4 **(a)** Define electric potential at a point.

……

……

……. [1]

(b) An isolated nucleus in a vacuum produces electric potential V at a distance r from its centre. Fig. 4.1 shows the variation with r of V.

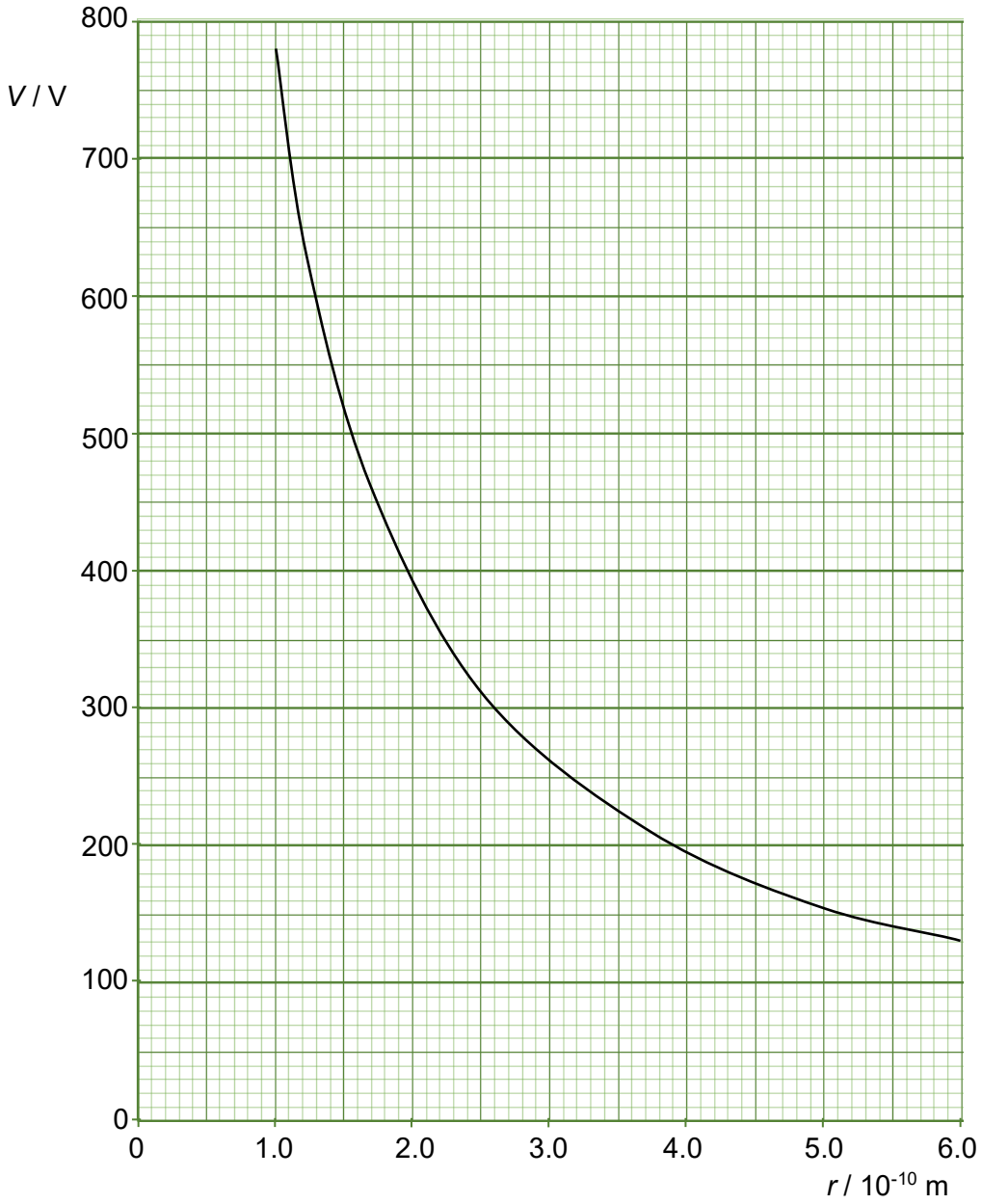

Fig. 4.1

(i) Use data from Fig. 4.1 to show that there are 54 protons in the nucleus.

[3]

(ii) A single proton is placed at a distance of 2.0×10^{-8} m from the centre of the nucleus.

Suggest why it may be assumed that the proton and the nucleus behave as point charges.

……...

……...

…….. [1]

(iii) **1.** Explain how the magnitude of the electric field strength at a distance *r* between 1.0 x 10^{-10} m and 6.0 x 10^{-10} m from the centre of the nucleus can be obtained from the curve in Fig. 4.1.

……...

…….. [1]

2. Hence or otherwise, determine the electric force on a proton that is at 2.6 x10^{-10} m from the centre of the nucleus.

magnitude of the force = ……. N

direction of the force = ……..

[4]

[Total: 10]