

TWO OF THE FOLLOWING PROBLEMS WILL BE ON THE QUIZ ON FRIDAY, 29 FEBRUARY.

1. At some instant a -0.010 C point charge with a velocity of $\mathbf{v} = 1.50 \times 10^3 \mathbf{i}$ m/s is at a position where there is a magnetic field $\mathbf{B} = 0.125 \mathbf{k}$ T and an electric field $\mathbf{E} = 200 \mathbf{i}$ N/C. What is the direction and magnitude of the total force on the particle?
2. A current loop has a dipole moment of $\boldsymbol{\mu} = 2.0 \text{ A} \cdot \text{m}^2 \mathbf{i}$ and is placed in a magnetic field of $\mathbf{B} = 3.0 \text{ T } \mathbf{k}$. What is the torque on the loop and its potential energy?
3. An electron in a constant magnetic field moves like so:



What is the direction of the magnetic field?

4. A wire 2.80 m in length carries a current of 5.00 A in a region where a uniform magnetic field has a magnitude of 0.390 T. Calculate the magnitude of the magnetic force on the wire assuming the angle between the magnetic field and the current is
 - (a) 60°
 - (b) 90°
 - (c) 120°
5. A particle with a positive charge $q = 3.20 \times 10^{-19}$ C moves with a velocity $\mathbf{v} = (2\mathbf{i} + 3\mathbf{j} - \mathbf{k})$ m/s through a region where there is both a uniform magnetic field $\mathbf{B} = (2\mathbf{i} + 4\mathbf{j} + \mathbf{k})$ T and a uniform electric field $\mathbf{E} = (4\mathbf{i} - \mathbf{j} - 2\mathbf{k})$ V/m. What is the direction and magnitude of the force on the particle?
6. A proton moves in a circle of radius 21 cm perpendicular to a magnetic field $B = 0.4$ T. Find
 - (a) the period of the motion.
 - (b) the speed of the proton.