Physics 1200

Radioactivity

Bonus Part

As mentioned in the video, this portion of the lab is no longer included in the student handout which explains the procedure and analysis. After making the video however, I have found an old handout which includes this portion of the lab. It will be provided to the student which means no further explanation is needed.

Measurements from Video	
Time (min./sec)	Decay (counts/12 sec interval)
:00	692
:20	541
:40	537
1:00	433
1:20	422
1:40	391
2:00	365
2:20	332
2:40	297
3:00	281
3:20	244
3:40	218
4:00	226
4:20	193
4:40	194
5:00	165
5:20	164
5:40	128

The lab handout reminds us to account for background noise. This measurement was already taken in Part II. As a reminder, if you calculate counts/sec for the background radiation, don't forget to multiply it by 12 before you subtract it from the above numbers.

If N is the number of undecayed radioactive nuclei present at some instant, the rate of change of N is

$$R = \frac{dN}{dt} = -\lambda N$$

Solving this equation gives

$$N = N_o e^{-\lambda t}$$

Combining these two equations gives

$$R = R_o e^{-\lambda t}$$

If you plot the data, then do a curve fit (exponential), you should obtain the above equation. You can then use λ to calculate the half-life of our sample.