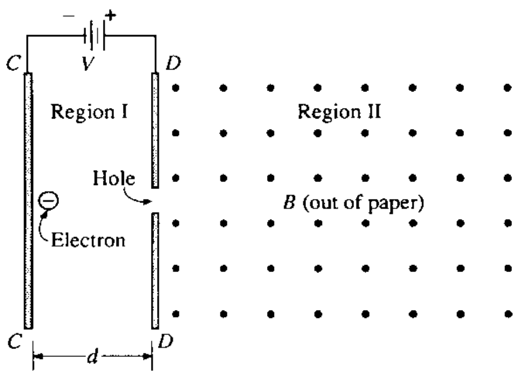



1991B2. In region I shown above, there is a potential difference V between two large, parallel plates separated by a distance d. In region II, to the right of plate D, there is a uniform magnetic field B pointing perpendicularly out of the paper. An electron, charge -e and mass m, is released from rest at plate C as shown, and passes through a hole in plate D into region II. Neglect gravity.

a. In terms of e, V, m, and d, determine the following.

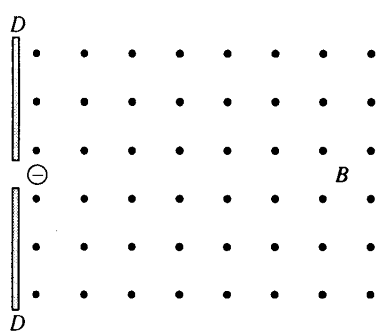
i. The speed $v_0$ of the electron as it emerges from the hole in plate D

ii. The acceleration of the electron in region I between the plates

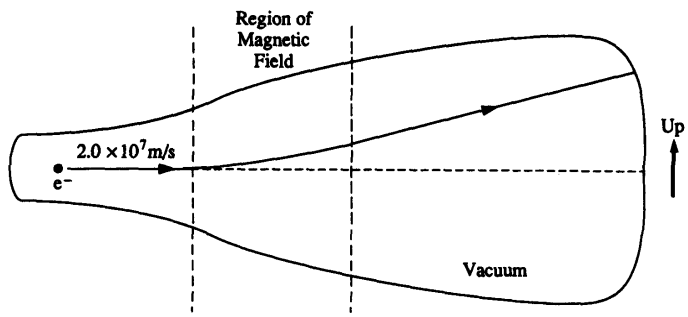
b. On the diagram below do the following.

i. Draw and label an arrow to indicate the direction of the magnetic force on the electron as it enters the constant magnetic field.

ii. Sketch the path that the electron follows in region II.




c. In terms of e, B. V, and m, determine the magnitude of the acceleration of the electron in region II.



Cross Section of Cathode Ray Tube

1992B5. The figure above shows a cross section of a cathode ray tube. An electron in the tube initially moves horizontally in the plane of the cross section at a speed of $2.0 \times 10^7$ meters per second. The electron is deflected upward by a magnetic field that has a field strength of $6.0 \times 10^{-4}$ tesla.

a. What is the direction of the magnetic field?

b. Determine the magnitude of the magnetic force acting on the electron.

c. Determine the radius of curvature of the path followed by the electron while it is in the magnetic field.

An electric field is later established in the same region as the magnetic field such that the electron now passes through the magnetic and electric fields without deflection.

d. Determine the magnitude of the electric field.

e. What is the direction of the electric field?