A beam of electrons is accelerated through a potential of 1 Volt. This beam is incident

on a screen with two slits separated by 1mm and detected on a screen 1m behind the slits.

1) [5 points] Find the de Broglie wavelength of the electrons.

λ = h / (2 me E)0.5 = 1.23\*10-9 m

2) [6 points] Sketch the pattern of electrons observed on the screen. What is the distance between maxima?

Sin^2 pattern, y=L λ /d = 1.23\*10^(-6) m

3) [4 points] If the electron beam were replaced by a beam of neutrons having the same kinetic energy, how would the observed pattern change?

Ratio of masses mn/me = 1836.

So pattern shrinks by a factor of 1/(1836)^(1/2) = 0.023

Alternatively: ynew = 2.86 \*10^(-8) m

4) [5 points] Now imagine that the beam of electrons is replaced by a beam of xrays having the same momentum. What is the energy of the xrays (give your answer in eVs)?

Eph = p c = h c/ c ( 2 me E)^(1/2) = 1.62 \*10^(-16) J = 1011 eV