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APPENDIX 1

The calibration curve of KCl solution was shown in Fig. A 1.

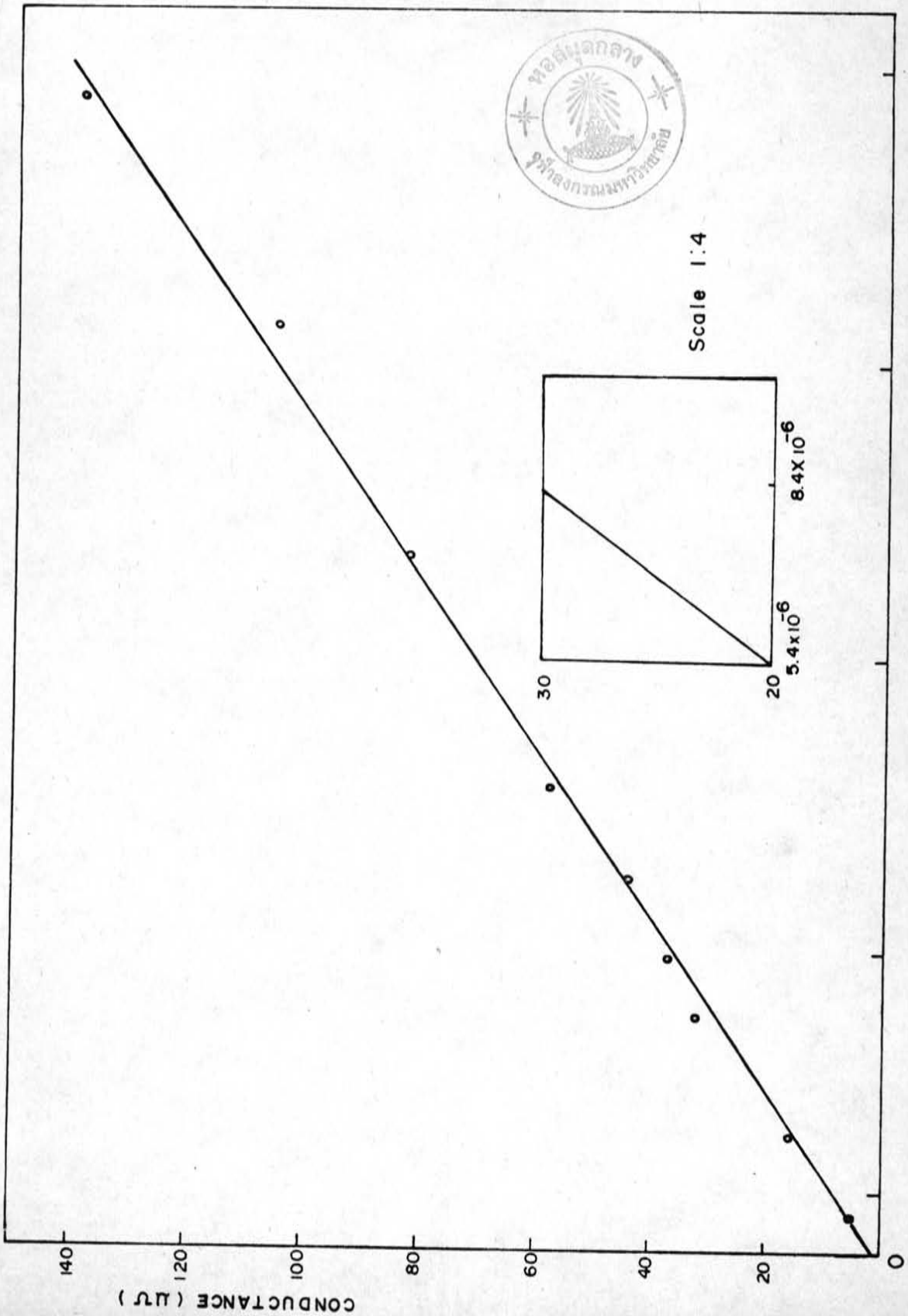

FIGURE A1 Calibration curve of KCl

APPENDIX 2

Gamma ray spectrometer

This instrument composed of the following parts:

Detector is a welled crystal type using crystal of sodium iodide (NaI) as a scintillator. The well dimension was 17 mm. in diameter and 55 mm in height.

Photomultiplier tube

Pre - amplifier

High voltage power supply

Linear amplifier

Multichannel analyzer

Discriminator

Scaler

Printer

The arrangement of the above equipment was shown in Fig. A 2.

