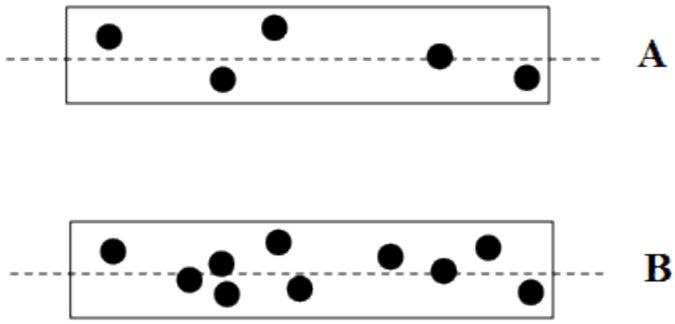
THE POLARIMETRY EXPERIMENT

In measuring optical rotation, plane-polarized light travels down a long tube containing the sample. If it is a liquid, the sample may be placed in the tube as a pure liquid (its is sometimes called a neat sample). Usually, the sample is dissolved in a solvent and the resulting solution is placed in the tube.

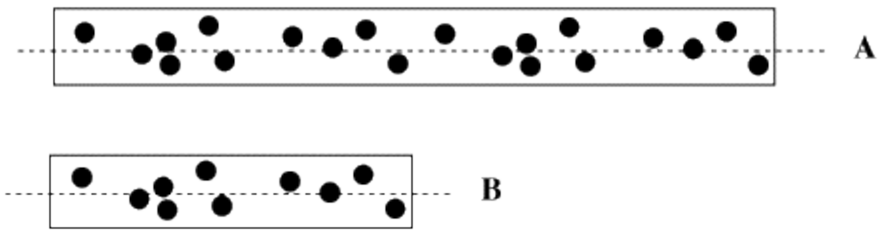
There are important factors affecting the outcome of the experiment.

- Optical rotation depends on the number of molecules encountered by the light during the experiment.
- Two factors can be controlled in the experiment and must be accounted for when comparing an experimental result to a reported value.



FigureSC7.1. The effect of concentration on optical rotation.

- The more concentrated the sample (the more molecules per unit volume), the more molecules will be encountered.
- Concentrated solutions and neat samples will have higher optical rotations than dilute solutions.
- The value of the optical rotation must be corrected for concentration.



FigureSC7.2. The effect of path length on optical rotation.

- The longer the path of light through a solution of molecules, the more molecules will be encountered by the light, and the greater the optical rotation.
- The value of the optical rotation must be corrected for the length of the cell used to hold the sample.

In summary:

$[\alpha] = \alpha / (c \times l)$

- α is the measured optical rotation.
- c is the sample concentration in grams per deciliter (1 dL = 10 mL).
- That is, c = m / V (m = mass in g, V = volume in dL).
- l is the cell length in decimeters (1 dm = 10 cm = 100 mm)
- The square brackets mean the optical rotation has been corrected for these variables.

Source : http://employees.csbsju.edu/cschaller/Principles%20Chem/stereochem/stereo_polarimetry.htm