Old Exams Questions Chapter 28

T071:

Q19. A loop of wire carrying a current of 3.0 A is in the shape of a right triangle with two equal sides, each 16 cm long. A 0.8T uniform magnetic field is parallel to the hypotenuse. The total magnetic force on the two equal sides has a magnitude of: (Ans: 0)

Q20. A potential difference of 600 V is applied to accelerate an electron from rest. This accelerated electron enters a uniform magnetic field and completes one revolution in 9 nano seconds. Determine the radius of the electron orbit? (Ans: 0.021 m)

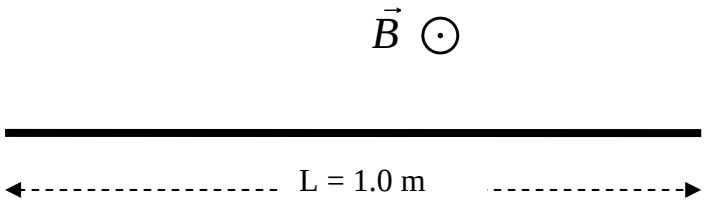
Q21. An electron with a velocity of $v = (4.0\times10^{4}\ i + 3.0\times10^{6}\ j)$ m/s enters a region of magnetic field B = (0.40 i) T. The magnetic force on the electron is: (A 1.9×10^{-13} k N)

Q22. A 300 turn square loop, having a side length of 6 cm, carries a current of 15 A. The loop is placed in an external magnetic field of magnitude 3.0 T. Determine the magnitude of the maximum torque exerted on the loop. (A: 49 N.m)

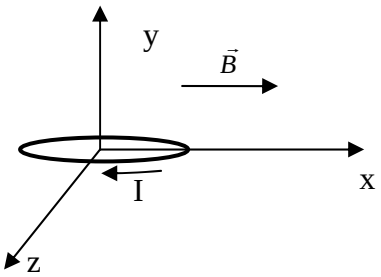
T062:

Q19. An electron moving perpendicular to a 50 μT magnetic field goes through a circular trajectory. What is the time required to complete one revolution? (7.15×10^{-7} s)

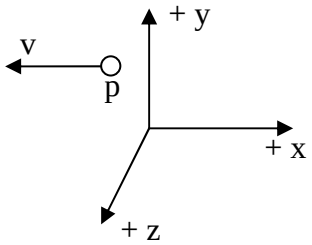
Q21: The following Fig. 1 shows a straight horizontal length of copper wire of mass m = 50 g and length L = 1.0 m lies in a uniform magnetic field B = 0.5 T directed out of the page. What is the magnitude and direction of the current in the wire to balance the gravitational force? (Ans: 0.98 A, to the left)



Q22. A 100 turns coil, lies in xz-plane, has an area of 2.0 m^2 and carries a current I = 0.3 A in the direction indicated in the Fig. 2. The coil lies in a magnetic field directed along the x-axis and has a magnitude of 1.5 T. What is magnitude and direction of the torque on the coil? (Ans: 90 N.m along the positive z axis)



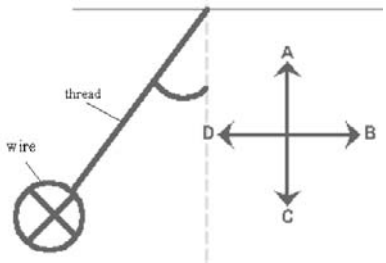
Q23. The Fig. 3 shows a proton moving at a constant speed of 300 m/s along the negative x-axis through uniform electric and magnetic fields. The electric field is directed along the positive y-direction and has a magnitude of 900 N/C. What is the magnitude and direction of the magnetic field?



<u>T-061:</u>

Q18. A charged particle is moving with speed **v** perpendicular to a uniform magnetic field. A second identical charged particle is moving with speed ***2*v** perpendicular to the same magnetic field. The frequency of revolution of the first particle is *f*. The frequency of revolution of the second particle is

Q19. An electron with a velocity $\vec{\mathbf{v}} = 5.0\times10^{7}\,\hat{\mathbf{i}}$ (m/s) enters a region of space where perpendicular electric and magnetic fields are present. The electric field is $\vec{\mathbf{E}} = -10^{4}\,\hat{\mathbf{j}}$ (N/C). What magnetic field (in Tesla) will allow the electron to go through un-deflected? (Ans: $\vec{\mathbf{B}} = +(2.0\times10^{-4})\hat{\mathbf{k}}$)

Q21. A horizontal, 

long current-carrying wire is

hanging from a vertical thread. The current is oriented into the plane of the figure 1 shown below. A uniform magnetic field is applied and the wire is pulled away from the vertical. Which of the arrows labeled **A** to **D** correctly indicates the direction of the magnetic field?

