Chapter 1 → Matter and Measurement

Uncertainty in Measurment
- Number associated with measurement is obtained from measuring device
- Measurements *always* have some degree of uncertainty
  - Important to indicate uncertainty

Significant Figures and Calculations
- Rules for counting significant figures
  1) Non-zero integers are always significant
  2) Zeros can be interpreted differently
     a) Leading zeros are zeros that preceed all non-zero digits
        ❖ These are *not* significant
     b) Captive zeros are zeros inbetween nonzero digits
        ❖ These are significant
     c) Trailing zeros are zeros to the right end of a number
        ❖ Only significant if decimal point is present
  3) Exact numbers have ∞ significant figures
- Advantages of Exponential Notation
  1) Easy indicated
  2) Less zeros are needed to be copied

  **Limit the number of significant figures to the number with least amount in the equation

Dimensional Analysis
- Also known as unit factor method
- Used to convert between units

Density
- The mass of a substance per unit of volume of a substance
- $\rho = \frac{m}{V}$
- Density of a liquid can easily be determined by weighing an accurately known volume of a liquid

Classification of Matter

- Matter is anything that has mass and occupies space
- Three states of matter
  - Liquid
    - definite volume; no definite shape
  - Gas
    - No definite volume or shape
      - Highly compressable
      - Easy to decrease volume of a gas (relativly)
  - Solid
    - Rigid; fixed volume and shape
  - Solids and liquids are *slightly* compressable
- Most matter is a mixture of pure substances
  - Examples→ wood, gasoline, wine, soil, air
- Mixtures have variable composition
  - Homogenous
    - Visibly, *indistinguishable* parts
  - Heterogenous
    - Visible, *distinguishable* parts
- Mixtures can be separated by physical means
- Pure substances have a constant composition
  - Can be compounds or free elements
- Boiling and freezing are *physical changes*
- Distilation
  - Proces that depends on differences in volatility
  - Volatility→ how readily substances become gasses
- Filtration
  - Used to separate a mixture of liquids and solids
- Chromatography
  - Uses stationary phase (soilid) and mobile phase (liquid
  - Paper chromatography
    - Porous paper used for stationary phase
    - Drop of liquid is placed on paper then dipped into a liquid
- Compound →substance with constant composition but can be broken down by chemical means
- Chemical change → Given substance becomes a *new* substance with *different properties and composition*
- Elements → cannot be decomposed by chemical or physical means

Temperature Conversions

- $T_K = T_C + 273.15$
- $T_C = (T_F - 32)\left(\frac{5}{9}\right)$
- $T_F = \left(T_C \times \frac{9}{5}\right) + 32$