APES “CHEMISTRY REVIEW” NOTES: MATTER & ENERGY

I. Matter
A. SUBSTANCE—{ELEMENTS & COMPOUNDS} matter with a definite composition: C, H₂O, NaCl, NH₃

B. Properties of Matter—characteristics; can be physical or chemical:
   - conductivity
   - density
   - solubility
   - melting point
   - boiling point
   - malleability
   - ductility
   - refractive index
   - odor

   1) PHYSICAL PROPERTY—characteristic that can be observed and measured without changing the chemical composition of the substance:
      - Intensive property—does not depend on the amount of matter
      - Extensive property—depends on the amount of matter

   2) CHEMICAL PROPERTY—ability to form new substances as a result of chemical reactions (rxns.)

C. States of Matter
   1) SOLID—matter with a definite, fixed shape and volume
   2) LIQUID
      - matter with variable shape and fixed volume
      - exhibits flow
      - takes the shape of its container
   3) GAS
      - matter with variable shape and volume
      - exhibits flow
      - takes the shape and volume of its container
      - GAS is used to describe a substance that is normally stable as a gas at room temperature (“oxygen gas”)
      - VAPOR is used to describe a substance when it found as a gas even though the normal state is not (“water vapor”)
   4) PLASMA
      - low-density ionized gases

D. PHYSICAL CHANGES
   1) alterations that do not change the substance’s identity and composition
   2) e.g.: paper that is shredded is still paper; sugar dissolved in water is still sugar
   3) key words: boil, freeze, melt, condense, dissolve, crush, break, cut…

E. MIXTURES
   1) a physical blend of two or more substances
      (gas-gas, liquid-gas, gas-liquid, liquid-liquid, solid-liquid, solid-solid)
   2) can be HETEROGENEOUS or HOMOGENEOUS
      - HETEROGENEOUS
         - not uniform; has different “phases”
         - e.g.: granite, Italian salad dressing
      - HOMOGENEOUS
         - called a SOLUTION
         - uniform; has one “phase”
         - e.g.: salt water, air
   3) phase—area of uniform composition and properties
   4) can be separated by physical means: evaporation, filtration, distillation, etc.
F. Elements and Compounds
   1) ELEMENT
      • simplest form of matter retaining the properties of that matter
      • e.g.: Ag Pb O W
   2) COMPOUND
      • more than one element in a type of matter
      • can only be separated by chemical methods
      • e.g. NaHCO₃ CO H₂CO CaCO₃

G. CHEMICAL CHANGES
   1) alterations that changes substance’s identity and composition to something new
   2) e.g.: burning firewood, rotting of fruit
   3) key words: rust, decompose, corrode, burn, ferment, grow, decay…

H. CHEMICAL RXNS.—the changing of substance(s) into new ones
   • REACTANTS—starting substances in a rxn.
   • PRODUCTS—new substances formed in a rxn.
     (“Reactants react to produce the products.”)
     H₂SO₄ + 2NaOH → Na₂SO₄ + 2H₂O
     reactants → products
   • clues that a chemical rxn. has occurred:
     energy is given off (gets hotter) production of a solid (precipitate; ppt.)
     energy is absorbed (gets colder) production of a gas
     color change usually not easily reversible
     odor change

I. ENERGY CHANGES IN RXNS.
   1) Exothermic—giving off heat (-ΔH)
   2) Endothermic—absorbing heat (+ H)