Results of 68

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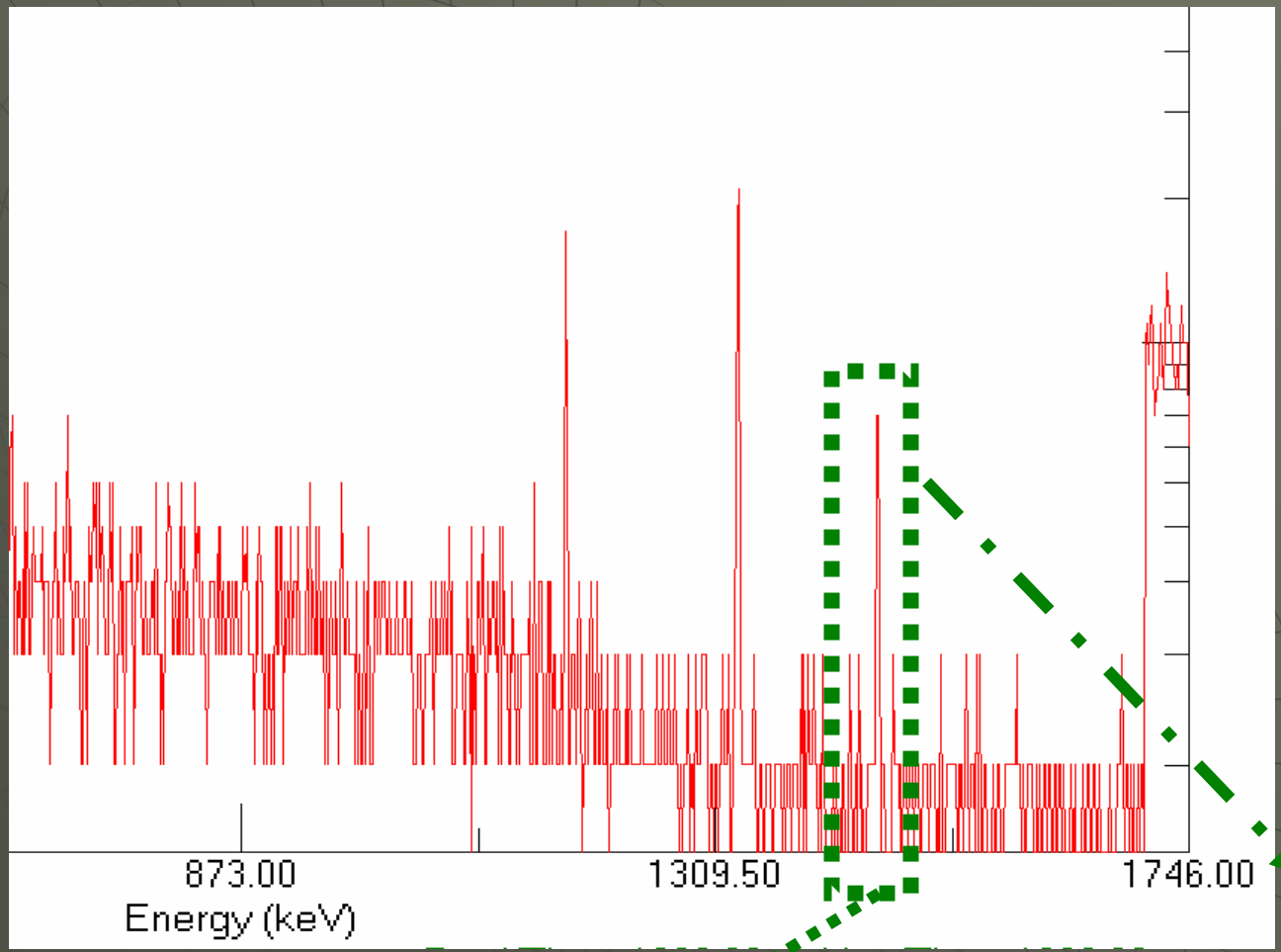
Decay Lab 1

We tested four substances for the gamma ray emissions from Potassium. This would indicate the relative amount of the Potassium in each substance.

