I. Measurement of fluid compartment by the dilution method.*

In this application, the basic definition of concentration is used. In order to estimate indirectly an otherwise unmeasurable volume in the body, a known amount (M) of an indicator substance is injected. After it has been allowed to mix thoroughly, an aliquot of the compartment is analyzed and the concentration (C) of the tracer is determined. The volume (V) in which the tracer has been distributed can be calculated as

$$V = \frac{M}{C}$$

where **V = the unknown volume**
M = the amount of tracer injected
C = the concentration of tracer after mixing

II. The calculation of cell volume changes.

Most of the cells of the body are freely permeable to H_2O but much less permeable to solutes. Thus the total amount of solute within a cell will remain relatively constant even though the cell changes its volume. For example, a red cell in isotonic saline will have an internal solute concentration (C) equal to that in the surrounding medium, and a corresponding volume (V). The total amount (M) of solute in the cell is given by the product VC=M. If it is now placed in a hypotonic medium, water will enter the cell, and the solute concentration in the cell will decrease to equal that in the medium. At the same time the cell volume (V) will increase in such a way that:

$$V_1C_1 = V_2C_2 = M = \text{constant}$$

where **V_1 = initial volume of cell**
C_1 = initial solute concentration of cell
V_2 = new volume of cell
C_2 = new solute concentration within cell

Thus, from a knowledge of V_1,C_1 and C_2, the new cell volume may be calculated:

$$V_2 = \frac{C_1V_1}{C_2}$$