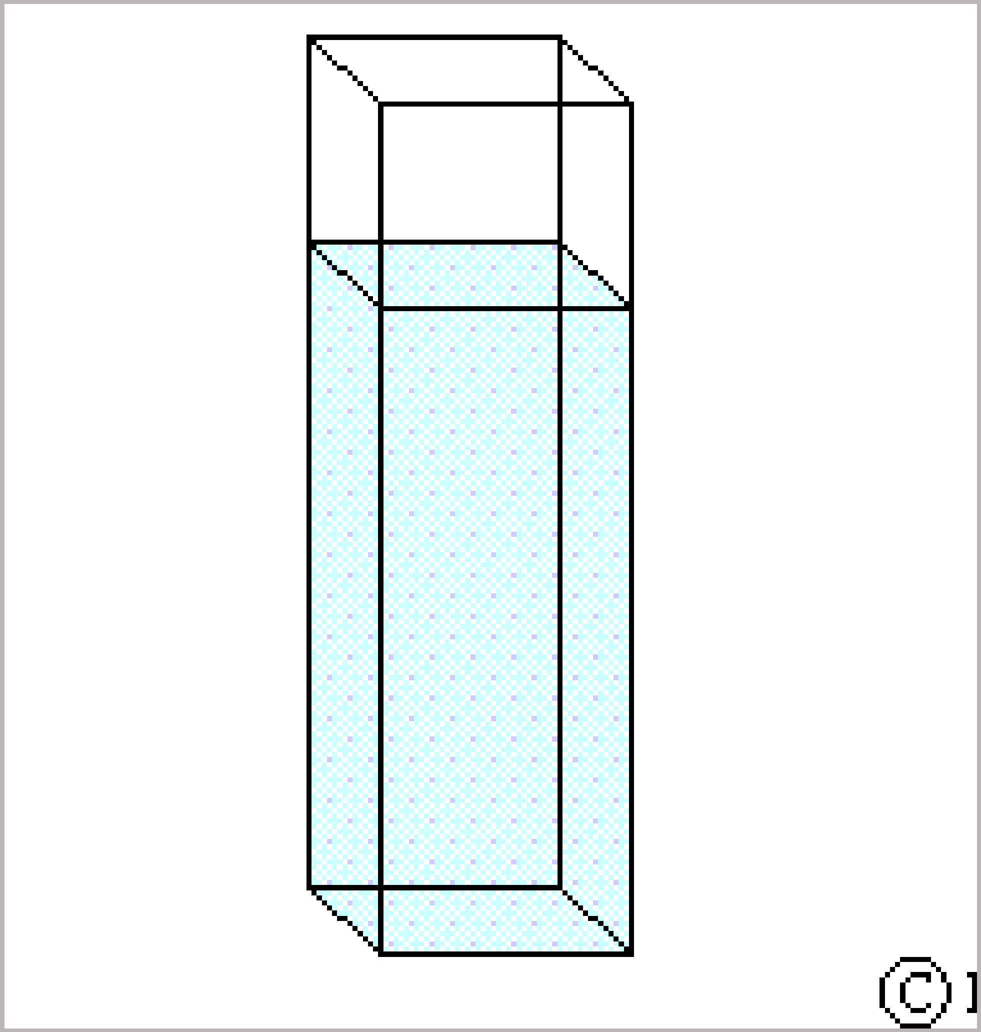
Beer_Lambert's Law

Beer's Law

Beer's law states that concentration and absorbance are directly proportional to each other and it was stated by August bee

