Red Team

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Introduction to Decay Lab 1

- Does distance affect the data analysis of the Cobalt?

- Does thickness of different materials affect the data analysis of the Cobalt?

- Does the angle of the copper barrier affect the data?

Setup of Decay Lab 1

- Single Ge detector in the lead castle to detect the gamma radiation of various sources.

Lead Castle

Ge Det.

Sample
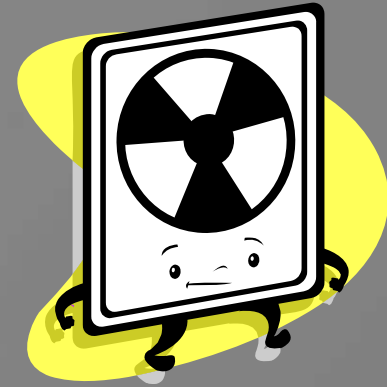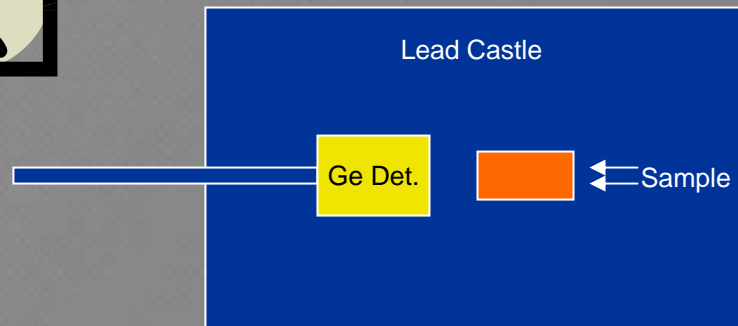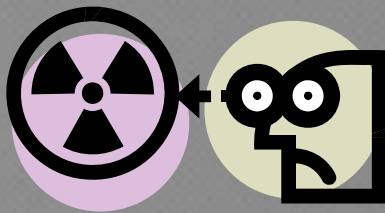
Procedure of Decay Lab 1

- Measured the distance of the four slots in the Lead Castle. Compared the data of the cobalt between the different distances.

- We measured the thickness of each barrier of the three elements (lead, copper, aluminum). Then took data of the different thicknesses.

- We also took the copper barrier and placed it at various angles in the lead castle to see how it would affect the thickness and data.

