

## Mixtures

1. Elements or compounds not chemically bonded.
  - a. Retain chemical identity
  - b. Physical change may occur, or not
  - c. Can be separated into components using physical properties
    - i. filtering
    - ii. Temperature of boiling or melting
2. classification
  - a. pure—only single substance, to a specific level
  - b. impure—a mixture
    - i. heterogeneous—individual substances can be seen
    - ii. homogeneous—same ratio in all parts
      1. solution—all components same phase
      2. suspension—different phases
3. solutions—
  - a. can be solid, liquid or gaseous
    - i. atmosphere
    - ii. salt water
    - iii. white gold
  - b. definitions
    - i. greater component is the solvent
    - ii. lesser components are the solutes
    - iii. concentration: solute amount/ solution amount (not solvent)
      1. saturated: cannot dissolve any more
      2. unsaturated: not at its capacity
    - iv. mole:  $6.02 \times 10^{23}$  number of anything—molecules are small!
      1. one formula mass (in grams) of a substance has one mole of molecules in it
      2. molarity: moles of solute/liters of solution
4. solubility:
  - a. ability to dissolve
  - b. depends on attraction of molecules for one another
    - i. similar between substances: infinitely soluble
    - ii. greater to itself than solvent: weakly soluble
  - c. temperature affects solubility
    - i. commonly elevated with greater temperature
    - ii. change of temperature can cause precipitation
5. soaps and detergents
  - a. induced dipole—induced dipole attraction for grime
  - b. ion—dipole attraction of water
6. softening hard water
  - a. water contains Ca and Mg ions
  - b. pass over Na ion saturated resins, displace Na ions

- 7. water purification
  - a. typical steps
    - i. remove dirt by filtering, coagulation, and settling
    - ii. aerate to improve taste
    - iii. disinfect to neutralize cholera, typhoid fever, dysentery, hepatitis
      - 1. ozone
      - 2. chlorine
      - 3. boiling
      - 4. iodine tablets
      - 5. ultraviolet treatment
    - iv. remove toxic solutes
      - 1. arsenic
      - 2. nitrates
      - 3. organic chemicals
  - b. desalinization—make fresh water from salt water
    - i. brackish groundwater or seawater
    - ii. distillation
      - 1. fuels
      - 2. sunlight
    - iii. reverse osmosis
- 8. wastewater treatment
  - a. similar to purification of natural water sources
    - i. screening, settling of solids
    - ii. disinfect with ozone (preferred), chlorine or UV
    - iii. secondary treatment involves aeration and additional settling
    - iv. tertiary treatment includes filtration