

5.6 Charged Particle in Crossed Electric and Magnetic Fields

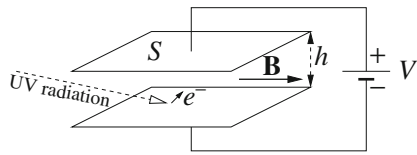


Fig. 5.4

A particle of electric charge q and mass m is initially at rest in the presence of a uniform electric field \mathbf{E} and a uniform magnetic field \mathbf{B} , perpendicular to \mathbf{E} .

a) Describe the subsequent motion of the particle.

b) Use the above result to discuss the

following problem. We have a parallel-plate capacitor with surface S , plate separation h and voltage V , as in Fig. 5.4. A uniform magnetic field \mathbf{B} is applied to the capacitor, perpendicular to the capacitor electric field, i.e., parallel to the plates. Ultraviolet radiation causes the negative plate to emit electrons with zero initial velocity. Evaluate the minimum value of \mathbf{B} for which the electrons cannot reach the positive plate.