4 **(a)** Define *electric field strength* and state its SI unit.

……

……

…… [2]

(b) Two parallel pates are set a distance of 12 mm apart in a vacuum as shown in Fig. 4.1. The top plate is at a potential of +300 V and the bottom plate is at a potential of -300 V. A proton is placed in the vacuum and moved by the electric field from plate A to plate B.

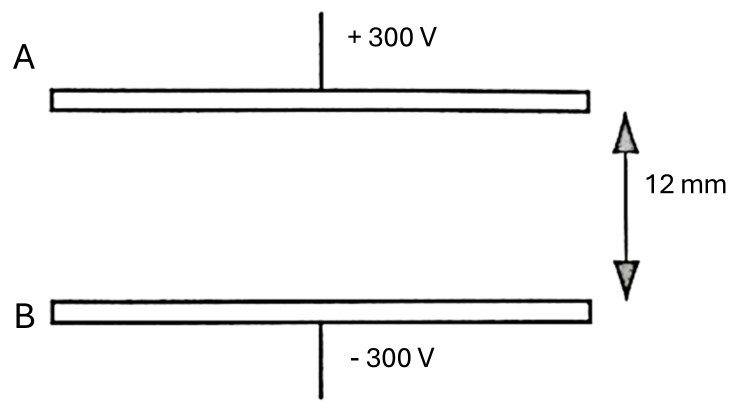

Fig. 4.1

(i) On Fig. 4.1, draw lines to show the electric field between the plates. [1]

(ii) Calculate the electric field strength between the parallel plates.

electric field strength = …… N C^{-1} [1]

(iii) Calculate the work done by the field on the proton.

work done = …… J [1]

(iv) State the gain in kinetic energy of the proton.

gain in kinetic energy = …… J [1]

(c) In a classical model of the hydrogen atom, the electron revolves around the positive nucleus, which is made up of single proton. Since the proton is very massive compared to the electron,

the proton can be assumed stationary as the electron goes around it in a circular orbit. The radius of this circular orbit is taken to be 5.3×10^{-11} m, which is the radius of the hydrogen atom.

Estimate the average electric current along the electron's orbit.

electric current = ... A [4]

[Total: 10]