

# Chapter 1

## Measurements

- I. Units and Conversions
- II. Concentration
- III. Solution Preparation

## I. Units and Conversions

- A. SI Units (*Système International d'Unités*)
  - 1) Base Units
  - 2) SI Prefixes
  - 3) Derived Units
    - Defined in terms of base units

**Table 1-2** SI-derived units with special names

Quantity	Unit	Symbol	Expression in terms of other units	Expression in terms of SI base units
Frequency	hertz	Hz		1/s
Force	newton	N		m • kg/s <sup>2</sup>
Pressure	pascal	Pa	N/m <sup>2</sup>	kg/(m • s <sup>2</sup> )
Energy, work, quantity of heat	joule	J	N • m	m <sup>2</sup> • kg/s <sup>2</sup>
Power, radiant flux	watt	W	J/s	m <sup>2</sup> • kg/s <sup>3</sup>
Quantity of electricity, electric charge	coulomb	C		s • A
Electric potential, potential difference, electromotive force	volt	V	W/A	m <sup>2</sup> • kg/(s <sup>2</sup> • A)
Electric resistance	ohm	Ω	V/A	m <sup>2</sup> • kg/(s <sup>2</sup> • A <sup>2</sup> )
Electric capacitance	farad	F	C/V	s <sup>4</sup> • A <sup>2</sup> /(m <sup>2</sup> • kg)

**Table 1-2**  
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## I. Units and Conversions (cont.)

### B. Unit Conversions (Dimensional Analysis)

- 1) Ex: Convert 65 mph to  $\mu\text{m}/\text{ps}$   
(1 mile = 1760 yd, 1 in = 2.54 cm)
- 2) Ex: Convert 15 square miles to  $\text{fm}^2$

## II. Concentration

- Amount of solute per amount of solvent or solution
- Several ways to express
- *Formal Concentration (F)*: sum of concentrations of all forms of solute

## III. Solution Preparation

*Methods for preparing solutions:*

- 1) Dissolve pure solute in solvent

*Exercise 1-A, pg 17 ( $\text{CH}_3\text{OH} = 32.042 \text{ g/mol}$ ):* A solution with a final volume of 500.0 mL was prepared by dissolving 25.00 mL of methanol ( $\text{CH}_3\text{OH}$ , density = 0.7914 g/mL) in chloroform.

- a) Calculate the molarity of methanol in the solution.
- b) The solution has a density of 1.454 g/mL. Find the molality of methanol.

### III. Solution Preparation (cont.)

*Methods for preparing solutions:*

2) Dilute more concentrated "stock" solution

– Grand Equation for Solution Dilution:

$$M_1V_1 = M_2V_2$$

– *Exercise 1-B-d, pg 17 (HBr = 80.91 g/mol):* A 48.0 wt% solution of HBr in water has a density of 1.50 g/mL. How much solution is required to prepare 0.250 L of 0.160 M HBr?