**• 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 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 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

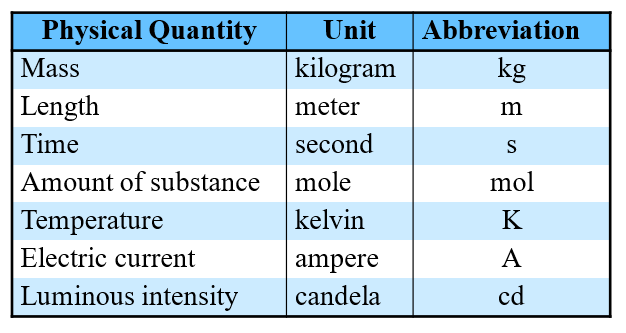
-Calculate and \_\_\_\_\_\_\_\_ using the appropriate rule: 3) 0.04216 + 0.0004134 = 4) (5.610) X (34.908) X (2.30) =

**• 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)

**•**

**Non SI Units**

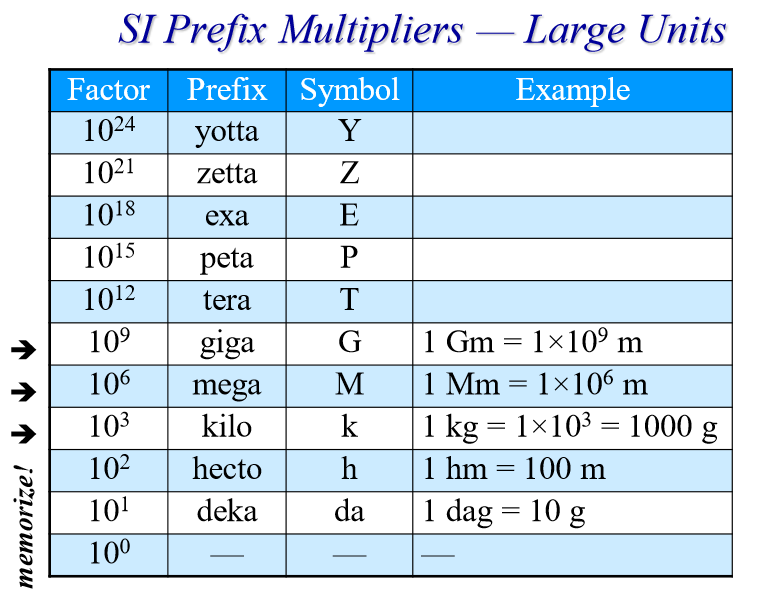
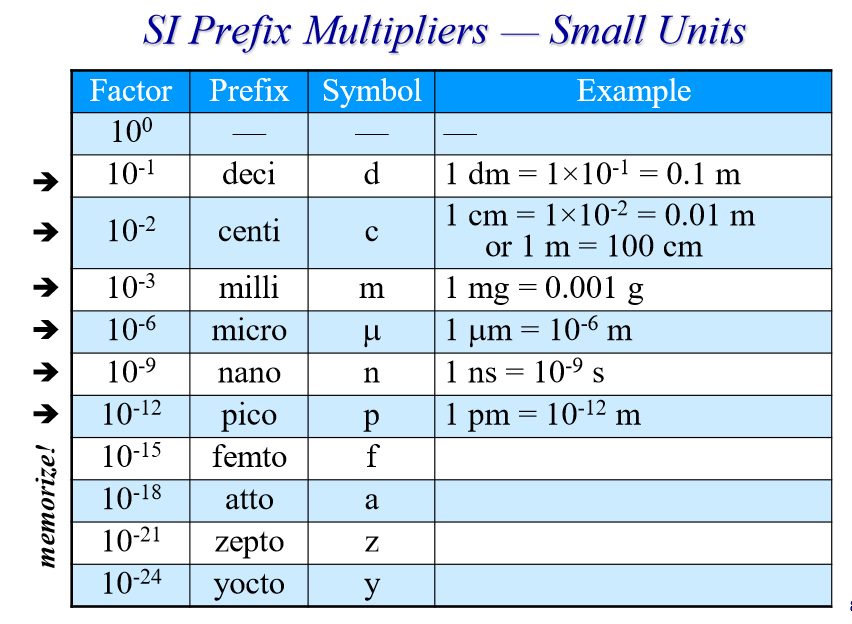
-Two units used in \_\_\_\_\_\_\_\_\_\_\_\_\_ that are \_\_\_\_\_\_ SI units