- Potassium Chloride
- Salt Substitute
- Iodized (table) salt
- Non-iodized (pickling) salt

Decay Lab I (empty)



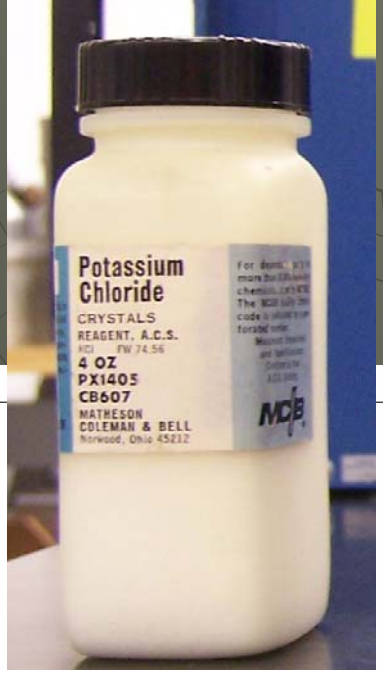
Potassium count at 1460 KeV.

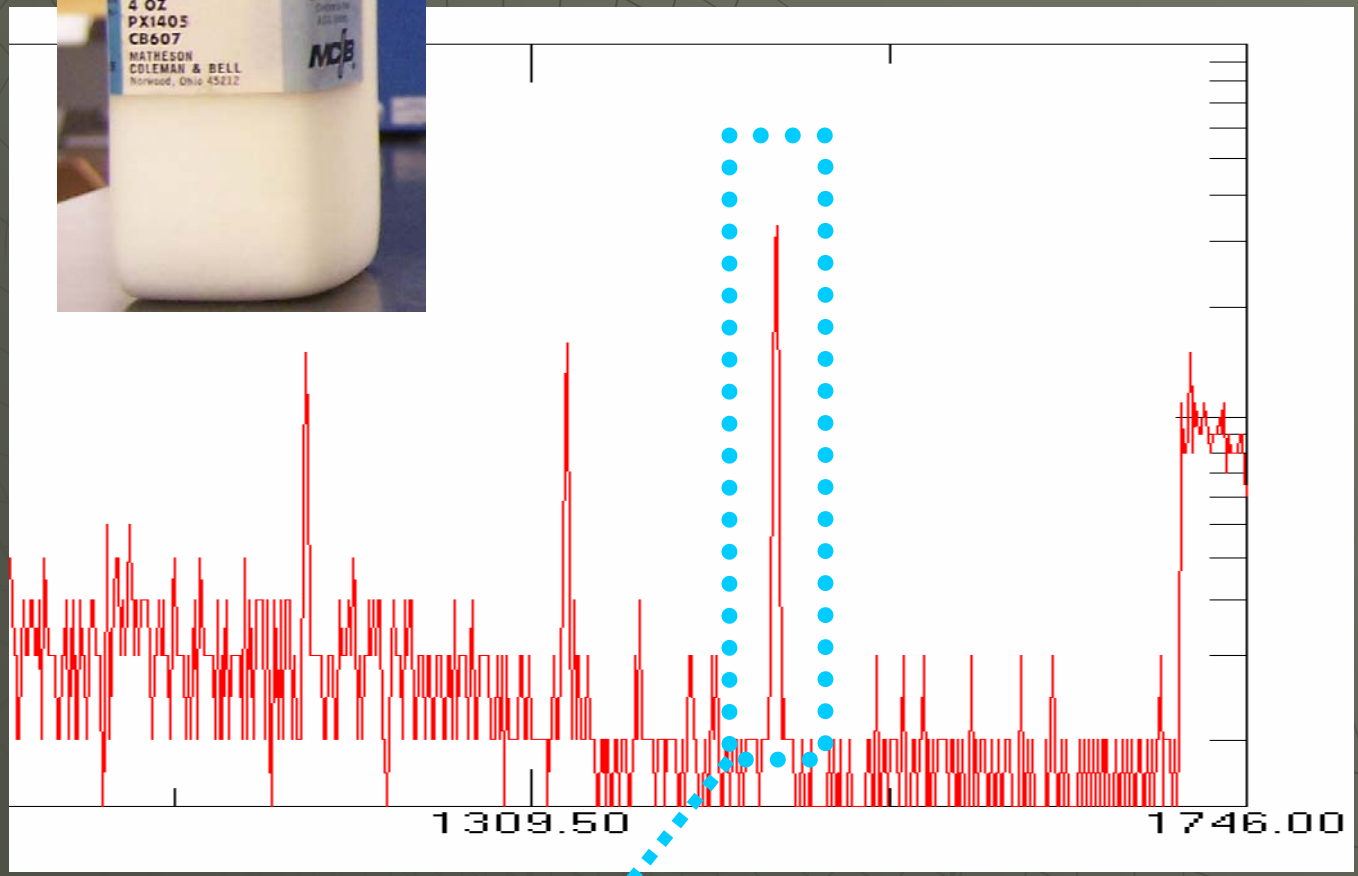
This test was a 20 minute run of the empty lead castle to test for the background noise that was present within the chamber.

