001 (part 1 of 3)

The magnetic field over a certain range is given by $\vec{B} = B_x\,\hat{\imath} + B_y\,\hat{\jmath}$, where $B_x = 3$ T and $B_y = 7$ T. An electron moves into the field with a velocity $\vec{v} = v_x\,\hat{\imath} + v_y\,\hat{\jmath} + v_z\,\hat{k}$, where $v_x = 1$ m/s, $v_y = 8$ m/s and $v_z = 6$ m/s.

The charge on the electron is -1.602×10^{-19} C.

What is the $\hat{\imath}$ component of the force exerted on the electron by the magnetic field? Answer in units of N.

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002 (part 2 of 3)

What is the $\hat{\jmath}$ component of the force?Answer in units of N.

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003 (part 3 of 3)

What is the $\hat{k}$ component of the force?Answer in units of N.

004

A segment of wire carries a current of 20 A along the x axis from $x = -6$ m to $x = 0$ and then along the z axis from $z = 0$ to $z = 7.2$ m. In this region of space, the magnetic field is equal to 51 mT in the positive z direction.

What is the magnitude of the force on this segment of wire? Answer in units of N.

005

An 6.79 m long copper wire with a cross-sectional area of 5.07×10^{-5} m^2, in the shape of a square loop, is connected to a 0.1011 V battery. The resistivity of copper is $2.8 \times 10^{-8}\ \Omega\,$m.

If the loop is placed in a uniform magnetic field of magnitude 0.556 T, what is the maximum torque that can act on it? Answer in units of N m.

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006 (part 1 of 2)

An electron circles at a speed of 11400 m/s in a radius of 1.22 cm in a solenoid. The magnetic field of the solenoid is perpendicular to the plane of the electron's path.

The charge on an electron is 1.60218×10^{-19} C and its mass is 9.10939×10^{-31} kg.

Find the strength of the magnetic field inside the solenoid. Answer in units of T.

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007 (part 2 of 2)

Find the current in the solenoid if it has 28.6 turns/cm. Answer in units of mA.