Electromagnetic Fields – Assignment 07

Magnetism II

#	Student ID	Student Name	Grade (10)
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Delivery Date	

١. يتم تسليم التمرين محلولا في خلال أسبوع من تاريخ التمرين، و يتم حذف درجتين من التمرين عن كل أسبوع تأخير
٢. يتم التسليم لمعيد المقرر مباشرة
٣. تتم أجابه التمرين في نفس ورق الأسئلة

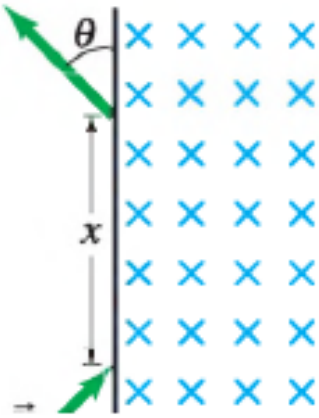
Q1	A doubly charged helium atom whose mass is 6.6×10^{-27} kg is accelerated by a voltage of 2700 V. (*a*) What will be its radius of curvature if it moves in a plane perpendicular to a uniform 0.340-T field? (*b*) What is its period of revolution?
Sol 1	.....

Q2	An electron moves with velocity $\vec{\mathbf{v}} = (7.0\hat{\mathbf{i}} - 6.0\hat{\mathbf{j}}) \times 10^4\,\mathrm{m/s}$ in a magnetic field $\vec{\mathbf{B}} = (-0.80\hat{\mathbf{i}} + 0.60\hat{\mathbf{j}})\,\mathrm{T}$. Determine the magnitude and direction of the force on the electron.
Sol 2	.....

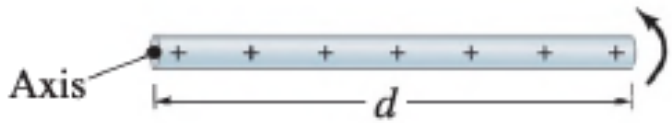
Q3	A proton moves through a region of space where there is a magnetic field $\vec{\mathbf{B}} = (0.45\hat{\mathbf{i}} + 0.38\hat{\mathbf{j}})\,\mathrm{T}$ and an electric field $\vec{\mathbf{E}} = (3.0\hat{\mathbf{i}} - 4.2\hat{\mathbf{j}}) \times 10^3\,\mathrm{V/m}$. At a given instant, the proton's velocity is $\vec{\mathbf{v}} = (6.0\hat{\mathbf{i}} + 3.0\hat{\mathbf{j}} - 5.0\hat{\mathbf{k}}) \times 10^3\,\mathrm{m/s}$. Determine the components of the total force on the proton.
Sol 3	.....

Q4	The path of protons emerging from an accelerator must be bent by 90° by a "bending magnet" so as not to strike a barrier in their path a distance d from their exit hole in the accelerator. Show that the field $\vec{\mathbf{B}}$ in the bending magnet, which we assume is uniform and can extend over an area $d \times d$, must have magnitude $B \geq (2mK/e^2d^2)^{\frac{1}{2}}$, where m is the mass of a proton and K is its kinetic energy.
Sol 4	.....

Q5	A 3.40-g bullet moves with a speed of 155 m/s perpendicular to the Earth's magnetic field of 5.00×10^{-5} T. If the bullet possesses a net charge of 18.5×10^{-9} C, by what distance will it be deflected from its path due to the Earth's magnetic field after it has traveled 1.00 km?
Sol 5	.....

Q6	A proton moving with speed $v = 1.3 \times 10^5$ m/s in a field-free region abruptly enters an essentially uniform magnetic field $B = 0.850\,\mathrm{T}$ $(\vec{\mathbf{B}} \perp \vec{\mathbf{v}})$. If the proton enters the magnetic field region at a 45° angle as shown in Fig. 27–46, (*a*) at what angle does it leave, and (*b*) at what distance x does it exit the field? 
Sol 6	.....

Q7	A 13.0-cm-diameter circular loop of wire is placed with the plane of the loop parallel to the uniform magnetic field between the pole pieces of a large magnet. When 4.20 A flows in the coil, the torque on it is 0.185 m·N. What is the magnetic field strength?
Sol 7	.....

Q8	Suppose a nonconducting rod of length d carries a uniformly distributed charge Q. It is rotated with angular velocity ω about an axis perpendicular to the rod at one end, Fig. . Show that the magnetic dipole moment of this rod is $\frac{1}{6}Q\omega d^2$. [*Hint*: Consider the motion of each infinitesimal length of the rod.] 
Sol 8	.....

Q9	A galvanometer needle deflects full scale for a 63.0-μA current. What current will give full-scale deflection if the magnetic field weakens to 0.800 of its original value?
Sol 9	.....

Q10	An oil drop whose mass is determined to be 3.3×10^{-15} kg is held at rest between two large plates separated by 1.0 cm . If the potential difference between the plates is 340 V, how many excess electrons does this drop have?
Sol 10	.....

Q11	The Hall effect can be used to measure blood flow rate because the blood contains ions that constitute an electric current. (*a*) Does the sign of the ions influence the emf? (*b*) Determine the flow velocity in an artery 3.3 mm in diameter if the measured emf is 0.13 mV and B is 0.070 T. (In actual practice, an alternating magnetic field is used.)
Sol 11	.....