Energy

(The Ability to do Work)

I. Forms of Energy
- A. Mechanical energy - energy used to exert a force and produce motion.
- B. Heat energy - the energy associated with the temperature of a body
- C. Radiant energy - the energy associated with electromagnetic energy (light, radio, x-ray)
- D. Chemical energy - energy associated with chemical change (the breaking and forming of bonds)
  1. Exothermic Reactions - excess heat energy is given off
     a. energy required to break the existing bonds is less than the energy given off as new bonds are formed
  2. Endothermic Reactions - heat energy is absorbed
     a. The energy required to break the existing bonds is greater that the energy given off in the formation of new ones.
  3. Calorimeter – instrument used to measure the energy absorbed or released as heat in a chemical or physical change
- E. Nuclear energy - fission and fusion reactions which split or combine atoms, changing their mass.

II. Types of Energy
- A. Potential energy - the energy of position (stored energy)
- B. Kinetic energy - the energy of motion

III. Law of the Conservation of Energy and Mass - Energy may be converted from one form to another, but is never created or destroyed.
- A. Most forms of energy tend to be converted into heat energy
  1. Ex. Potential Energy in gasoline undergoes chemical reaction (combustion) and is converted to mechanical energy and heat energy.

IV. Measurement of Energy - (Calorimetry)
- A. Basic Unit of Energy is the *joule*
- B. 1 calorie = 4.18 joules
- C. 1 calorie = amount of energy required to raise the temperature of 1g of water 1 degree Celsius
  1. calories = mass of H_2O X change in temperature (Dt) 1kcal = 1000cal (1kj=1000j)
- D. Specific Heat - the amount of heat energy required to raise the temperature of 1 gram of the material, one degree celsius
  1. Heat = Mass X Specific Heat X Dt (Q=mCDT)
     a. Ex. H_2O = 4.2 j/g °C
     b. Ex. Fe = 0.449 j/g °C