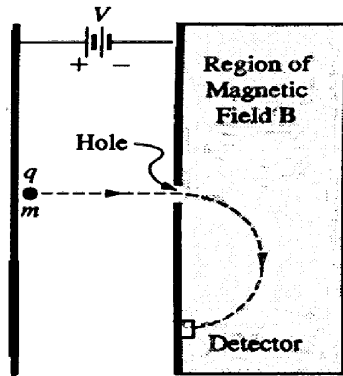


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3. A particle of mass m and charge q is accelerated from rest in the plane of the page through a potential difference V between two parallel plates as shown above. The particle is injected through a hole in the right-hand plate into a region of space containing a uniform magnetic field of magnitude B oriented perpendicular to the plane of the page. The particle curves in a semicircular path and strikes a detector. Neglect relativistic effects throughout this problem.

- (a) i. State whether the sign of the charge on the particle is positive or negative.
- ii. State whether the direction of the magnetic field is into the page or out of the page.
- (b) Determine each of the following in terms of m , q , V , and B .
- i. The speed of the charged particle as it enters the region of the magnetic field B
- ii. The force exerted on the charged particle by the magnetic field B
- iii. The distance from the point of injection to the detector
- iv. The work done by the magnetic field on the charged particle during the semicircular trip