Tests like these are important, in that they reveal additional radiation not from our source.

This graph reveals that there was a 42±8 net count of the gamma emissions coming from Potassium

Decay Lab I



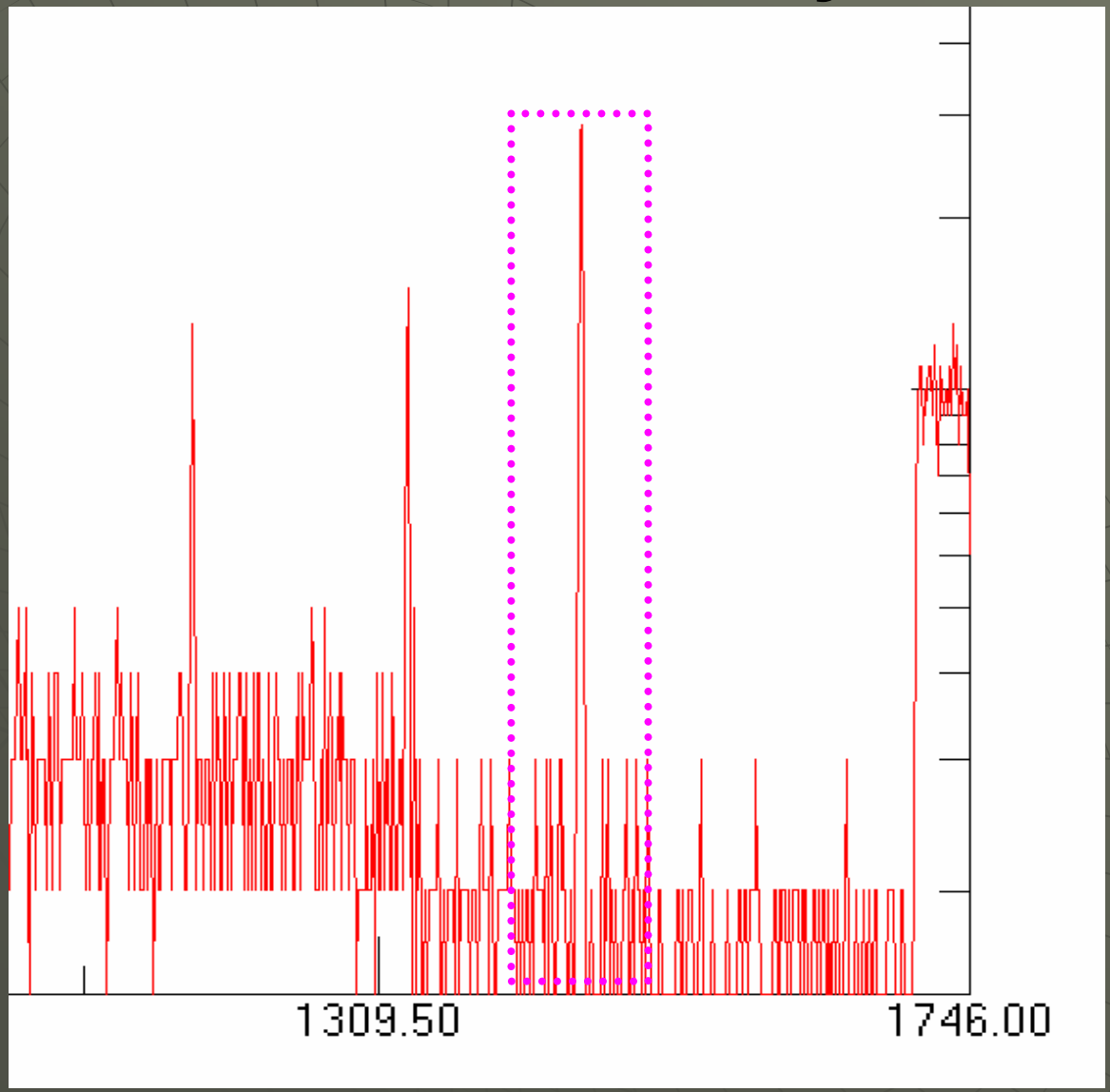


Potassium at 1460 KeV

This run was a 20 minute test of the gamma emissions emitted by Potassium Chloride.

