5 Fig. 5.1 shows a +1.20 nC charge at X in a uniform 4000 V m^{-1} electric field.

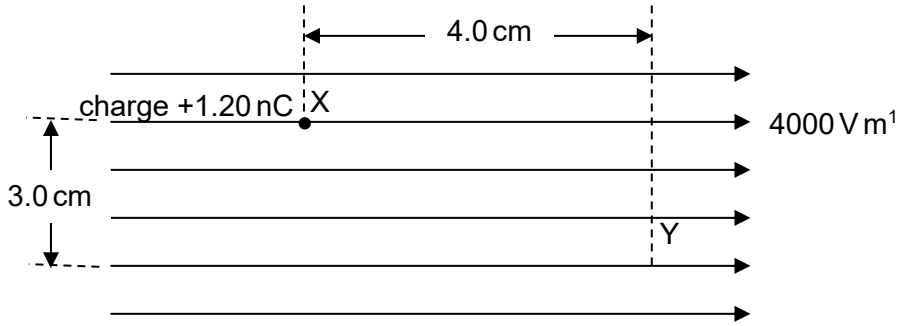

Fig. 5.1

(a) **(i)** Calculate the potential difference between X and Y and state whether the potential at X or Y is higher.

potential difference = _____ V

point of higher potential = _____. [3]

(ii) Calculate the work done by an external force to move the charge at X to Y.

[2]

work done = _____ J

(b) In the vacuum of an X-ray tube, electrons are accelerated from rest through a potential difference of 12 kV between the cathode and the anode. The current in the tube is 7.20 mA.

(i) Calculate the number of electrons passing through the tube in one second.

number = _____. [2]

(ii) Determine the speed of electrons arriving at the anode.

speed = _____ $m\,s^{-1}$ [2]

[Total: 9]