heated from 25.0°C to 80.0°C?

- **CALORIMETRY**:

  -**CALORIMETER**: _____ used to measure _____ (ex: _____… good insulators)

  -**ENTHALPY (H)**: measure of _____ as heat

  _____ = _____

  *Heat gained by system will be _____ as heat lost by surroundings (and vice versa)!
  Ex: Place a hot piece of metal in water

  -Example: An unknown metal with a mass of _____ grams is heated to a temperature of 80.0°C. It is then placed in _____ grams of water that is at a temperature of _____. The temperature of the water and metal then rise to a temperature of 23.5°C. What is the specific heat of the metal?