

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

Type	Definition / Examples
ORGANIC:	
INORGANIC:	
ANALYTICAL:	
BIOCHEMISTRY:	
PHYSICAL:	

- Types of Chemistry

Type	Definition / Examples
PURE CHEMISTRY:	
APPLIED CHEMISTRY:	

- Observations

Type	Definition / Examples
QUALITATIVE:	
QUANTITATIVE:	

- Scientific Notation

-Short cut for writing _____ or _____ numbers

-Always contains a number greater than ____ and less than ____ followed by $\times 10^N$ (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 $\times 10^N$

-More Examples:

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

-Express _____ in STANDARD NOTATION:

Move decimal _____ as before!

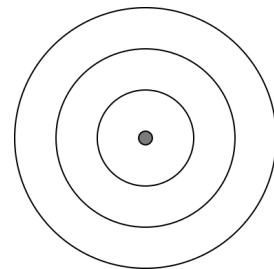
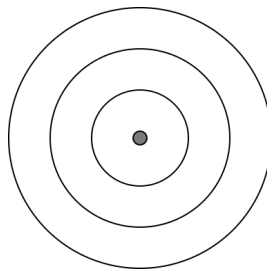
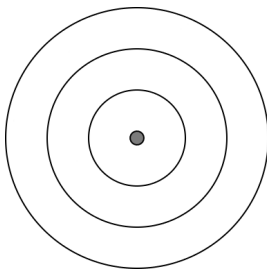
• Accuracy vs. Precision

Type	Definitions / Examples
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

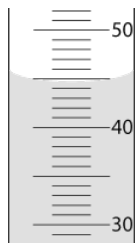
-In making a measurement, write down all of the _____ (exact) digits that the _____ gives and also one _____ digit that you _____

-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: $3.052 \times 2.10 \times 0.75 =$
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) $(5.610) \times (34.908) \times (2.30) =$

- SI Units

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

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

- Non SI Units

-Two units used in chemistry that are NOT 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 _____!)

- 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)

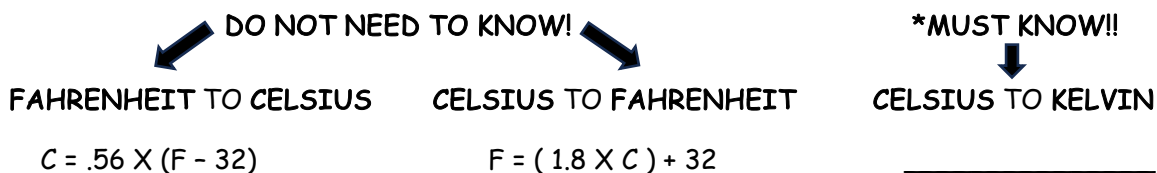
- **TEMPERATURE:**

-Use a _____ to measure

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

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

- Temperature Conversions



-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 cm³

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!)

Example	Work / Answer (with CORRECT Sig Figs)
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:

Example	Work / Answer (with CORRECT Sig Figs)
A piece of wood has a mass of _____ and a volume of 23 mL. What is the density?	
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.	
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?	
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/cm³)... 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"

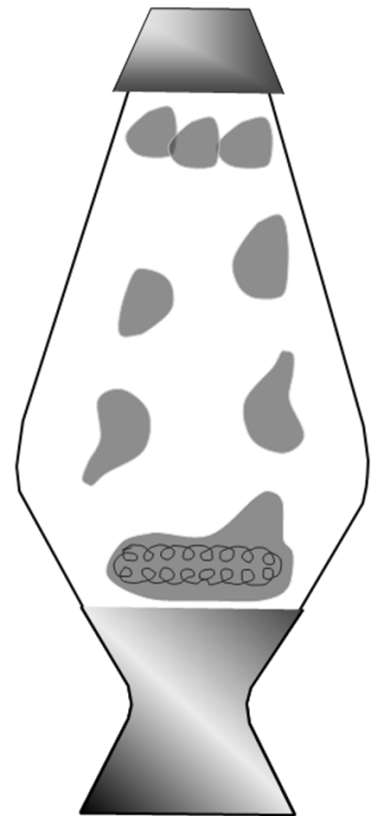
2) As the temperature _____, the lava density _____
BELOW the density of the liquid, making it _____ up

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!!!

Phase Change	Definition / Examples
MELTING:	
FREEZING:	
EVAPORATION:	
CONDENSATION:	
SUBLIMATION:	

- Describing Matter

Type	Definition / Examples
INTENSIVE PROPERTY:	
EXTENSIVE PROPERTY:	

-Types of Properties

Type	Definition / Examples
PHYSICAL PROPERTY:	
CHEMICAL PROPERTY:	

- Types of Changes

Type	Definition / Examples
PHYSICAL CHANGE:	
CHEMICAL CHANGE:	

- MIXTURE:

-Two Types

Type	Definition / Examples
HOMOGENEOUS:	
HETEROGENEOUS:	

- SOLUTION:

Parts of Solutions	Definition / Examples
SOLUTE:	
SOLVENT:	

- Examples

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

Type	Definition / Examples
ELEMENT:	
COMPOUND:	

- 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

Indicator	Definition / Examples
1) Energy Transfer	
2) Color Change	
3) Production of Gas	
4) PRECIPITATE	

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

- Reaction Laws

Law	Definition / Examples
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:

- 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

Type	Definition / Examples
EXOTHERMIC:	
ENDOTHERMIC:	

- **HEAT CAPACITY:**

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

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

-Water has a _____ C_p ($4.184 \text{ J/g}^\circ\text{C}$)... need _____ heat to raise the temperature

-Metals have a _____ C_p ... _____ heat needed to raise the temperature

- Specific Heat Problems

-Units are usually _____ or _____

-Equation:

$$q = \text{_____ (Joules)}$$

$$m = \text{_____ (grams)}$$

$$c = \text{_____}$$

$$\Delta T = \text{_____ Temp} - \text{_____ Temp } (^\circ\text{C})$$

-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

$$\text{_____} = \text{_____}$$

*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?