

FOURTH MIDTERM

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Discussion Section # _____

SHOW ALL WORK!!!!

REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!

Use the conversion constants and data given on the front page.

Electrons are run through a velocity selector as discussed in class with the following values of the fields: $E = 125,000 \text{ V/m}$ and $B = 0.350 \text{ T}$.

- (a) Calculate the velocity of electrons selected by this system;
- (b) Protons are incident on the same system. Find the radius of the orbit of these protons after they leave the velocity selector and pass through a region with $B = 0.350 \text{ T}$ perpendicular to the velocity.

a)
$$v = \frac{E}{B} = \frac{125,000 \text{ N/C}}{.35 \text{ N/Am}} = 3.57 \times 10^5 \text{ m/s}$$

10 pt.

wrong exponent -2 pt
wrong units -1 pt

algebraic error in derivation -3 pt
no derivation & wrong formula -10 pt.

b)
$$R = \frac{mv}{qB} = \frac{mE}{qB^2} = (6.38 \times 10^{-29} \text{ m}_p) \text{ m} = 1.07 \text{ cm}$$

15 pt.

same as above except
no derivation & wrong formula -15 pts
using wrong mass -2 pts
not completing calculation or
doing incorrectly -2 pts