Data for Decay Lab 1
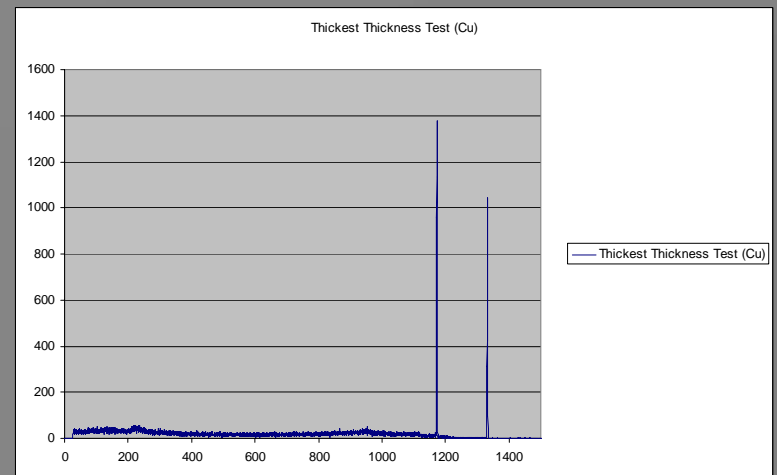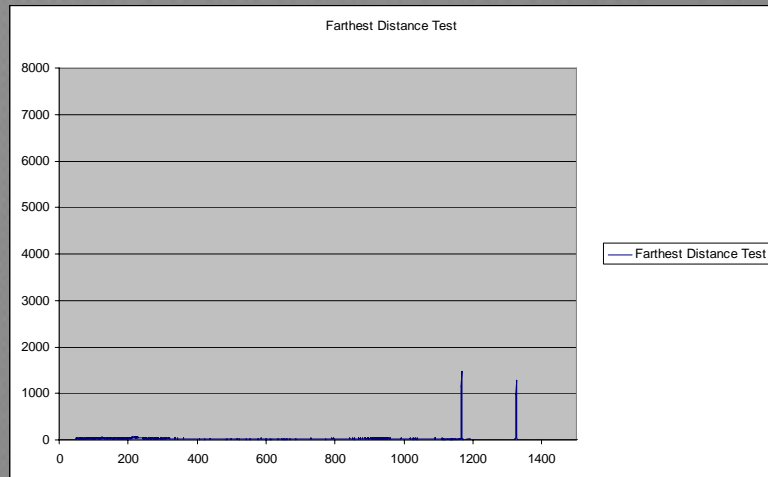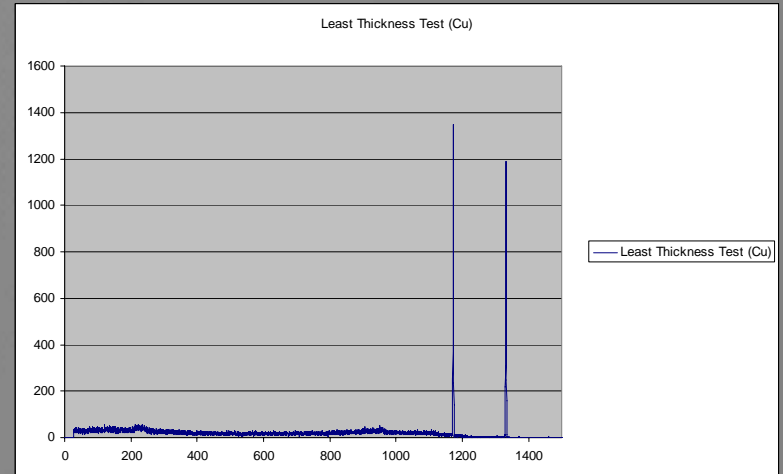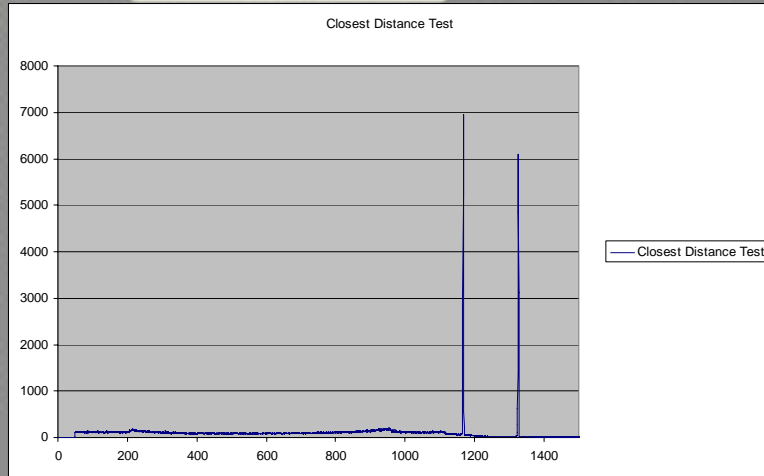
Introduction to Decay Lab 2
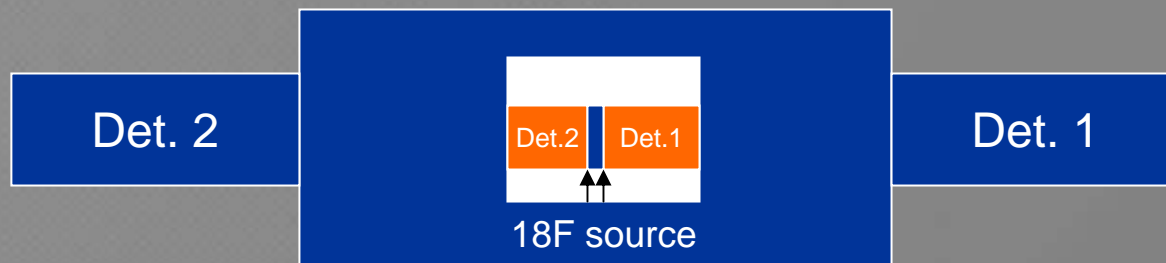
- What is the decay curve of 18F, a short lived isotope?

- 18F Source produced overnight. Source allowed to decay and placed in the setup in the morning. Decay observed in afternoon.

