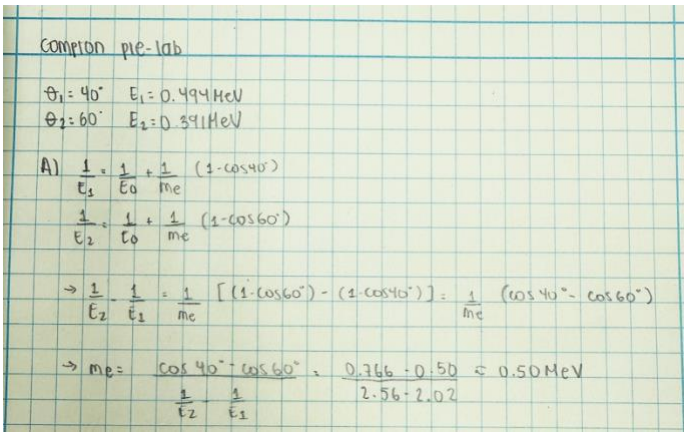
Prelab #7: Compton Scattering

6.1 Summarize the experiment in no more than 5 sentences: What physics phenomenon are you investigating, what will you be measuring (observables), what physics constants will you be determining from this experiment

→ In this experiment we will study how gamma ray photons scatter when they hit almost free electrons in a target. We will use a cesium source along with a NaI(Tl) scintillation detector and a multichannel analyzer to record the photon energy spectra at different scattering angles. We will start by calibrating the detector with gamma ray lines of known energy so we can convert channel numbers into actual photon energies. Then we will measure the scattered photon energies at each angle and compare our results with the Compton scattering formula, which comes from conserving energy and momentum in the collision. From the way the scattered photon energy changes with angle, we will determine the electron rest mass and evaluate how well the measurements match Compton theory

6.1 You measured the scattered photon energy to be 0.494MeV at 40 degrees (between the incident and scattered photons) and 0.391MeV at 60 degrees.

A. Ignore uncertainties, what is the mass of the electrons from these two data points? - DO not try to get one mass for each degrees and then take average. Both data points together should be use together to provide ONE electron mass. (If you can't figure out other methods, use the initial photon energy Eo =0.6617MeV. But it is actually unnecessary to know Eo)



B. What graph should you be making so that a simple linear fit can be used to determine me. Determine the photon energy if the photon is scattered 60, and 80 degrees. Do not use alculators of any sort. Take a screen shot of how you did it in the python console.

```python
import numpy as np

E0 = 0.6617
me = 0.511

def Ef(theta_deg):
    theta = np.deg2rad(theta_deg)
    return E0 / (1 + (E0/me) * (1 - np.cos(theta)))

print("Energy at 60 deg:", Ef(60), "MeV")
print("Energy at 80 deg:", Ef(80), "MeV")
```

```
In [15]: %runfile '/Users/catacisneros/Libr
Compton Scattering/prelab.py' --wdir
Energy at 60 deg: 0.4016495812793253 MeV
Energy at 80 deg: 0.31965367620838087 MeV
```