11 An electron has charge $-q$ and mass m. It is accelerated from rest in a vacuum through a potential difference V.

(a) Show that the momentum p of the accelerated electron is given by

$$p = \sqrt{(2mqV)}.$$

[2]

(b) The potential difference V through which the electron is accelerated is 120 V.

(i) State what is meant by the *de Broglie wavelength*.

.....

.....

.....[2]

(ii) Calculate the de Broglie wavelength of the electron.

wavelength = ... m [3]

(c) The separation of copper atoms in a copper crystal is approximately 2×10^{-10} m.

By reference to your answer in **(b)(ii)**, suggest whether electron diffraction could be observed using a beam of electrons that have been accelerated through a potential difference of 120 V and are then incident on a thin copper crystal.

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.....[2]

[Total: 9]