Setup of Decay Lab 2

- Two detectors front to front. 18F source placed in-between detectors.
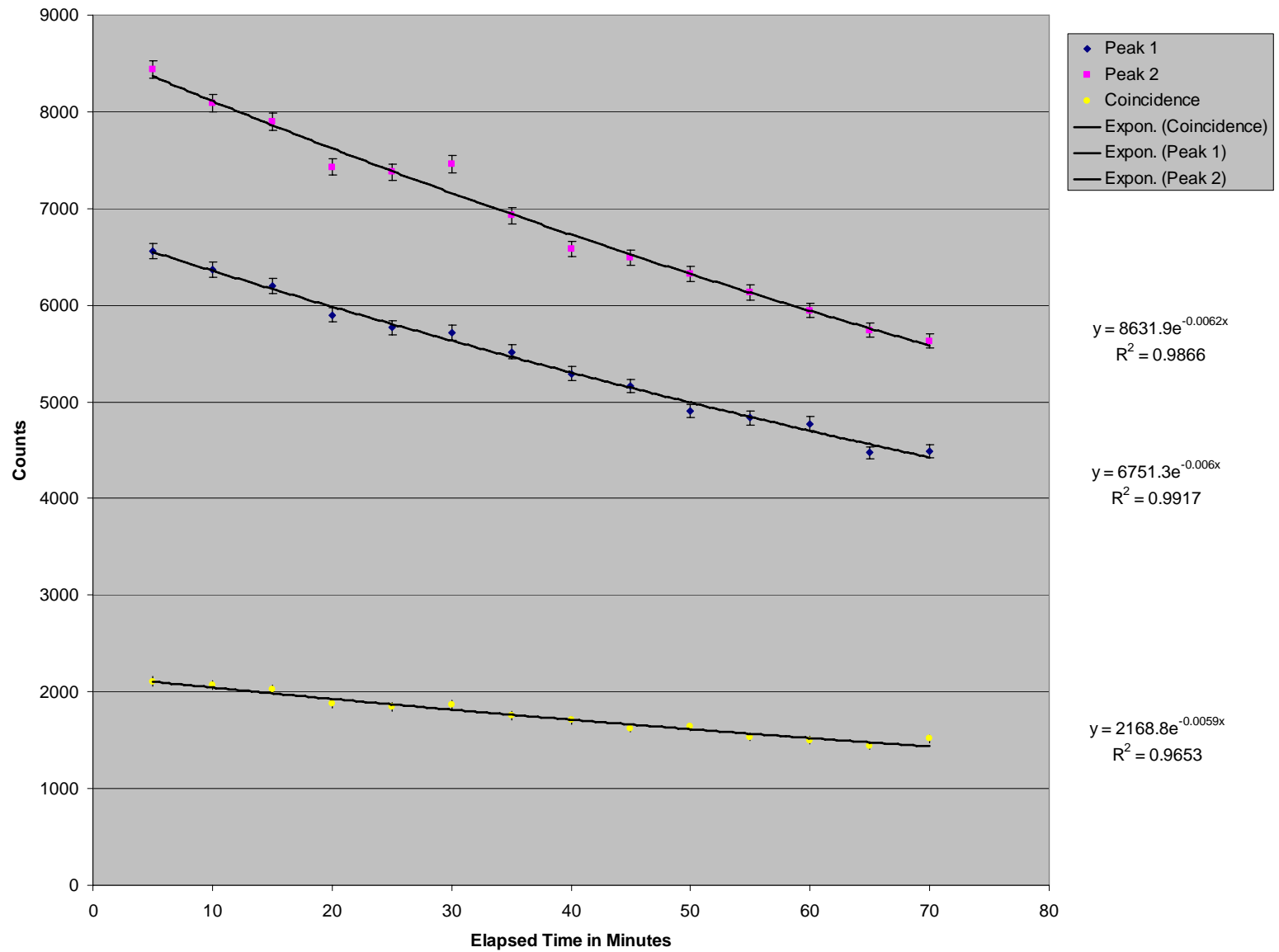
Procedure of Decay Lab 2

- Every 5 minutes for 70 minutes, we recorded the counts of the three different peaks (1, 2, and coincidence).

- Looked for the 511 keV lines in each of the detectors.

- Calculated the differences between the peaks.

18F Difference Counts vs. Time

Legend:
- Peak 1
- Peak 2
- Coincidence
- Expon. (Coincidence)
- Expon. (Peak 1)
- Expon. (Peak 2)

$y = 8631.9e^{-0.0062x}$
$R^2 = 0.9866$

$y = 6751.3e^{-0.006x}$
$R^2 = 0.9917$

$y = 2168.8e^{-0.0059x}$
$R^2 = 0.9653$

Counts (y-axis)

Elapsed Time in Minutes (x-axis)

18F Ln of Count Difference vs. Time

Chart plotting Ln of Difference Counts vs. Elapsed Time in Minutes, with data series Peak 1, Peak 2, Coincidence, and their linear fits.