Volume=\_\_\_\_\_\_\_\_\_\_\_\_\_ Temperature= \_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

**PRACTICE: 9 sentences…**

**• Prefixes**

M (mega) = \_\_\_\_ k (kilo) = 103 D (deka) = 101 d(deci) = \_\_\_\_

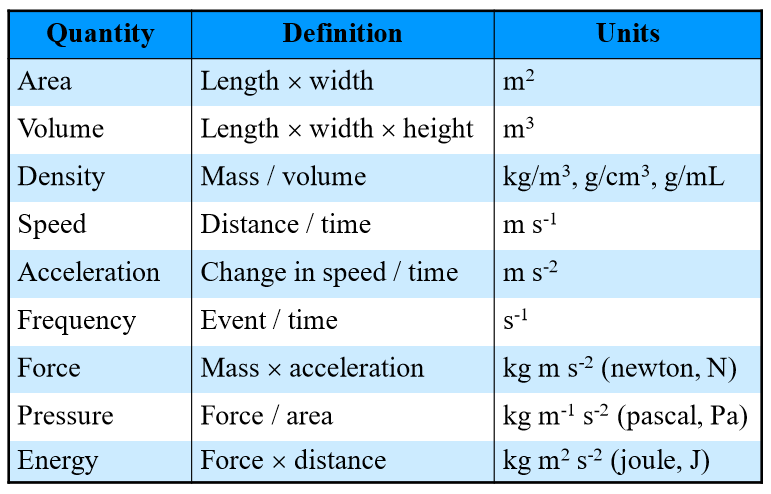
c (centi) = 10-2 m m(milli) = \_\_\_\_ µ (micro) = 10-6 n (nano) = \_\_\_

*Positive exponents are \_\_\_\_\_\_\_\_\_\_\_ than the base unit, while negative are \_\_\_\_\_\_\_\_\_\_\_*

-Ex: 1 km = \_\_\_\_\_\_\_\_\_\_ m (KILO is \_\_\_\_\_\_\_\_\_\_)

-Ex: \_\_\_\_\_\_\_\_\_ mm = 1 m (MILLI is \_\_\_\_\_\_\_\_\_\_)

**• DERIVED UNITS:**



• Which Unit Should Be Used?

a) Length of a marathon (mm or km)

b) Amount of water contained in a soda can (mL or kL)

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

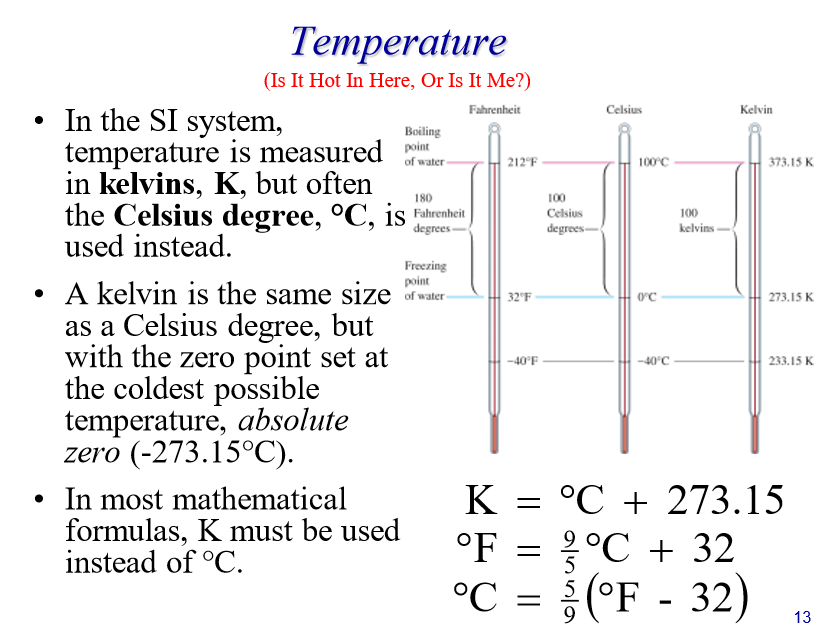
d)Time it takes to blink your eye once (ks or ms)

e) Number of waves that pass by per second (m/s, Hz)

f) The force of the atmosphere on the top of your head (J, Pa, N)

g) The amount of energy in a bag of popcorn (J, N, Pa)