This graph reveals that there was a 289±19 net count of the gamma emissions coming from the Potassium Chloride.

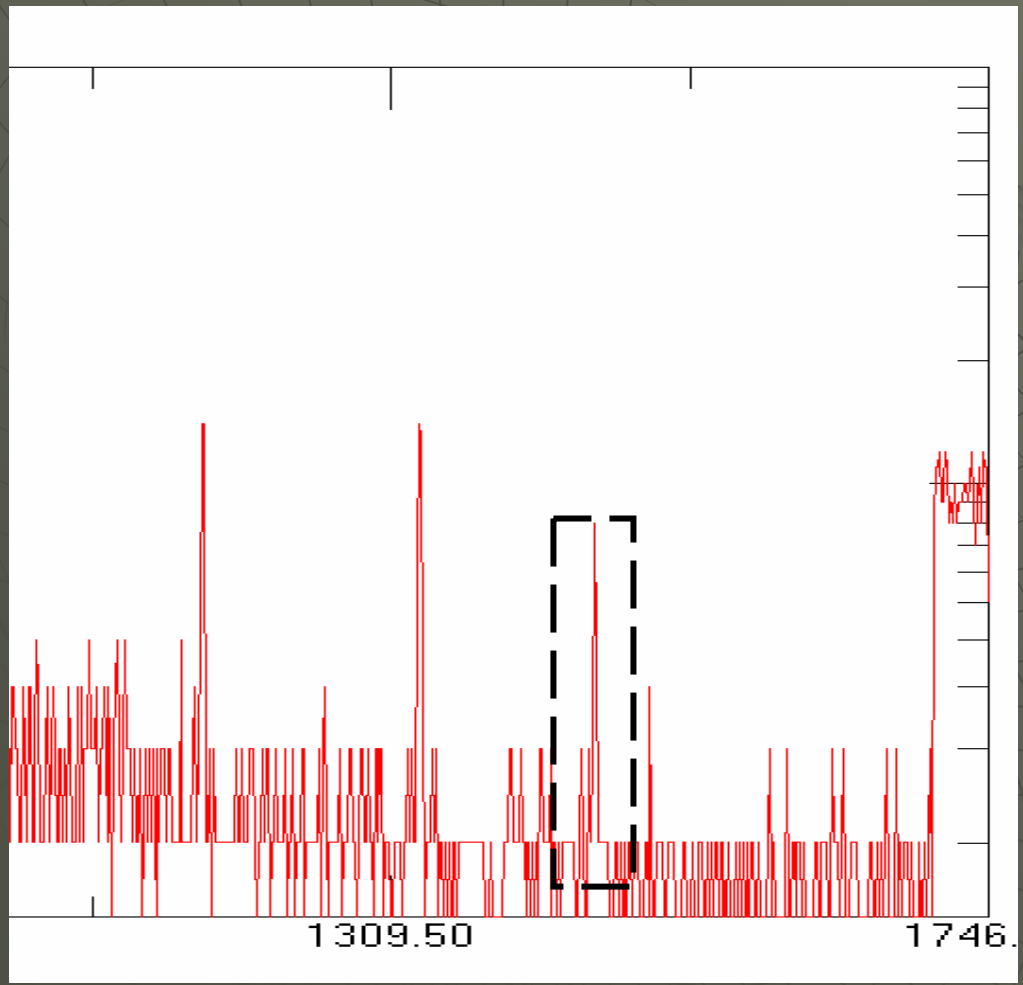
Decay Lab I



This run was a test of salt substitute which we also tested for twenty minutes.

This graph reveals that there was a 286±18 net count of the gamma emissions coming from the salt substitute.