Legend:
- Peak 1
- Peak 2
- Coincidence
- Linear (Coincidence)
- Linear (Peak 1)
- Linear (Peak 2)

$y = -0.0062x + 9.0632$
$R^2 = 0.9866$

$y = -0.006x + 8.8175$
$R^2 = 0.9917$

$y = -0.0059x + 7.6819$
$R^2 = 0.9653$

Y-axis: Ln of Difference Counts

X-axis: Elapsed Time in Minutes
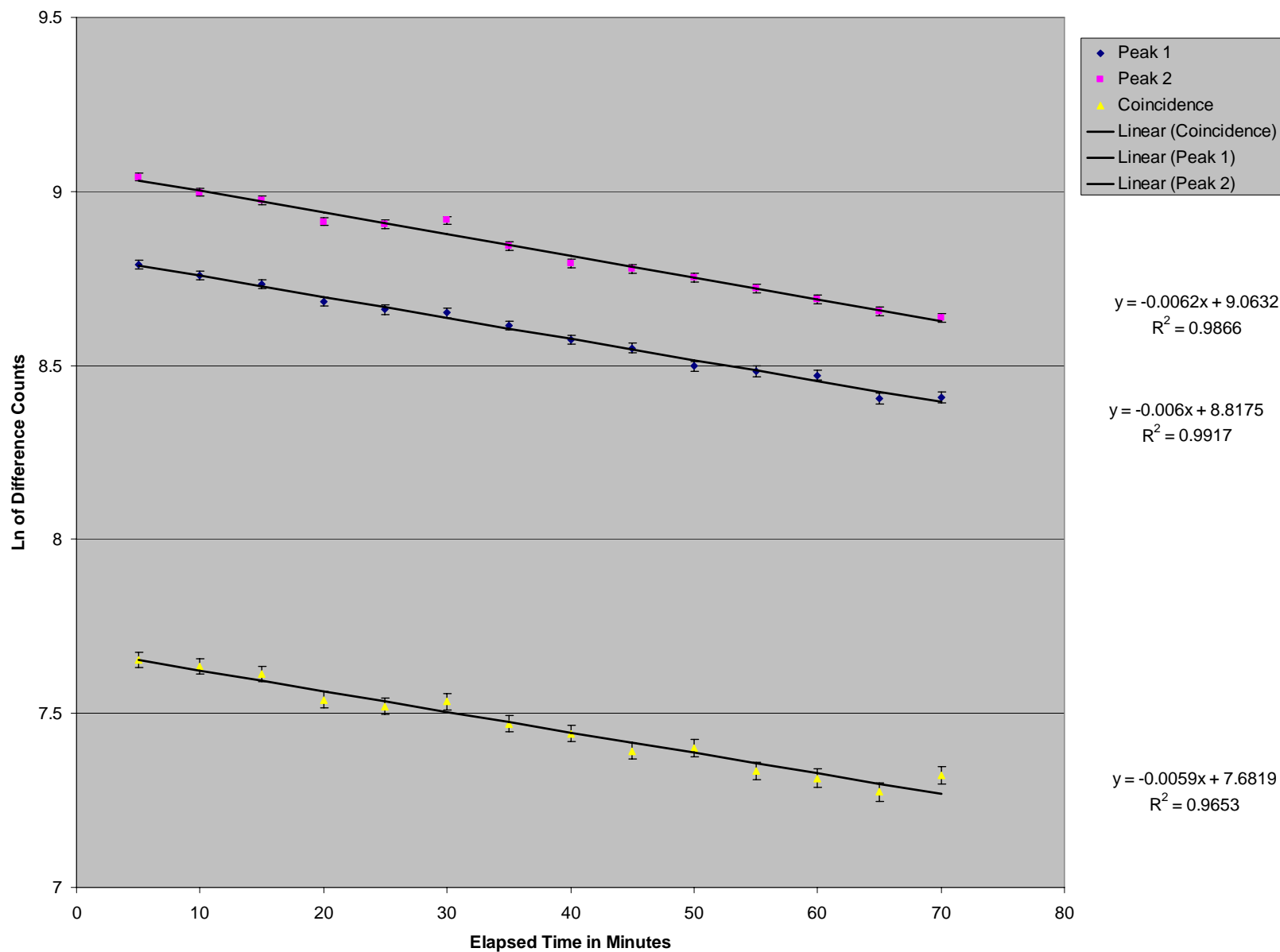
Introduction to PIXE

- Used the KN to produce energetic protons which interact with unknown samples.
- This determines the elemental content of the different samples.