**• TEMPERATURE:**

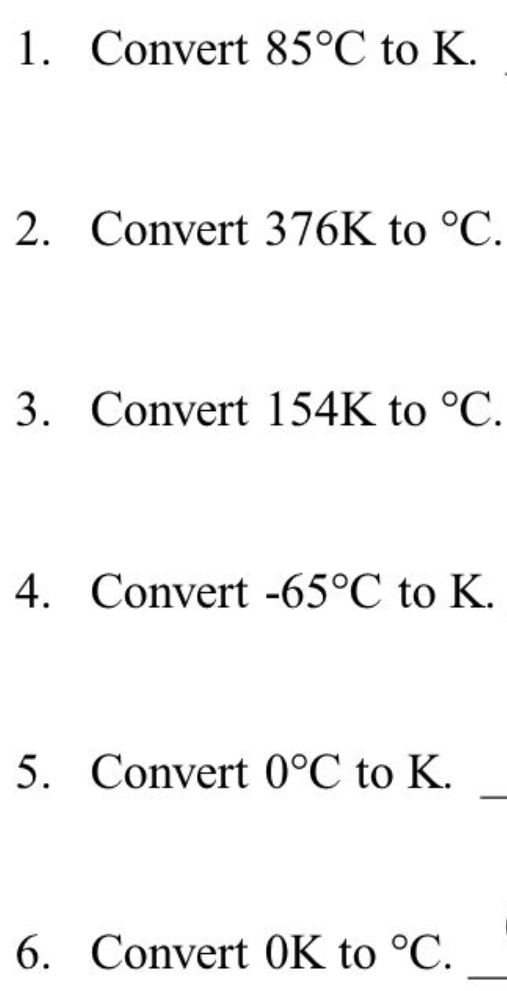
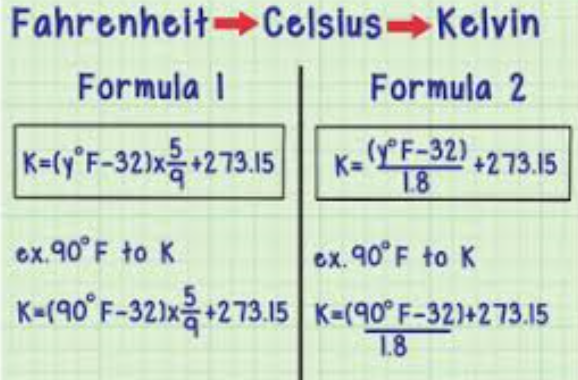
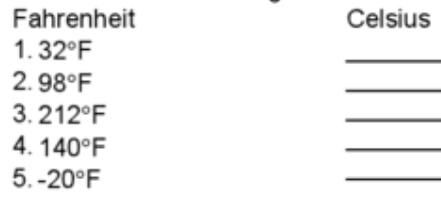
-Water FREEZES at \_\_\_\_\_\_\_ and BOILS at \_\_\_\_\_\_\_\_

-Zero point on the \_\_\_\_\_\_\_\_\_\_ scale is ABSOLUTE ZERO (\_\_\_\_\_\_\_\_\_\_)

-Room Temperature= \_\_\_\_\_\_\_°C or \_\_\_\_K

-Human Body Temperature= 98.6°F or \_\_\_\_\_°C or \_\_\_\_\_K

• **Temperature Conversions Practice:**

**• Conversion Factors**

-Amounts can be expressed in different \_\_\_\_\_\_\_\_\_ ways

-Some Common Conversions:

1 in = 2.54 cm 1 ft = 12 in 1 yd = \_\_\_\_\_ 1 mi = 5280 ft 1 m = 10 dm 1 m = \_\_\_\_\_\_\_

1 m = 1000 mm \_\_\_\_\_\_\_\_ = 1 km 1 g = \_\_\_\_\_\_\_ 1 g = 100 cg 1 g = 1000 mg 1000 g = \_\_\_\_\_\_\_

1 mL = 1 cm3 1000 mL = \_\_\_\_\_ 1 min = 60 s 1 hr = \_\_\_\_\_\_\_ 1 day = 24 hr 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