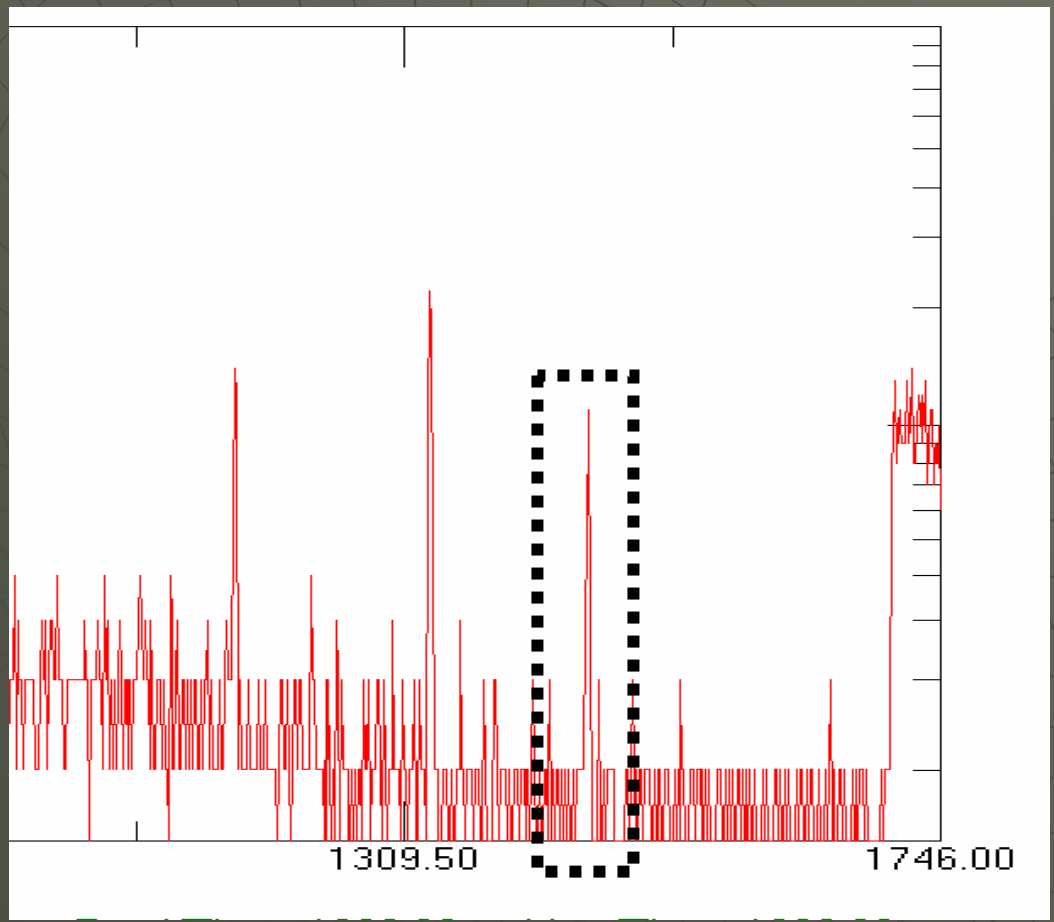
Decay Lab I



This is the salt without iodide which was also tested for twenty minutes

This graph reveals that there was a 17±8 net count of the gamma emissions coming from the salt without iodide.

Decay Lab I



This run was a test of salt with iodide which we also tested for twenty minutes.

This graph reveals that there was a 43±10 net count of the gamma emissions coming from the iodized salt.

