

Using Scientific Methods

Forensic Science



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The Metric System

- **The worldwide standard for measurements**
- **All measurements have two parts**
 - **A number**
 - **Units**

The Metric System (continued)

- **Based on multiples of ten**
- **Basic Units**
 - Length = meter
 - Volume = liter
 - Mass = gram
 - Time = second
 - Temperature = Kelvin
- **Other Units**
 - Area = m^2
 - $cm^3 = mL$

The Metric System (continued)

- **Metric Prefixes**

- **Smaller**

- **Deci = 1/10**
 - **Centi = 1/100**
 - **Milli = 1/1000**
 - **Micro = 1/1,000,000**
 - **Nano = 1/1,000,000,000**

- **Larger**

- **Deka = 10**
 - **Hecto = 100**
 - **Kilo = 1000**

- **Examples**

- **Centimeter = 1/100 of a meter**
 - **Milligram = 1/1000 of a gram**
 - **Kiloliter = 1000 liters**

The Metric System (continued)

- Remember
 - King Henry Died By Drinking Chocolate Milk
 - Kilo
 - Hecto
 - Deka
 - Base
 - Deci
 - Centi
 - Milli

Dimensional Analysis (Factor-Label Method)

- **Steps**
 - **Write down the given measurement**
 - **Create one or more expressions of the number 1 using the following**
 - **Put the given unit in the denominator (bottom) of the conversion**
 - **Put the unit you want to convert to in the numerator (top)**
 - **For example $100\text{cm}/1\text{m} = 1$ (there are 100cm in 1m)**
 - **Cancel the redundant units (those in both the denominator and the numerator) and solve for the desired unit**

Dimensional Analysis (Factor-Label Method) (continued)

- **Example**
- **Convert 3.60 meters to inches**
 - $\frac{100\text{cm}}{1\text{m}} = 1$
 - $\frac{1\text{in}}{2.54\text{cm}} = 1$
- $3.60\text{m} \times \frac{100\text{cm}}{1\text{m}} \times \frac{1\text{in}}{2.54\text{cm}} = ?$
- $3.60\text{m} \times \frac{100\text{cm}}{1\text{m}} \times \frac{1\text{in}}{2.54\text{cm}} = ?$
- $\frac{3.60 \times 100 \times 1\text{in}}{2.54} = 141.7\text{in} \quad (360 \div 2.54 = 141.7)$

Physical Properties

- **Observed with the senses and can be determined without destroying the object**
- **Examples: color, shape, mass, length, odor, density, melting point, and boiling point**

Chemical Properties

- **Indicate how a substance reacts with something else**
- **The substance is changed while the chemical property is observed**
- **Examples: iron rusting, food digesting, marshmallows burning**

Types of Reactions (Rxns)

- **Synthesis Rxns**

- **Two or more substances combine to form a more complex substance**



***1 product formed**

Types of Reactions (Rxns)

(continued)

- **Decomposition Rxns**

- One substance breaks down to form two or more simpler substances



***1 reactant**

Types of Reactions (Rxnns)

(continued)

- **Single Replacement Rxns**
 - One substance is replaced in its compound by another substance
 - $A + BC \rightarrow AC + B$
 - $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
 - $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

Types of Reactions (Rxns)

(continued)

- **Double Replacement Rxns**
 - Ions of two compounds exchange places to form two new compounds
 - $AB + CD \rightarrow AD + CB$
 - Example: $BaCl_2 + Na_2SO_4 \rightarrow 2NaCl + BaSO_4$

Resources

- **Saferstein, Richard. *Forensic Science: An Introduction*. New Jersey: Pearson Prentice Hall, 2008.**
- **Do an Internet search for the following video: Fortune Teller Fish Amy Toy**