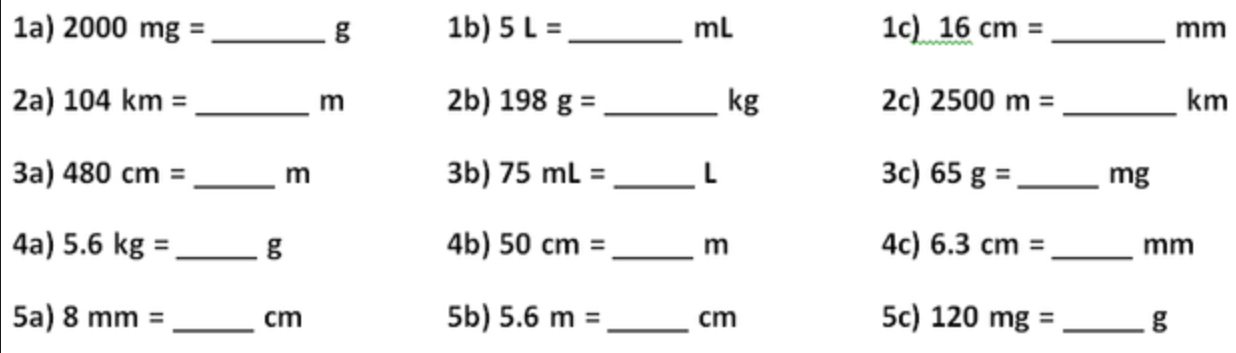
5) Do the \_\_\_\_\_\_\_\_… multiply across the top, then divide

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

-Example: What is 258 cm 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)!!

-Examples: (SHOW ALL WORK!)

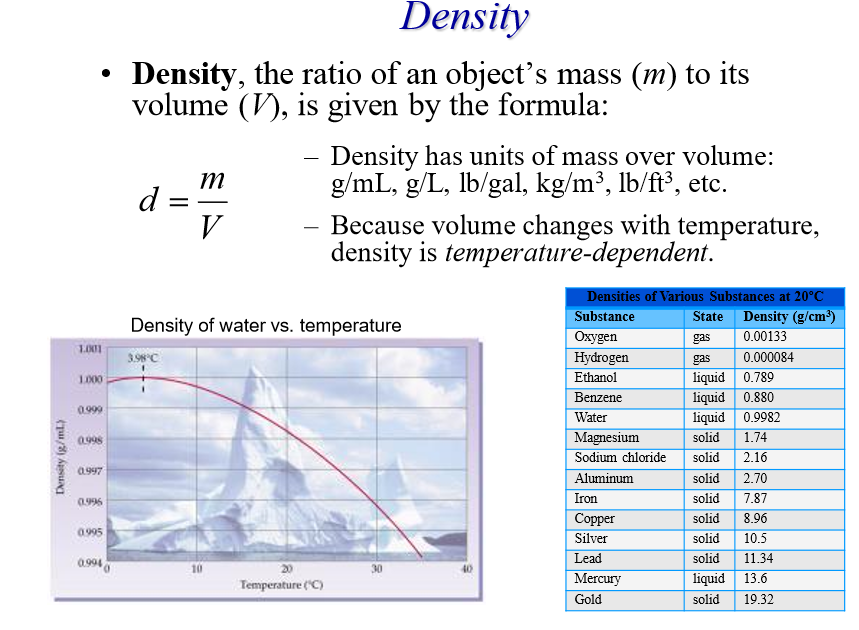


|  |
| --- |
| WORK SPACE: |

Tougher conversion problems:

|  |
| --- |
| Convert 164 inches to meters |
| Convert 102,780,000 seconds to days |
| Conver 144 oz to liters |
| Convert 100 Km/hr to m/s |

**• DENSITY:**



**-INTENSIVE PROPERTY:**

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

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/cm3) of mercury.

c) A piece of wood has a density of 0.82 g/mL and a volume of 10 mL (= 10 cm3). What is the mass of the wood in mg?

d) Aluminum has a density of \_\_\_\_\_\_ g/cm3. 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!