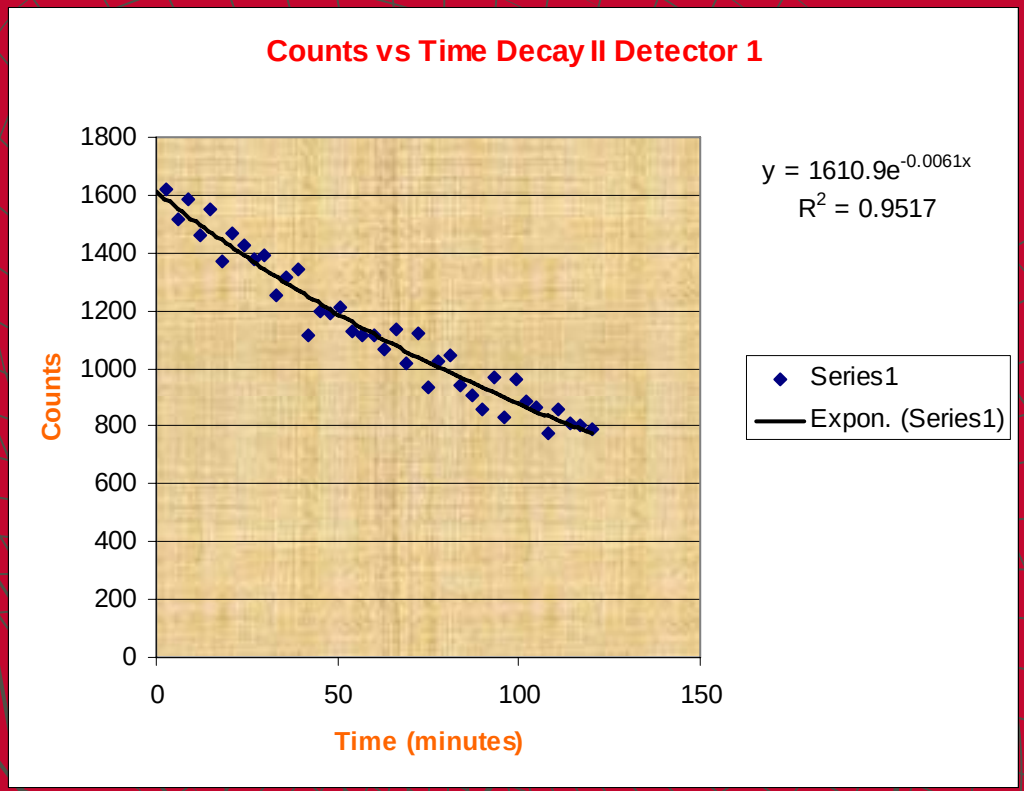
Conclusion

- We found that the Potassium Chloride contained the highest concentration of Potassium, and the salt substitute was relatively the same. The iodized salt and the non-iodized salt showed the same results as the background noise in the empty castle.

Decay Lab 2

- Purpose: To determine the half life of Fluorine 18
- Procedure: Made a sample of Fluorine 18 by irradiating a sample of Oxygen 18. Placed sample between two clover Germanium detectors to detect the two 511 keV gamma rays produced by the annihilation of the positrons produced in the beta decay of Fluorine 18. Measured hits on each individual detector and on both at the same time.
- Our results in this lab contain more error than usual due to one detector which was working improperly.

Decay Lab 2



- Plotted Counts vs Time for each detector
- Calculated best fit line
- Matched best fit equation to radioactive decay equation form:

$N(t) = N_{Initial} * e \wedge -\lambda t$

$y = 1610.9 * e \wedge -.0061x$

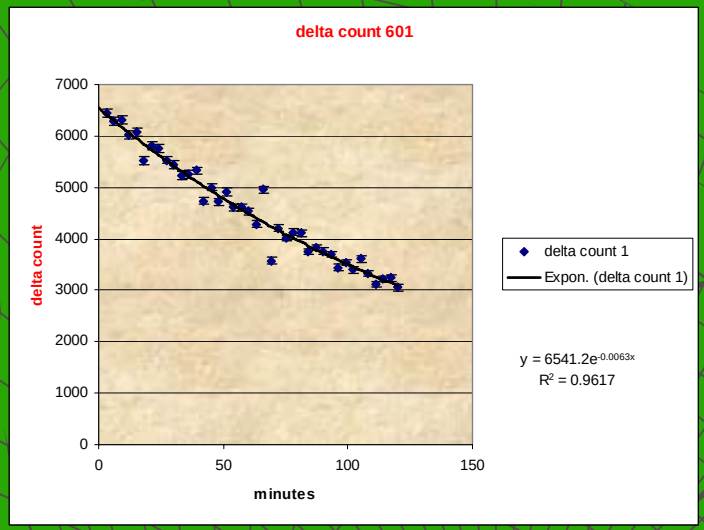
- Used half life equation:

