Questions 43-44

A narrow beam of protons produces a current of 1.6×10^{-3} A. There are 10^9 protons in each meter along the beam.

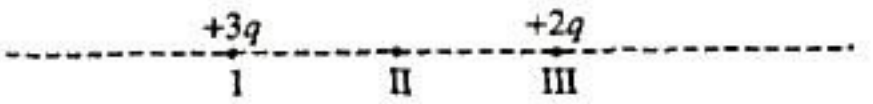
43. Of the following, which is the best estimate of the average speed of the protons in the beam?

(A) 10^{-15} m/s
(B) 10^{-12} m/s
(C) 10^{-7} m/s
(D) 10^{7} m/s
(E) 10^{12} m/s

44. Which of the following describes the lines of magnetic field in the vicinity of the beam due to the beam's current?

(A) Concentric circles around the beam
(B) Parallel to the beam
(C) Radial and toward the beam
(D) Radial and away from the beam
(E) There is no magnetic field.

Questions 45-46 refer to two charges located on the line shown in the figure below, in which the charge at point I is $+3q$ and the charge at point III is $+2q$. Point II is halfway between points I and III.



45. Other than at infinity, the electric field strength is zero at a point on the line in which of the following ranges?

(A) To the left of I
(B) Between I and II
(C) Between II and III
(D) To the right of III
(E) None; the field is zero only at infinity.

46. The electric potential is negative at some points on the line in which of the following ranges?

(A) To the left of I
(B) Between I and II
(C) Between II and III
(D) To the right of III
(E) None; this potential is never negative.