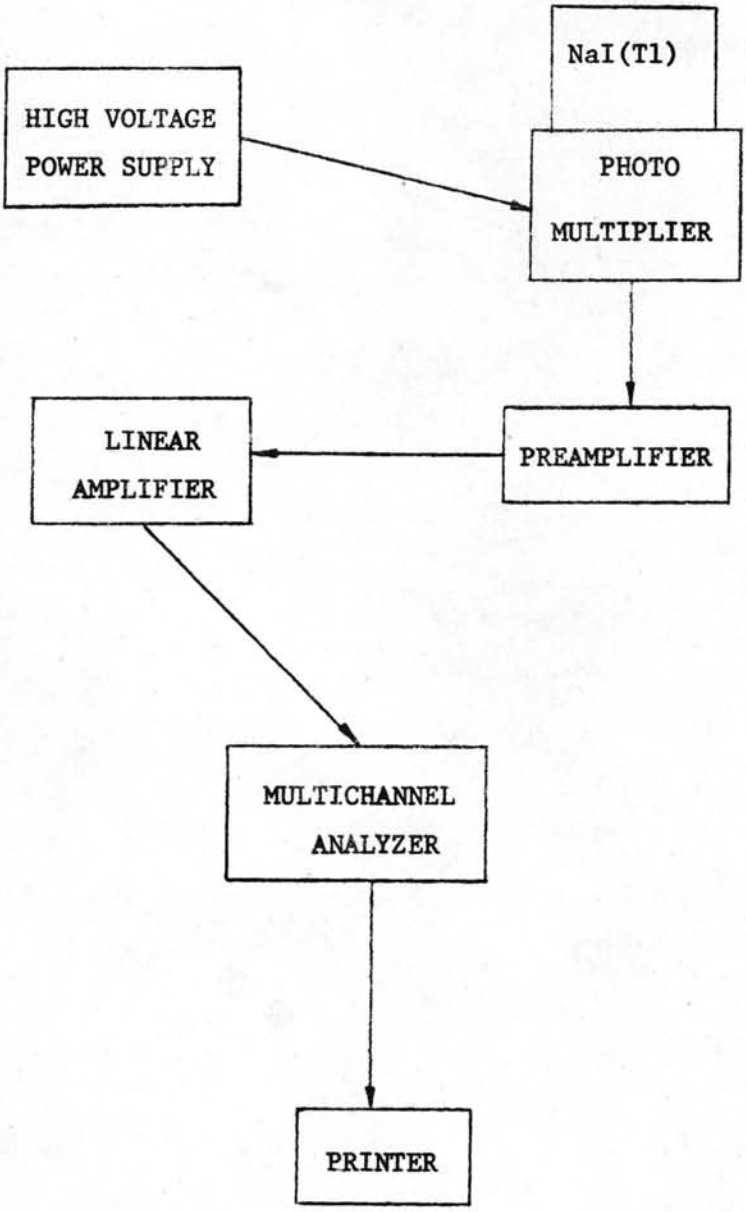

Figure. A 2 Schematical diagram of gamma ray spectrometer.

APPENDIX 3

The daughter substances of thorium elements are shown in Fig. A. 3.

Thé amount of daughter substances at equilibrium may be obtained by the following relation

$$\frac{N_{d.s.}}{(t_{\frac{1}{2}})_{d.s.}} = \frac{N_{Th}}{(t_{\frac{1}{2}})_{Th}}$$

For example the ratio of tallium to thorium at equilibrium is

$$\frac{N_{Tl}}{N_{Th}} = \frac{(t_{\frac{1}{2}})_{Tl}}{(t_{\frac{1}{2}})_{Th}} = \frac{3.1 \text{ min}}{1.39 \times 10^{10} \text{ yr}}$$