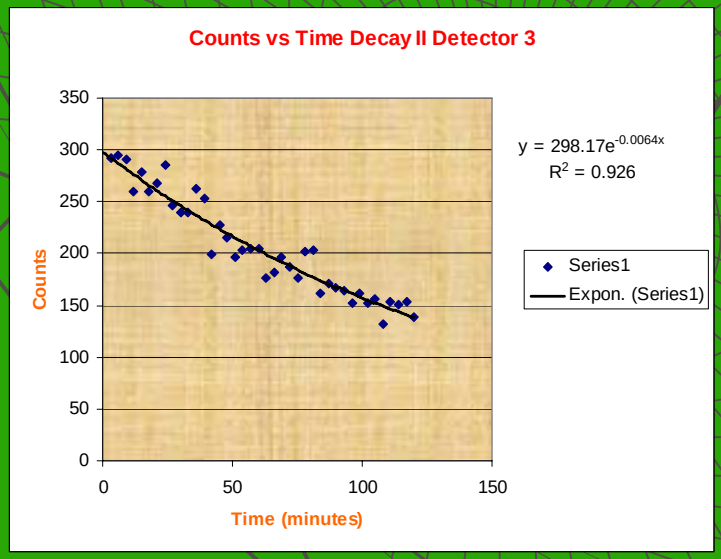
$T_{Half\text{-}Life} = \ln(2) / \lambda$

$T_{Half\text{-}Life} = \ln(2) / .0061$

$= 113.63$ minutes

Decay Lab 2





Detector 2:

Half-Life of 110.02 minutes

Coincidences:

Half-Life of 108.3 minutes

Actual Half-Life:

109.6 minutes

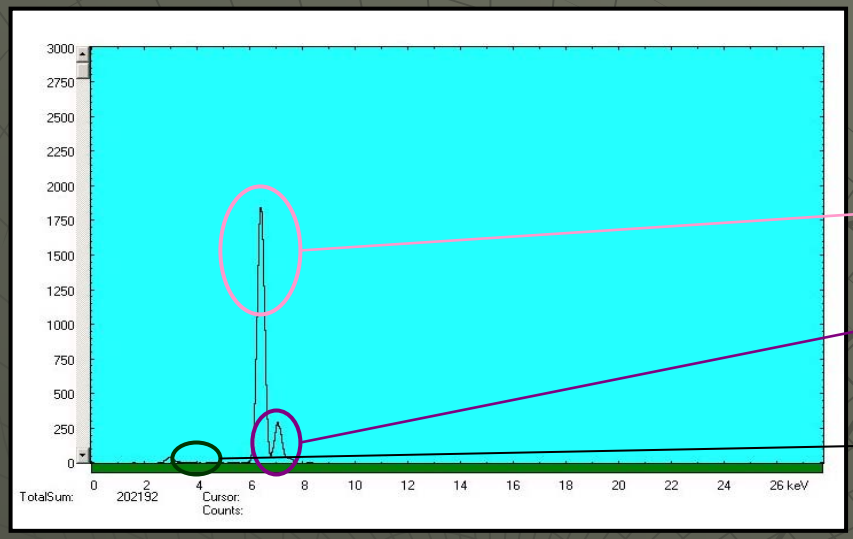
Conclusion

- While doing Decay Lab II, we determined the half life of Fluorine 18 to within 1.2 percent error. We learned how to use radiation to calculate the half-lives of different radioactive isotopes, and learned about the mechanism of beta decay.

PIXE

- Purpose: To identify unknown elements within different objects
- Procedure: Placed objects in front of a proton beam and observed the x-ray emissions caused by the release of energy when electrons excited by the protons de-excite.

PIXE



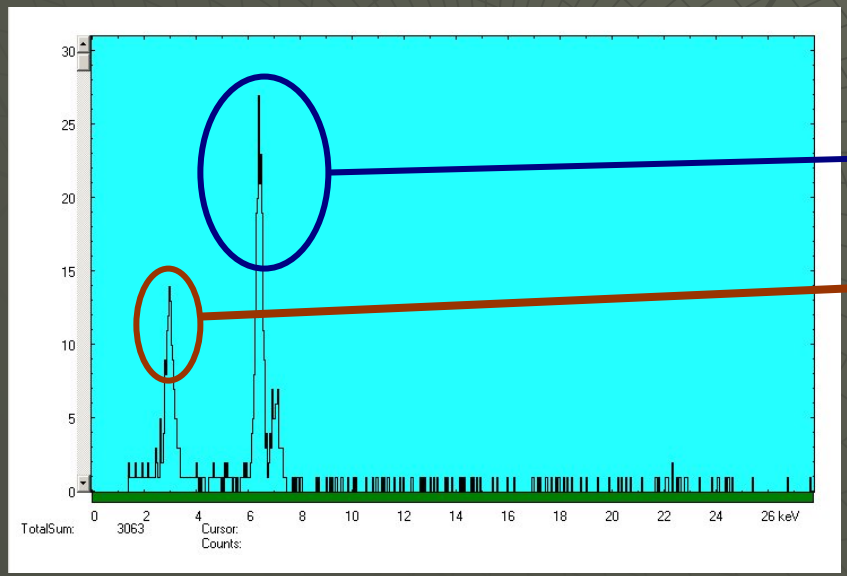
Analysis of a meteorite.