Q29. A wire of length L carries a current I , is bent in the form of a circle. The magnitude of its magnetic moment is: (Ans: $\frac{IL^2}{4\pi}$)

T-052:

Q#14. What is the angle between a 1.0-mT uniform magnetic field and the velocity of an electron, if the electron has an acceleration of 7.0×10^{12} m/s^2 and a speed of 7.0×10^{4} m/s?(Ans: 35^{o})

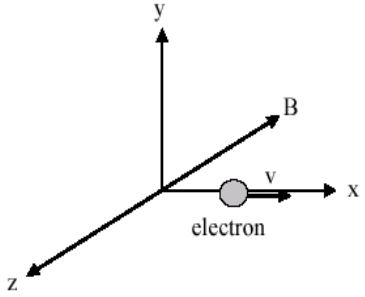
Q#9. A wire lying along the y axis from y = 0 to y = 0.36 m carries a current of 2.0 mA in the negative direction of the y axis. The wire fully lies in a uniform magnetic field given by B=0.36 i + 0.46 j (T). What is the magnetic force on the wire? (Ans: 2.6×10^{-4} N in the positive z direction.)

Q#29. A uniform magnetic field of 2.0 T along the positive z-axis crosses an electric field E. What is the electric field needed to guide an electron with a speed of 40 km/s along a straight line in the positive x-axis direction? (Ans: 80 kV/m along the positive y-axis.)

T-051:

Q#5. An electric field of magnitude 400 V/m is normal to a magnetic field of magnitude 0.25 T. If an electron moving through these two fields experiences no force, what is the speed of the electron? (Ans: 1.60 km/s.)

Q#17. In the figure 1, an electron of speed 2.0×10^5 m/s moves along positive x axis in a uniform magnetic field of 0.2 T pointing into the page –z direction. The magnetic force on the electron is:



Q#23. In a uniform magnetic field, a particle of charge 1.5 μC and mass 2.0 μg completes 5 revolutions in one second. What is the magnitude of the magnetic field? (Ans: 42 mT.)

T-042:

Q#17 An electron enters a region that contains a magnetic field directed into the page as shown in figure 7. The velocity of the electron makes an angle of 30 degrees with the +y axis. What is the direction of the magnetic force on the electron when it enters the field? (A1: at an angle of 30 degrees below the positive x axis and in the plane of the page.)

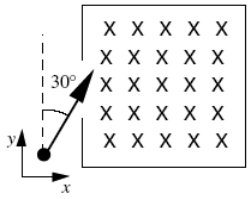


Figure 7

Q#19: An electron is accelerated from rest through a potential difference of 500 Volts, then injected into a uniform magnetic field. Once in the magnetic field, it completes one revolution in 4.0 nano-s. What is the radius of the orbit? (A1 8.4 mm)

Q#21: A circular coil of 160 turns has a radius of 1.90 cm and carries a current I. If the maximum torque that the coil can experience in a uniform 35.0 mT magnetic field is 0.08 N*m, what is the value of I. (A1 12.6 A.)

T-041

Q#1: In figure 5, an electron moves toward the west at speed of 1.0×10^{7} m/s in a downward (normal into the page) uniform magnetic field of 3.0×10^{-4} T. The magnetic force on the electron is (Ans: 4.8×10^{-16}, north.)

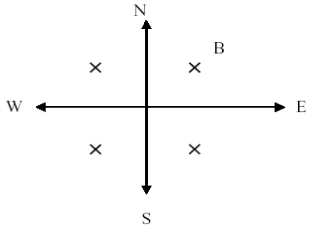


Figure (5)

T-032:

Q#1: Figure 6 shows the circular paths of an electron and a proton that travel at the same speed in a uniform magnetic field B**,** which points into the page. (a) Which particle follows the bigger circle, and (b) does that particle travel clockwise or counterclockwise?

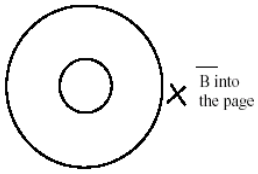


Figure 6