6 **(a)** Define *acceleration*.

.....

.....[1]

(b) State what is meant by a *field of force*.

.....

.....[1]

(c) Two parallel metal plates A and B are separated by a distance of 2.8 cm in a vacuum, as shown in Fig. 6.1.

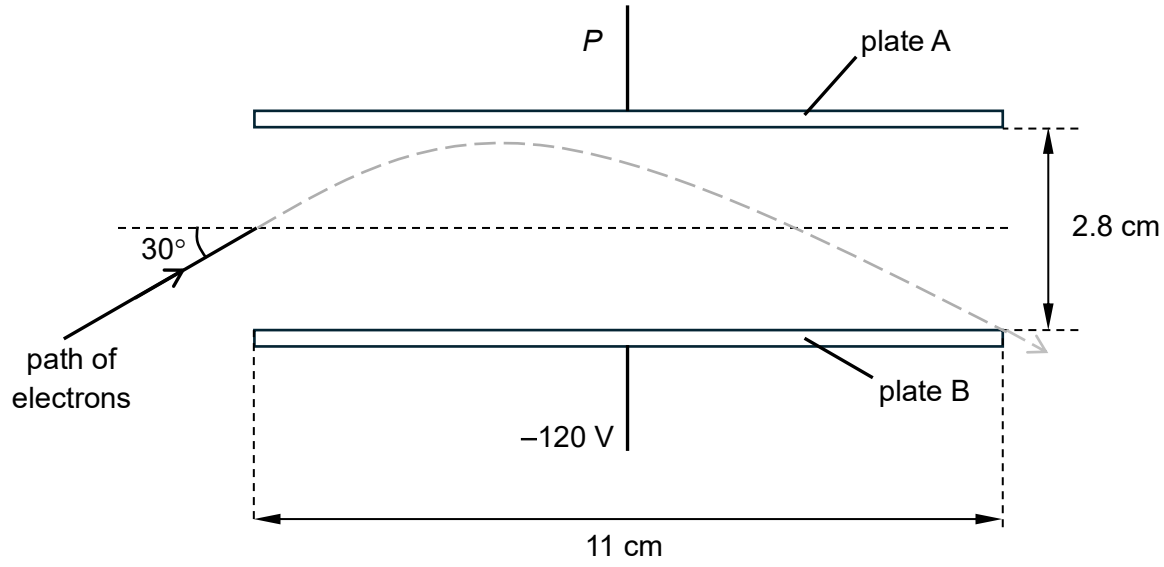

Fig. 6.1

The plates have length 11 cm. Plate A is at unknown potential *P* while plate B is at a potential of −120 V. The electric field may be assumed to be uniform between the plates and zero outside the plates.

An electron with kinetic energy 4.1×10^{-16} J enters the region midway between the plates. The initial direction of the electron is at an angle 30° above the horizontal. The electron charts out a parabolic path between the plates and exits just at the edge of plate B as shown in Fig. 6.1.

(i) Sketch on Fig. 6.1, lines to represent the electric field within the plates. [1]

(ii) For the electron between the metal plates,

1. show that the vertical component of velocity just as the electron enters the electric field is 1.5×10^{7} m s^{-1},

[2]

2. the time for the electron to travel a horizontal distance equal to the length of the plates,

time = ... s [1]

3. calculate the acceleration of the electron.

acceleration = ... m s^{-2} [2]

(iii) Hence or otherwise, determine the potential *P* of plate A for the electrons to chart out the path shown in Fig. 6.1.

P = ... V [3]

[Total: 11]