This graph shows:

- Iron
- Nickel

Trace amounts of:

- Titanium and Calcium

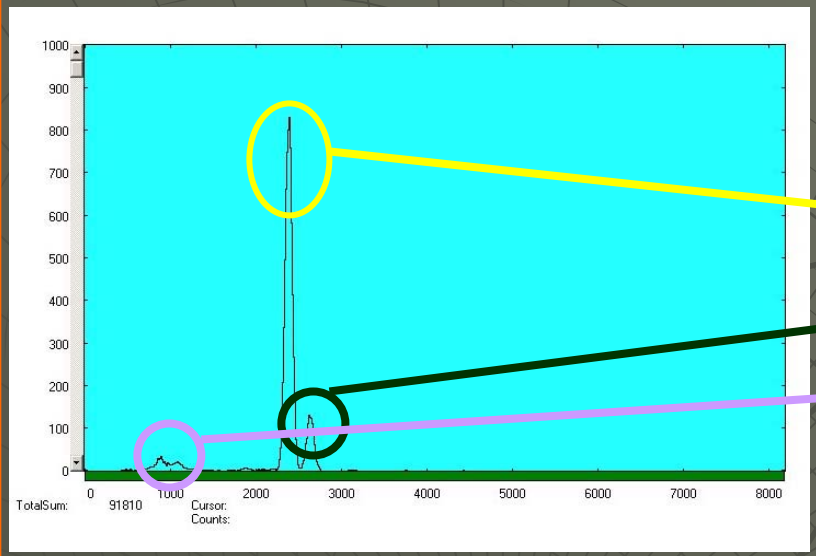


Analysis of unknown metal.

This graph reveals that the unknown metal was in fact iron.

The extra peak on the left is from the Argon in the air, and appears higher than in the other graphs because the time duration was smaller.

PIXE

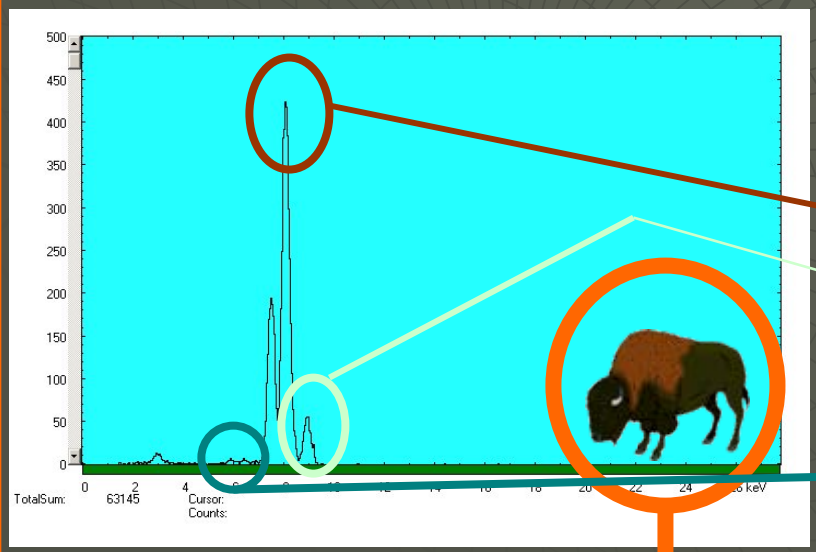


Analysis of a Roman coin.

This graph shows:

- High concentrations of Copper
- Some Iron,
- Calcium, and Arsenic

Arsenic was used in the refinement of copper, so it makes sense.



Analysis of a Buffalo Nickel.

This graph shows:

- Mostly Copper
- Some Nickel

Trace amounts of:

- Manganese, Buffalo

PIXE conclusion

- Just as we found the different elements contained within different metals PIXE can be used to elements contained in other substances.

- Such as:

  Paint, rare substances i.e. space rocks, ancient art work, etc..

Final Conclusion

Fun this program was