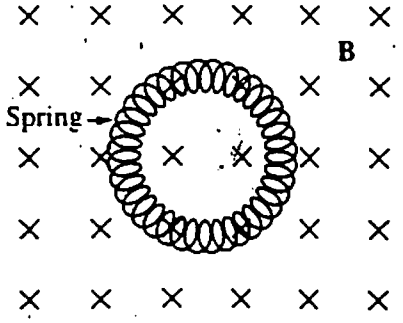
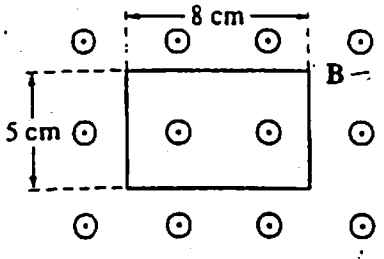
Magnetism (2)



6. A metal spring has its ends attached so that it forms a circle. It is placed in a uniform magnetic field, as shown above. Which of the following will NOT cause a current to be induced in the spring?

(A) Changing the magnitude of the magnetic field
(B) Increasing the diameter of the circle by stretching the spring
(C) Rotating the spring about a diameter
(D) Moving the spring parallel to the magnetic field
(E) Moving the spring in and out of the magnetic field



7. A rectangular wire loop is at rest in a uniform magnetic field B of magnitude 2 T that is directed out of the page. The loop measures 5 cm by 8 cm, and the plane of the loop is perpendicular to the field, as shown above. The total magnetic flux through the loop is

(A) zero
(B) 2×10^{-3} T·m^2
(C) 8×10^{-3} T·m^2
(D) 2×10^{-1} T·m^2
(E) 8×10^{-1} T·m^2

Questions 8 & 9.

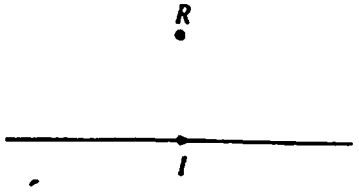
A magnetic field of 0.1 T forces a proton beam of 1.5 mA to move in a circle of radius 0.1 m. The plane of the circle is perpendicular to the magnetic field.

8. Of the following, which is the best estimate of the work done by the magnetic field on the protons during one complete orbit of the circle?

(A) 0 J
(B) 10^{-22} J
(C) 10^{-5} J
(D) 10^{2} J
(E) 10^{20} J

9. Of the following, which is the best estimate of the speed of a proton in the beam as it moves in the circle?

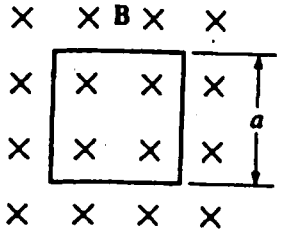
(A) 10^{-2} m/s
(B) 10^{3} m/s
(C) 10^{6} m/s
(D) 10^{8} m/s
(E) 10^{15} m/s



10. The direction of the magnetic field at point R caused by the current I in the wire shown above is

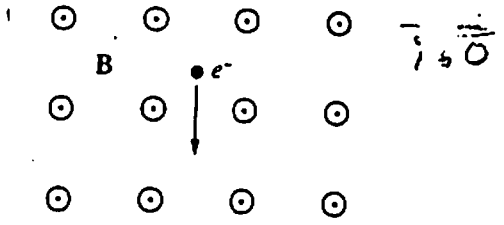
(A) to the left
(B) to the right
(C) toward the wire
(D) into the page
(E) out of the page

Magnetism (1)



1. A square loop of wire of resistance R and side a is oriented with its plane perpendicular to a magnetic field **B**, as shown above. What must be the rate of change of the magnetic field in order to produce a current I in the loop?

(A) IR/a^2
(B) Ia^2/R
(C) Ia/R
(D) Ra/I
(E) IRa

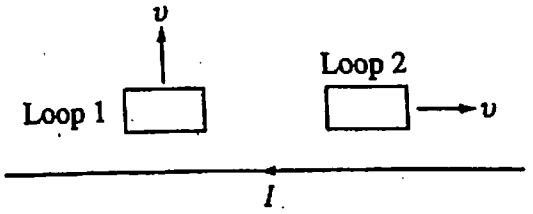


2. An electron is in a uniform magnetic field **B** that is directed out of the plane of the page, as shown above. When the electron is moving in the plane of the page in the direction indicated by the arrow, the force on the electron is directed

(A) toward the right
(B) out of the page
(C) into the page
(D) toward the top of the page
(E) toward the bottom of the page

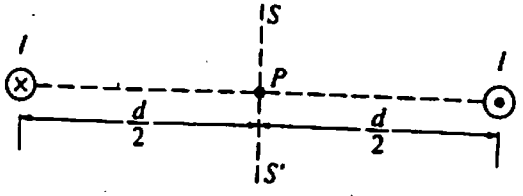
3. Two parallel wires, each carrying a current I, repel each other with a force F. If both currents are doubled, the force of repulsion is

(A) $2F$
(B) $2\sqrt{2}F$
(C) $4F$
(D) $4\sqrt{2}F$
(E) $8F$



4. Two conducting wire loops move near a very long, straight conducting wire that carries a current I. When the loops are in the positions shown above, they are moving in the directions shown with the same constant speed v. Assume that the loops are far enough apart that they do not affect each other. Which of the following is true about the induced electric currents, if any, in the loops?

	Loop 1	Loop 2
(A)	No current	No current
(B)	No current	Counterclockwise direction
(C)	Clockwise direction	No current
(D)	Clockwise direction	Clockwise direction
(E)	Counterclockwise direction	Clockwise direction



5. Two long, parallel wires are separated by a distance d, as shown above. One wire carries a steady current I into the plane of the page while the other wire carries a steady current I out of the page. At what points in the plane of the page and outside the wires, besides points at infinity, is the magnetic field due to the currents zero?

(A) Only at point P
(B) At all points on the line SS'
(C) At all points on the line connecting the two wires
(D) At all points on a circle of radius $2d$ centered on point P
(E) At no points