$$= \frac{1}{2.36 \times 10^{15}}$$

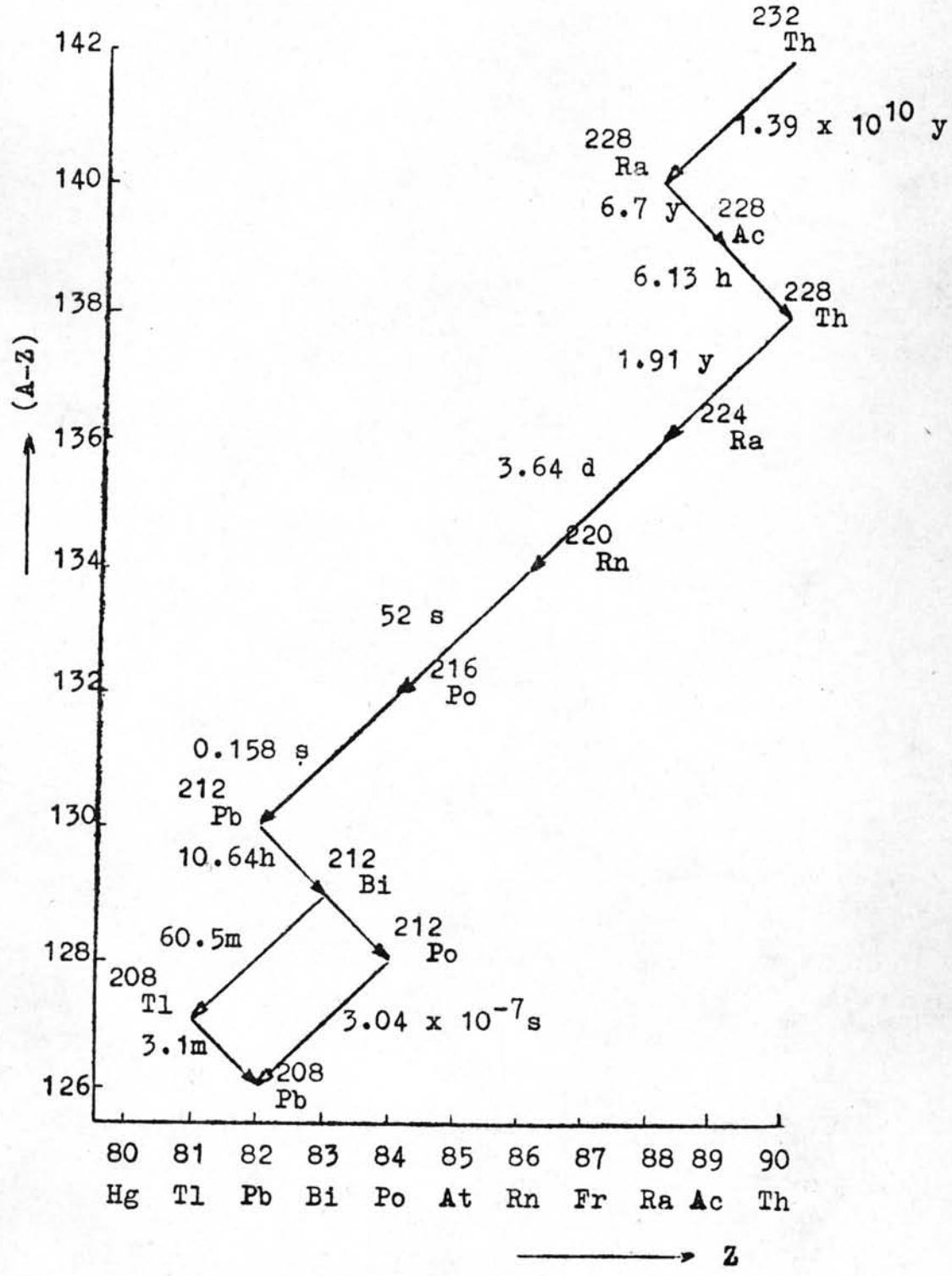

Figure. A 3 Thorium decay series

APPENDIX 4

Explanation of variables used in the computer program.

CPL	=	Capillary length
EXPTT	=	Experimental time
BIGCI	=	Initial amount of solute in capillary
BIGCF	=	Final amount of solute in capillary
VOL	=	Capillary volume
DU	=	Upper limit of diffusivity
DL	=	Lower limit of diffusivity
IMAX, DIVX	=	Number of capillary increment
JMAX, DIVT	=	Number of time increment
EPS	=	Accuracy value
D	=	Diffusivity

SYMBOLS

c	Total concentration, (total moles per volume)
c_A	Concentration of A, (moles of A per volume)
c_{av}	Average concentration, (moles per volume)
D_A	Diffusivity, ((length)^2 per time)
i	Index for the step movement in x-direction
j	Index for the step movement in y-direction
J_A	Molar flux, (moles of A per unit time per unit area)
j_m	Refractive index
k	Index for the step movement in z-direction
L	Capillary length
M	Number of grid points in capillary
N_A	Molar flux with respect to the stationary point, (moles of A per unit time per unit area)
$N_{d.s.}$	Amount of daughter cell at equilibrium, (moles)
N_{Th}	Amount of thorium, (moles)
N_{Tl}	Amount of Tallium, (moles)
t	Time
$t_{\frac{1}{2}}$	Half life, (time)
v_A	Velocity of A, (length per time)
v_M	Average molar velocity, (length per time)
β	Cell constant
λ	Wavelength, (length)
$\lambda_1, \lambda_2, \lambda_3$	Coefficients

Φ	Dimensionless concentration
τ	Dimensionless time
η	Dimensionless length in x - direction
ξ	Dimensionless length in y - direction
β	Dimensionless length in z - direction
$\Delta\tau$	Step increment in dimensionless time
$\Delta\eta$	Step increment in η - direction
$\Delta\xi$	Step increment in ξ - direction
$\Delta\beta$	Step increment in β - direction

VITA

Miss Chirakarn Ngamwiwit was born on May 4,1951 at Bangkok. She received a Bachelor Degree of Science in Chemical Engineering from Chulalongkorn University in 1974. Her profession is a teacher at King Mongkut's Institute of Technology, North Bangkok Campus.