***Q1T2 MATTER & ENERGY*** Unit Study Guide:

1. **Physical vs. chemical** 
   1. Properties (definitions and examples)
      1. Intensive vs. extensive
   2. Changes (definitions and examples)
   3. Additional key vocabulary you must know:
      1. Solubility (soluble or insoluble)
      2. Luster, hardness
      3. Combustion, flammability
      4. Oxidation/Corrosion (rusting)
      5. Conductivity (conductor of heat and electricity)
      6. Malleability and ductility
2. Define **Potential energy** vs. **kinetic energy**
   1. PE 🡺 KE is exothermic (heat energy released)
   2. KE 🡺 PE is endothermic (heat energy absorbed)
3. Definition of **temperature** and the **Celsius vs. Kelvin scales**; use water as a reference substance for mp/fp and bp/cp temperatures
4. **Classification of matter**
   1. Pure substance vs. mixture
   2. **Pure substance element**
      1. Made of unique atoms
      2. Monatomic vs. diatomic elements
      3. Particle diagram representation for both
      4. **Cannot be chemically decomposed**.
      5. Given a Periodic table 🡪 metals vs. nonmetals (staircase dividing line)
   3. **Pure substance compound**
      1. Classify as Ionic vs. Covalent (molecular) compounds
      2. **CAN be chemically decomposed back into elements**
      3. **Fixed element ratios** (Law of definite proportions)
      4. Particle diagram representations
   4. **Mixtures** 🡺 **vary in compositions** 🡪 recognize examples of each type below and be able to draw or label particle diagrams for each.
      1. Homogenous 🡪 visibly uniform 🡪 also called solutions 🡪 can be solid, liquid or gas phase 🡪 when a solid dissolves fully in water to form aqueous solution symbolized as (aq)
      2. Heterogenous 🡪 not visibly uniform 🡪 think   
         “oil and water”
   5. **Physical separation techniques** [mixtures back to pure substances]
      1. Filtration
      2. Distillation
      3. Chromatography
   6. **Phases (states) of matter**
      1. **Solid vs. liquid vs. gas**

* Characteristics of the three phases in terms of:
  + Shape
  + Volume
  + Particle arrangement
  + KE
  + Entropy
  + Compressibility
  1. **Phase changes** 🡪 know the definitions and be able to identify each 🡪 which are endothermic or exothermic 🡪

Freezing [or solidification or crystallization] ⬄melting (fusion

Evaporation ⬄condensation

Sublimation ⬄ deposition

* 1. **Heating vs. cooling curves**
     1. Recognize a curve as a heating curve or a cooling curve
     2. Solid vs. liquid vs. gas phases
     3. Where do the phase changes occur?
     4. Where does temperature change? Symbolized as ΔT
     5. Where does PE change and where is PE constant?
     6. Where does KE change and where is KE constant?
  2. **Phase diagrams**
     1. Solid vs. liquid vs. gas regions
     2. mp/fp identification
     3. bp/cp identification
     4. solid-liquid + slope vs. – slope line
     5. triple point
     6. critical point (critical temp and critical pressure)

*5.* **Energy, heat and heat calculations**

🡺 Define **energy**

🡺Using **Energy = heat + work** what two things is energy really good for?

🡺 Define potential and kinetic energy

🡺 In calorimetry, work = 0. What does that mean for us in terms of energy?

🡺What are the **units of energy** we will use?

🡺 What is the conversion factor for J ⬄ cal?

🡺What is the **Law of conservation of energy**?

🡺 Define **Heat**

🡺 Differentiate between the system and surroundings when studying the transfer of energy

🡺 Differentiate between an endothermic and exothermic process

🡺 What is a calorimeter and what is the heat calculation formula we need to use when we do

🡺 Write out the specific heat constant in words

🡺 The c for Aluminum is known to be .900 J/g•°C. How does this compare to the c for water?

* Which will heat up and cool faster?

🡺 What is the heat formula for fusion/freezing? Define each variable and use water for Hf.

🡺 Write the Hf constant in words

🡺 What is the heat formula for vaporizing/condensing? Define each variable and use water for Hv.

🡺 Write the Hv constant in words.

🡺***Hopt****: For any heating or cooling curve we can calculate the heat (q) for each region and then add them all up to get the total q value.*

*🡺 Using – qlost  = + qgained can you determine the specific heat of a metal? (see heat calcs worksheet)*