Wave particle duality

1 de Broglie's hypothesis

de Broglie created the equation for the energy of a photon:

$$E = \frac{hc}{\lambda}$$

And also deduced that photon momentum is:

$$p = \frac{h}{\lambda}$$

This caused de Broglie to put forward the idea that all particles had wave like properties.
The de Broglie wavelength is calculated using the equation

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

2 Electron diffraction

Calculation to find the wavelength of electrons from an electron gun:

Set kinetic energy equal to eV

$$\frac{1}{2}mv^2 = eV$$

Multiply both sides by m and rearrange

$$m^2v^2 = 2meV$$

Squarerooting

$$mv = \sqrt{2meV}$$

Combining with de Broglie's equation $\lambda = \frac{h}{mv}$

$$\lambda = \frac{h}{\sqrt{2meV}}$$

When electrons are diffracted they show a very similar pattern to the pattern when photons are diffracted, evidence for the wavelike nature of electrons.