Physical Science Chapter 4 Notes

What you learned before…

* All matter is made up of \_\_\_\_\_\_\_\_\_\_
  + Particles
* \_\_\_\_\_\_\_\_\_ energy is the energy in motion
  + Kinetic
* Energy can be transferred or changed but it is never \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_
  + Created or destroyed

What you will learn now…

* Temperature depends on kinetic energy
* How temperature is measured
* How changes in temperature can affect matter

Temperature depends on particle movement

* **Kinetic Theory of Matter**
  + All particles that make up matter are constantly in motion
  + Helps explain solid, liquid, and gases
  + Particles in a **solid** aren’t very free to move. Vibrate back and forth, held tightly together by forces of attraction
  + Particles in a **liquid** move freely, constantly sliding past and tumbling over each other
  + Particles in a **gas** are far apart and move at high speeds, might collide but typically don’t interact with other particles

Temperature and Kinetic Energy

* *Temperature*: measure of the average kinetic energy of all particles in an object
* The warmer the temperature, the more quickly the particles are moving, the higher average kinetic energy
* The cooler the temperature, the more slowly the particles are moving, the lower average kinetic energy

Temperature doesn’t just measure speed of particles

* measure of average kinetic energy of the particles
* KE depends on both mass and speed
* How does temperature change if KE was increased??

Measuring Temperature

* Fahrenheit, Celsius, Kelvin
* Fahrenheit – most common, pure water freezes at 32 degrees and boils at 212 degrees
* Celsius – scientific scale, pure water freezes at 0 degrees and boils at 100 degrees
* Kelvin – absolute zero, there are no negatives
* Would you need a coat if I told you it was 30 degrees outside?
* *Thermometers*: typically the liquid inside the thermometer expands or contracts in a response to the temperature of what you are measuring
  + Liquid filled – measure how much the liquid expands in a narrow tube as temperature increases
  + **Thermal Expansion :** why liquid filled thermometers work
    - Affects many substances
    - Occurs in most solids and all gases

Energy Flow

* From warmer objects to cooler objects
* Heat is different from temperature
  + **Heat** is the flow of energy from an object at a higher temperature to an object at a lower temperature
  + Thermal energy: total random kinetic energy of particles in an object
  + Temperature is an *average*, thermal energy is a *total*

Measuring Heat

* **Calorie** (c) : amount of energy needed to raise the temperature of 1 gram of water by 1 degree Celsius
* **Joule** (J) : standard scientific unit of energy
* 1 calorie = 4.18 joules
* calorie and Calorie (C) aren’t the same thing
  + In food, one Calorie is actually a kilocalorie or 1000 calories
  + Calorimeter – burn the food and measure the amount of energy released through heat

Specific Heat

* Some substances change temperature easily when compared to others
* High specific heat : that substance has to absorb large quantities of energy for its temperature to increase and must release a large quantity of energy for its temperature to decrease
* Thermal energy also depends on object’s mass because TE is total KE of all particles in an object
  + Temperature of large bodies of water change slowly… lot of mass, lot of particles

Heat Transfer

* **Conduction**: transfer of energy through touching
  + Conductors: transfer heat easily
    - What are wires made out of in walls? Why?
  + Insulators: poor conductors of heat
    - Why do you think this is important when talking about insulation in your house?
* **Convection**: transfer of energy through movement of large numbers of particles in the same direction in a liquid or gas
  + Warm water is less dense than cold water
  + Temp increases, molecules spread out, become less dense
* **Radiation:** energy traveling in waves
  + Electromagnetic waves: visible light, microwaves, infrared light
  + Can travel through empty space