51. A parallel-plate capacitor has charge $+Q$ on one plate and charge $-Q$ on the other. The plates, each of area A, are a distance d apart and are separated by a vacuum. A single proton of charge $+e$, released from rest at the surface of the positively charged plate, will arrive at the other plate with kinetic energy proportional to

(A) $\frac{edQ}{A}$

(B) $\frac{Q^2}{eAd}$

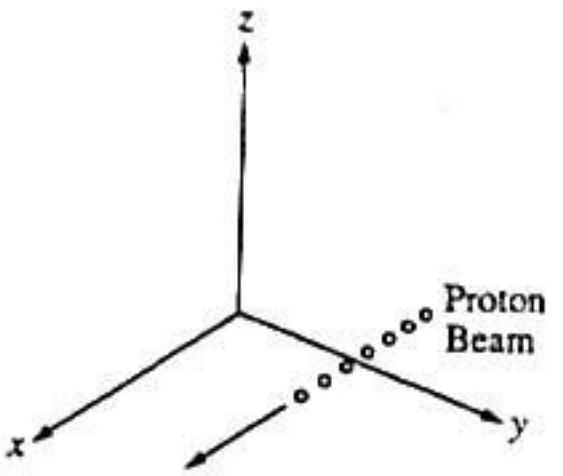
(C) $\frac{AeQ}{d}$

(D) $\frac{Q}{ed}$

(E) $\frac{eQ^2}{Ad}$

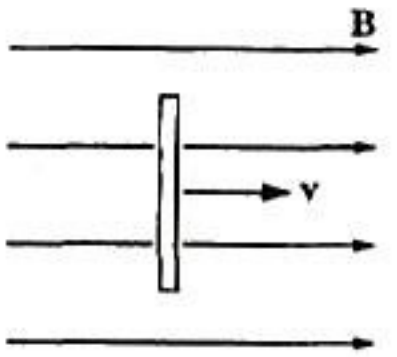
52. In which of the following cases does there exist a nonzero magnetic field that can be conveniently determined by using Ampere's law?

(A) Outside a point charge that is at rest
(B) Inside a stationary cylinder carrying a uniformly distributed charge
(C) Inside a very long current-carrying solenoid
(D) At the center of a current-carrying loop of wire
(E) Outside a square current-carrying loop of wire



53. A beam of protons moves parallel to the x-axis in the positive x-direction, as shown above, through a region of crossed electric and magnetic fields balanced for zero deflection of the beam. If the magnetic field is pointed in the positive y-direction, in what direction must the electric field be pointed?

(A) Positive y-direction
(B) Positive z-direction
(C) Negative x-direction
(D) Negative y-direction
(E) Negative z-direction



54. A vertical length of copper wire moves to the right with a steady velocity $\mathbf{v}$ in the direction of a constant horizontal magnetic field $\mathbf{B}$, as shown above. Which of the following describes the induced charges on the ends of the wire?

	Top End	Bottom End
(A)	Positive	Negative
(B)	Negative	Positive
(C)	Negative	Zero
(D)	Zero	Negative
(E)	Zero	Zero