Setup of PIXE

- Three stations: one that controls the aiming of the beam, one that turns the beam on and off, and one that controls the computer data.
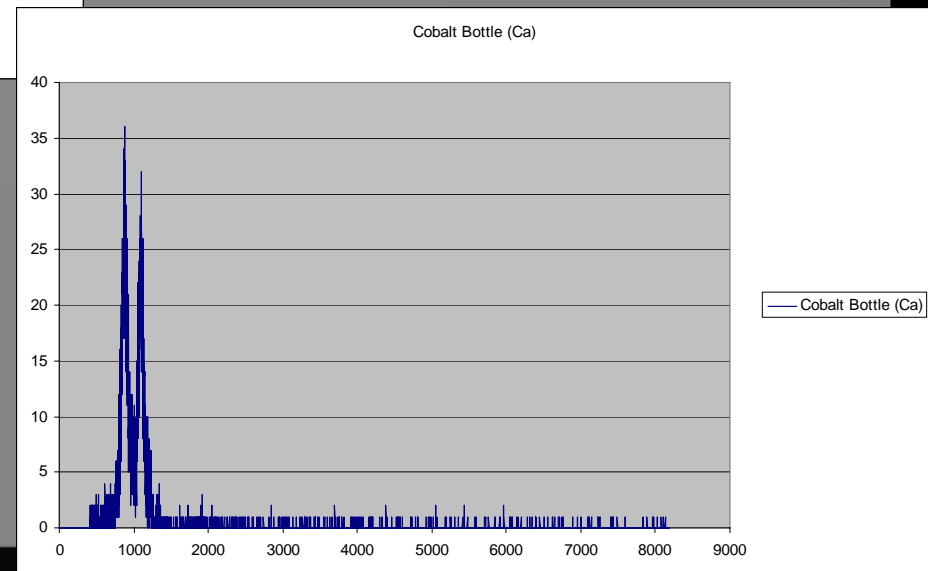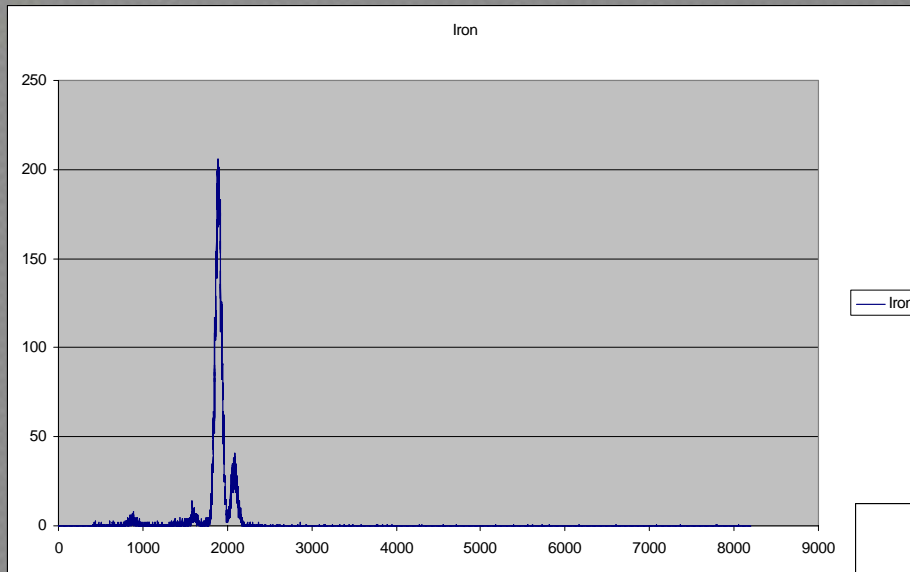
Up

Left   Right

Down

On

Off

Procedure of PIXE

- A proton beam hits the sample and produces an x-ray that is detected by the x-ray detector.

- The information is sent to the computer in graph form. The graphs show peaks, which we measure to find the element in the sample.

PIXE Data

Iron

Cobalt Bottle (Ca)

The End

Thank you for staying awake