CHAPTER 6

Experimental Observations
6.1 Experimental Observations:

We first record the counts \( (N_0) \) of gamma rays reaching the counter directly i.e. without placing the solution in their path of gamma rays, we measure the counts \( (N) \) of gamma rays passing through for various heights \( (l) \) of the liquid column. This procedure repeated for all concentrations we prepared.

The experimental observations for counts \( (N_0/N) \) with varying height of solutions (NaCl, KCl, NH\(_4\)Cl, AlCl\(_3\).6H\(_2\)O, CuCl\(_2\).2H\(_2\)O) at various gamma ray energies (MeV) are given in Appendix (1):

\[
\text{Table: 6.1.1.1 to 6.1.1.8 for NaCl solution ,}
\]
\[
6.1.2.1 to 6.1.2.8 for KCl solution ,
\]
\[
6.1.3.1 to 6.1.3.8 for NH\(_4\)Cl solution ,
\]
\[
6.1.4.1 to 6.1.4.8 for AlCl\(_3\).6H\(_2\)O solution ,
\]
\[
6.1.5.1 to 6.1.5.8 for CuCl\(_2\).2H\(_2\)O solution .
\]

The graph of \( \ln(N_0/N) \) versus height \( (l) \) of liquid for NaCl solution at 0.123 MeV as shown in Figs.(6.1.1 and 6.1.2). (For simplicity only one graph is given and the same method is used for all concentrations).

The observed graphs are seen to be closed distributed around lines having positive slopes. These lines are obtained by fitting the experimental data by the least square method. Their slopes gives the linear attenuation
coefficient $\mu \text{ (cm}^{-1}\text{)}$ and thus the linearity of the curves with positive slopes suggest the relation

$$\frac{N_0}{N} = e^{\mu l}$$

This indicates the validity of the standard exponential absorption law of gamma rays when they pass through the liquid substances

$$N = N_0 e^{-\mu l}.$$
**Fig. 6.1.1**: $\ln(\text{No} / \text{N})$ versus height of liquid column

for NaCl solution at 0.123 MeV.
Fig. 6.1.2: Ln(No/N) versus height of liquid column for NaCl solution at 0.123 MeV.