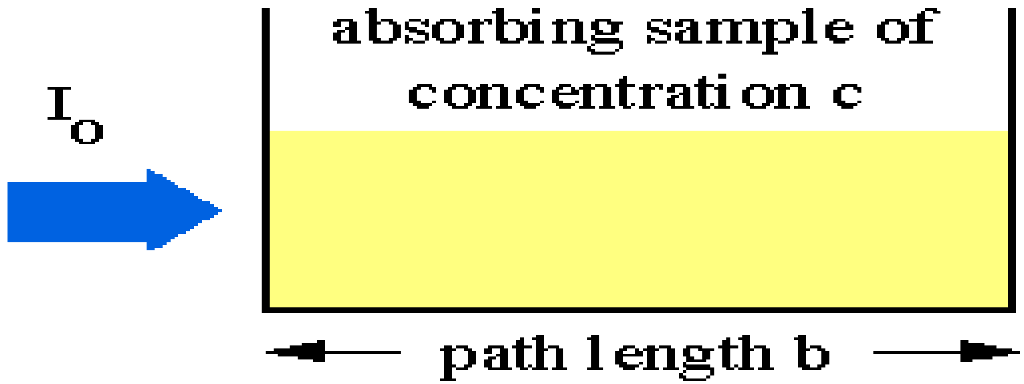
$A=\mathcal{E} bc$

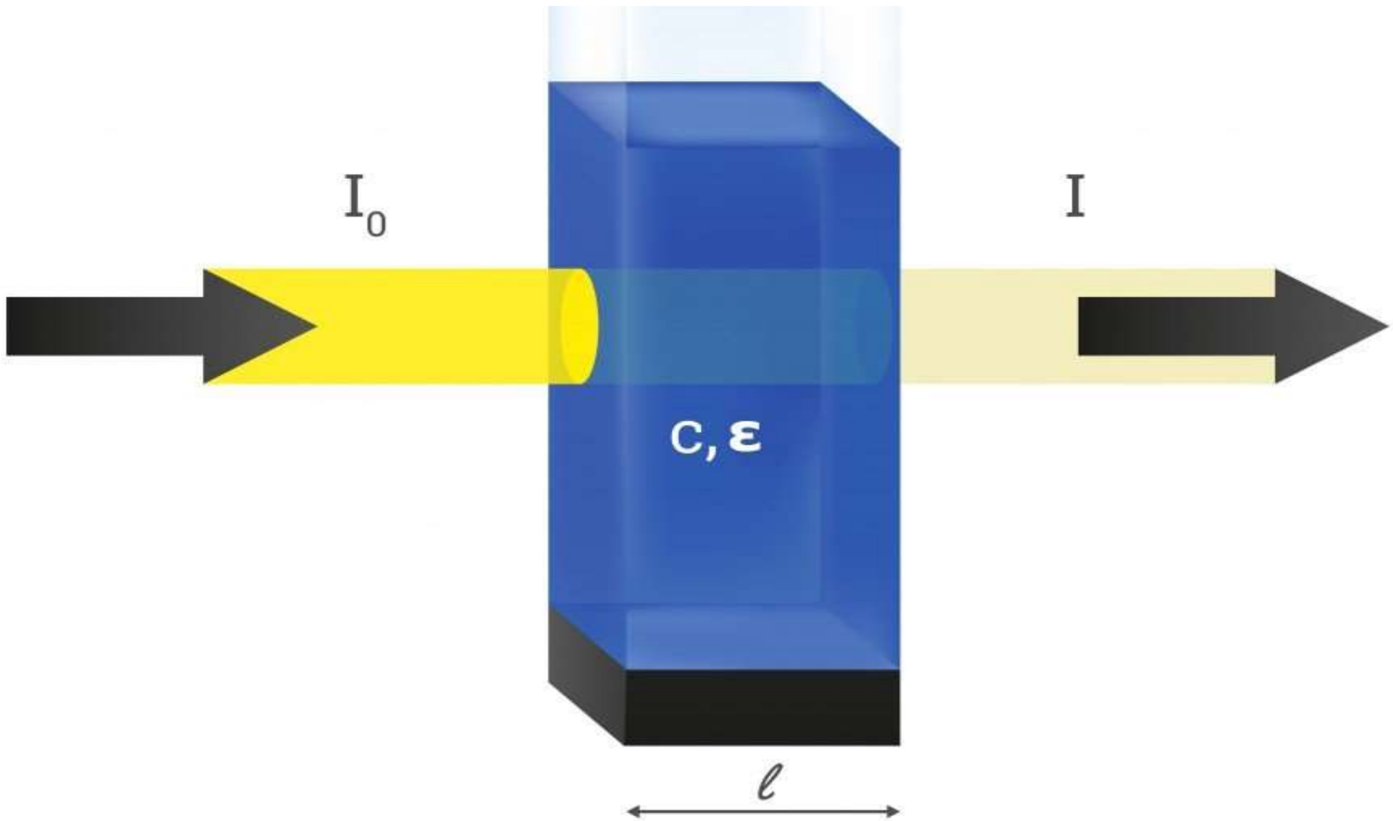


Lambert law

Lambert law states that absorbance and path length are directly proportional and it was stated by johann Heinrich Lambert

$A = \mathcal{E}\, l$


absorbing sample of
concentration c
I_o
I
path length b


I_0
I
c, ε
ℓ

BEER'S _LAMBERT LAW

- When a monochromatic light of initial intensity Io passes through a solution in a transparent vessel, some of the light is absorbed so that the intensity of the transmitted light I is less than Io.
- There is some loss of light intensity from scattering by particles in the solution and reflection at the interfaces, but mainly from absorption by the solution.
- . The relationship between I and Io depends on the path length of the absorbing mcdium, 1, and the concentration of the absorbing solution, c. These factors are related in the laws of Lambert and Beer.

Derivation of Beer_Lambert law

- If material bodies are exposed to radiation, part of the incident radiation is absorbed, a part is scattered and a part is transinitted.
- As a result of absorption the intensity of light passing through material bodies, i.e. the intensity of transmitted light, decreases.
- The fraction of incident light absorbed depends on the thickness of the absorbing medium.
- Lambert derived a quantitative relationship between the decrease in intensity of a monochromatic light due to the passage through a. homogeneous medium of thickness dx and the intensity of light I. This law is known as Lamberts law, and may be stated as:
- The decrease in intensity of light with thickness of the absorbing medium at any point is directly proportional to the intensity of light.

Mathematical derivation

- absorbance $A=A-\log_{10}(1/T)$
- $A=\log(I_o/I)$
- Therefore
- $1/T=1/I/I_o \Rightarrow I/I_o$
- Lambert's law
- $A=\log_{10}(I_o/I)\propto l$
- $A=\varepsilon\, l$

Azeeem valli

Beer's law:

$A = \log_n(I_o/I) \propto C$

$A = \mathcal{E}\ C$

Combining both law's

For absorbance

$A = \log_o(i_o/I) = \mathcal{E}\ cl$

$A = \mathcal{E}\ cl$

Limitations:

1.deviations in absorptivity coefficients at high concentrations (>0.01M) due to electrostatic interactions between molecules in close proximity
2.cattering of light due to particulates in the sample
3.luoresecence or phosphorescence of the sample
3.changes in refractive index at high analyte concentration
4.hifts in chemical equilibria as a function of concentration