Question 18 (17 marks)

4.00×10^{-2} m
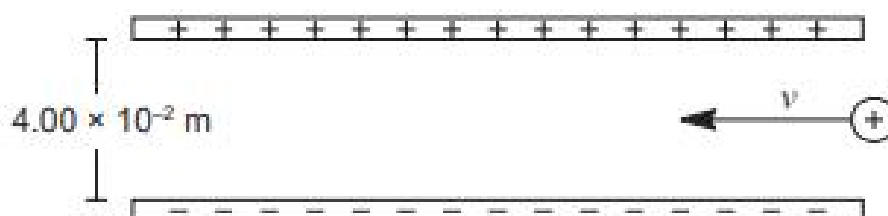
In an evacuated chamber, a proton enters an electric field at a speed of 1.79×10^6 m s^{-1} midway between two charged parallel plates and is initially moving parallel to them. The plates are 4.00×10^{-2} m apart and there is a potential difference of 4.80×10^3 V between them.

(a) (i) Calculate the downward force exerted on the proton by the electric field. (3 marks)

Answer: _____ N

(ii) Choose which mathematical relationship (A, B, C or D) describes the path taken by the proton when it enters the field. Circle your answer. (1 mark)

A. $y \propto x$　　　　B. $y \propto \dfrac{1}{x}$　　　　C. $y \propto \sqrt{x}$　　　　D. $y \propto x^2$

(b) Given that the proton does not exit the field before hitting the bottom plate, how far from the right hand end of the bottom plate does the proton land? Ignore any effects due to gravity. (7 marks)

(c)   Calculate the velocity of the proton just before it strikes the bottom plate. Include an angle in your answer.

(6 marks)

Answer: _____ m s^{-1} at _____ ° to the horizontal