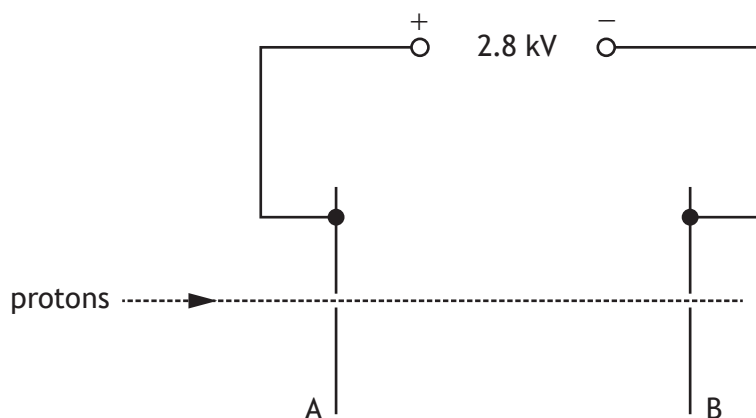**7.** Protons are accelerated by an electric field between metal plates A and B, in a vacuum.

Part of the apparatus used is shown.

(a) Explain why the protons are accelerated by the electric field. **2**

(b) (i) A proton is travelling at a speed of 3.8×10^5 m s^{-1} at plate A.

Show that the kinetic energy of the proton at plate A is 1.2×10^{-16} J. **2**

Space for working and answer

7. (b) (continued)

(ii) The potential difference between plates A and B is 2.8 kV.

Calculate the work done on the proton as it accelerates from plate A to plate B.

Space for working and answer

3

(iii) Determine the speed of the proton at plate B.

Space for working and answer

4

7. (continued)

(c) The distance between plates A and B is now doubled.

The potential difference between plates A and B is unchanged.

Another proton, with the same initial speed at plate A, is accelerated between the plates.

State what effect, if any, this has on the speed of the proton at plate B.

You must justify your answer. **2**