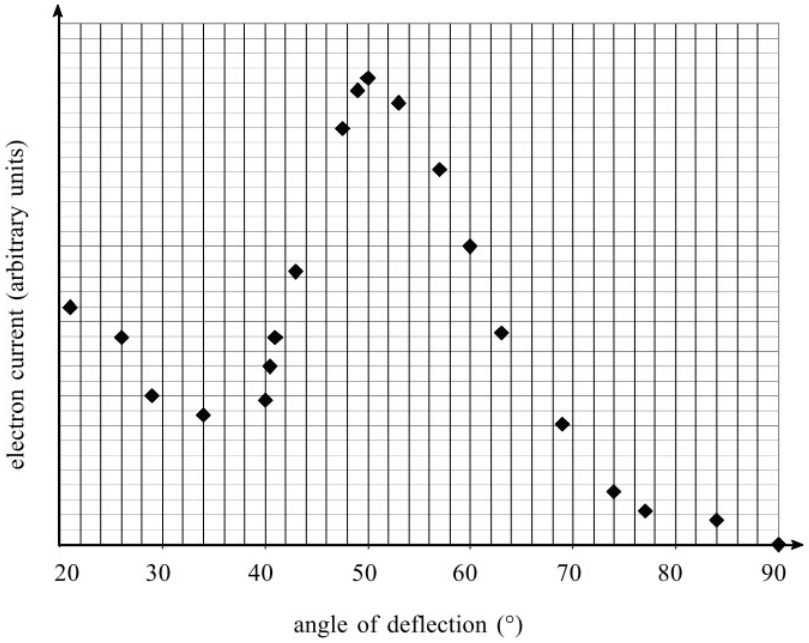
Wave Behaviour of Particles Assignment NAME_____

1.

a) State de Broglie's relation and describe its physical meaning. /2

b) Calculate the wavelength of an alpha particle moving at 1.67×10^{7} ms^{-1}. /2

2. In a Davisson–Germer experiment electrons are accelerated by a fixed potential difference and directed onto the surface of a crystal. The electron current detected at various angles of deflection is shown in the graph below:



a) On the graph above, draw a curve of best fit that shows the trend in the data points.

/1

b) Using your curve of best fit, determine the angle of deflection at which the maximum electron current occurs.

/1

c) State and explain what can be inferred about electrons from this experiment.

/2

d) If the spacing in the crystal is 0.909 nm and the peak shown on the graph is a first-order maximum, show that the wavelength of the electrons is approximately 7×10^{-10} m.

/2

e) If the electrons are being fired at the crystal at energies of 3.0 eV, use the wavelength found above to calculate the momentum of the electrons and verify de Broglie's relation.

/3

3. Discuss the two advantages of electron microscopes over optical microscopes. /2

TOTAL /15