#%% Problem 1

X = []

for ii in range(0,101):

x = ii

X.append(x)

F = []

for jj in range(0,101):

y = 836773.401\*m.exp(-574.528\*X[jj])

F.append(y)

plt.figure(1)

plt.grid()

plt.plot(X,F)

plt.title('Instentaneous Deposition Profile Problem 1')

plt.xlabel('Distance within material[m]')

plt.ylabel('Fluence[J/m^2]')

#%% Problem 2

hv = [1, 1.5, 2, 3, 4, 5, 6, 8, 10, 15, 20, 30, 40, 50, 60, 80, 100]

sigma = [42507, 13463, 5817.5, 1736.9, 726.66, 367.79,79210.71, 88.196, 45.827, 15.693, 8.6561, 5.0678, 4.1258, 3.7238, 3.4928, 3.2093, 3.018]

print('Enter Number between 1 and 100')

y = input()

x = float(y)

xo = 0

yo = 0

x1 = 0

y1 = 0

Sigma = 0

for i in range(0,17):

s = hv[i]

if x == s:

Sigma = sigma[i]

break

else:

Sigma == 0

if Sigma == 0:

for ii in range(0,17):

s = hv[ii]

if x > s:

xo = s

yo = sigma[ii]

else:

jj = ii-1

xo = hv[jj]

yo = sigma[jj]

x1 = s

y1 = sigma[ii]

Sigma = (yo\*(x1-x)+y1\*(x-xo))/(x1-xo)

break

else:

Sigma = Sigma

print('Cross Section = ', Sigma, 'Barns')

#%% Problem 3

a = 7.56\*10\*\*(-16)

k = 1.38\*10\*\*(-23)

Na = 6.022\*10\*\*(-23)

def BE(Z\_given):

BE = (2.517\*10\*\*(-18))\*Z\_given\*\*(7/3)

return(BE)

row = [2710, 7300, 11343] #Al, Fe, Pb

A = [0.027, 0.065, 0.208] #Al, Fe, Pb

Z = [13, 26, 82] #Al, Fe, Pb

def Yield(row\_given, A\_given, Z\_given, m\_given):

Y = row\_given\*(Na/A\_given)\*BE(Z\_given)\*(2+Z\_given) + a\*(m\_given/row\_given)\*((2/(3\*k))\*BE(Z\_given))\*\*4

return(Y)

M = []

for ii in range(0,101):

M.append(ii)

Yal =[]

Yfe =[]

Ypb =[]

for jj in range(0,101):

Yal.append(Yield(row[0], A[0], Z[0], M[jj]))

Yfe.append(Yield(row[1], A[1], Z[1], M[jj]))

Ypb.append(Yield(row[2], A[2], Z[2], M[jj]))

plt.figure(2)

plt.grid()

plt.loglog(M,Yal, 'k', label='Al')

plt.loglog(M,Yfe, 'b', label='Fe')

plt.loglog(M,Ypb, 'r', label='Pb')

plt.legend(loc='upper right')

plt.title('Burnout Yield for Cases of Al, Fe, and Pb Problem 3')

plt.xlabel('Mass of Case[Kg]')

plt.ylabel('Yield[J]')

YAL = Yield(row[0], A[0], Z[0], M[1])

YFE = Yield(row[1], A[1], Z[1], M[1])

YPB = Yield(row[2], A[2], Z[2], M[1])

YAL = (10/7)\*YAL

YFE = (10/7)\*YFE

YPB = (10/7)\*YPB

Conversion = 2.39\*10\*\*(-13)

YAL = Conversion\*YAL

YFE = Conversion\*YFE

YPB = Conversion\*YPB

print('The Yield for Al is', YAL, 'kT')

print('The Yield for Fe is', YFE, 'kT')

print('The Yield for Pb is', YPB, 'kT')

#%% Problem 4

MI = 0.08999 #For part b

def BuildUp(A1\_given, A2\_given, c1\_given, c2\_given, mu\_given):

MFP = mu\_given\*MI

BUF = A1\_given\*m.exp(c1\_given\*MFP) + A2\_given\*m.exp(c2\_given\*MFP)

return(BUF)

print('BUF is =', BuildUp(-114.1, 115.1, 0.14, 0.16, 0.01749))

BUF = [1, 1.000000806, 1.00000521, 1.00000444]

P = [0.055064, 0.250586, 0.376856, 0.245272]

R = 7.07107\*10\*\*3 #For Part b

Y = 2.34304\*10\*\*14

mu = [-2.21, -0.2392, -0.03782, -0.01749]

Sum = 0

for ii in range(0,4):

Sum = Sum + P[ii]\*BUF[ii]\*m.exp(mu[ii]\*MI)

x = (4\*m.pi\*R\*\*2)

F = (Y/x)\*Sum

print('Fluence is =', F)