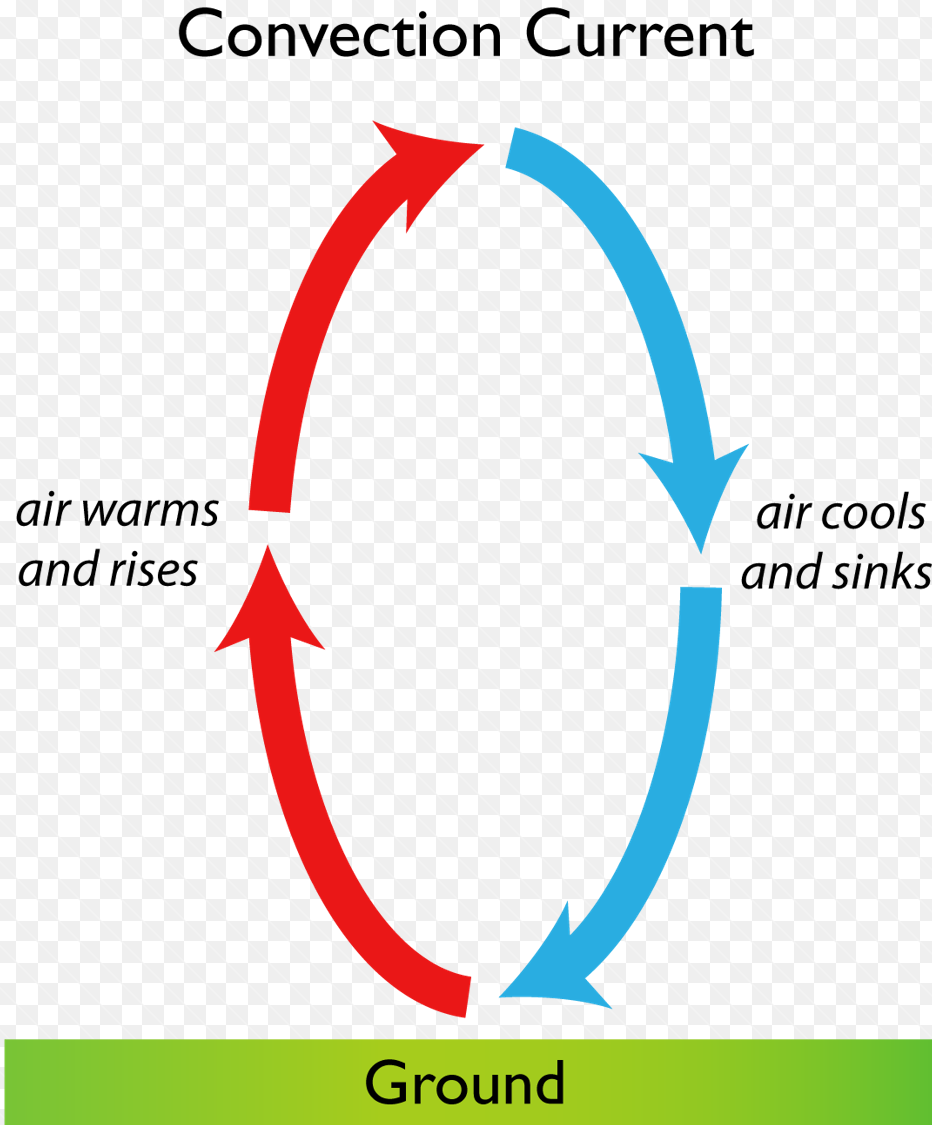
-Most ALL \_\_\_\_\_\_\_\_\_ solids less dense than water---

-Helium is less dense than \_\_\_\_\_\_

-A \_\_\_\_\_\_\_\_\_ is less dense than water

• **Density and Temperature** - cause \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ currents.

**• Lava Lamp Density \*Wind and wind patterns**



Without a large ΔT, or large **difference in temperature**, the convection process will slow down and eventually stop.

• MATTER:

-MASS:

-WEIGHT:

\*MASS \_\_\_\_\_\_\_ WEIGHT!

-Three States of Matter

o SOLID: definite \_\_\_\_\_\_\_\_\_, definite \_\_\_\_\_\_\_\_\_, high \_\_\_\_\_\_\_\_, not easily \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_ moving particles

o LIQUID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ shape, \_\_\_\_\_\_\_\_ but has a definite volume, not easily compressed

o 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:

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• 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

o HOMOGENEOUS:

Ex:

o HETEROGENEOUS:

Ex:

• SOLUTION:

-SOLUTE:

-SOLVENT:

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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

o ELEMENT:

Ex:

o COMPOUND:

Ex:

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• 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 è Ex:

2) Color Change è

Ex:

3) Production of Gas è Ex:

4) PRECIPITATE è 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:

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-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 Cal (kilocalorie) = \_\_\_\_\_\_\_ calories

• THERMODYNAMICS:

-Energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in a chemical reaction (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_)

-HEAT (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) is also usually produced or absorbed o SYSTEM:

o 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

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• Specific Heat Problems

-Units are usually \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_

-Equation:

q = \_\_\_\_\_\_\_\_\_ (Joules) m = \_\_\_\_\_\_\_\_ (grams) c = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ DT = \_\_\_\_\_\_\_\_\_\_\_ 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)!

-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?