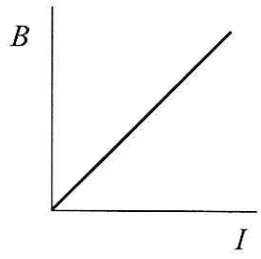
55. The current through a solenoid is varied and the resulting magnetic field at its centre is recorded in each case. A graph of the magnetic field versus the current is produced.



Which of the following represents the slope of this graph?

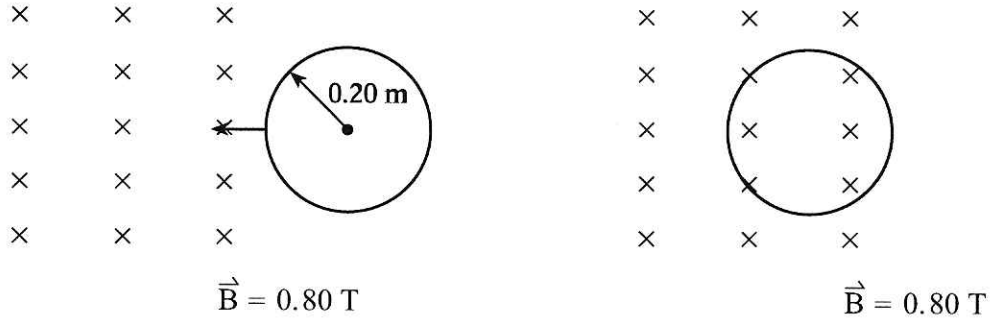
A. $\frac{\mu_0 N}{l}$

B. $\frac{Nl}{\mu_0}$

C. $\frac{\mu_0 B}{N}$

D. $\frac{Il}{N}$

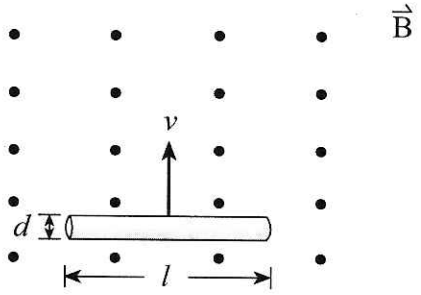
56. A circular loop of resistance 1.2 Ω is pulled a distance of 0.40 m into a perpendicular magnetic field as shown below.



An average current of 0.50 A is produced in the coil during this event. Calculate the constant speed with which the coil was pulled.

A. 0.10 m/s
B. 0.75 m/s
C. 1.9 m/s
D. 2.4 m/s

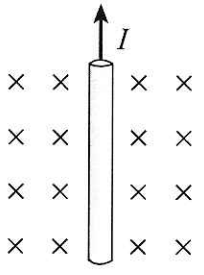
57. A length of conducting wire is moving perpendicular to a magnetic field as shown below.

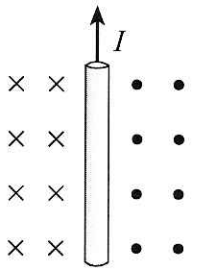


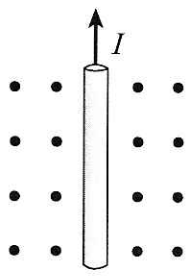
Which of the following does not affect the size of the emf produced between the ends of the wire?

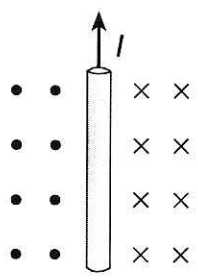
A. speed of wire
B. length of wire
C. thickness of wire
D. magnetic field strength

58. Which of the four diagrams below correctly depicts the magnetic field found on either side of a current carrying wire?

A. 

B. 

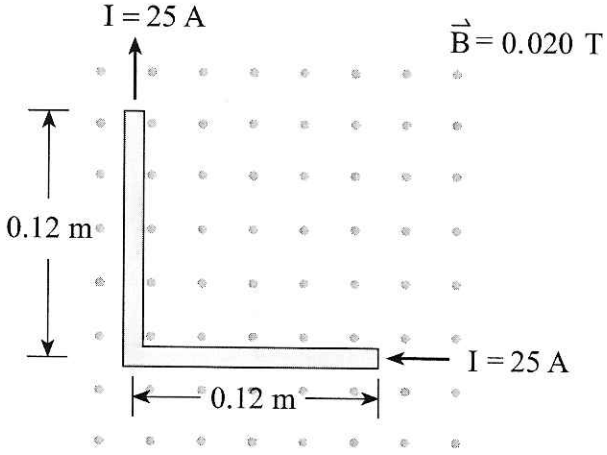
C. 

D. 

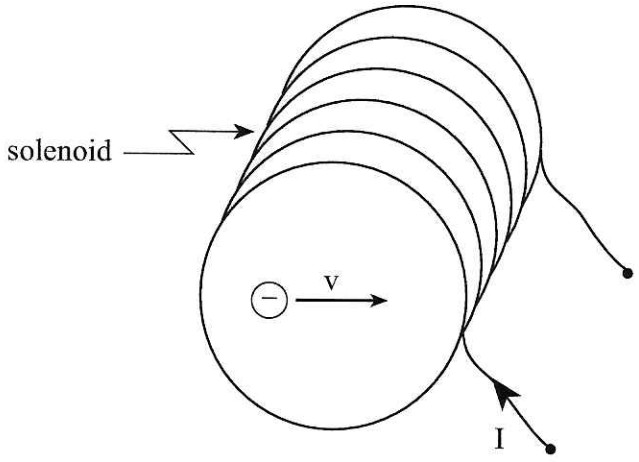
59. Charged particles having momentum p_1, pass perpendicularly through a magnetic field and their circular path has a radius of r. What would the radius be for particles with the same charge having momentum $p_2 = 2\,p_1$?

A. 2r
B. $\frac{1}{2}$r
C. $\sqrt{2}$r
D. $\frac{r}{\sqrt{2}}$

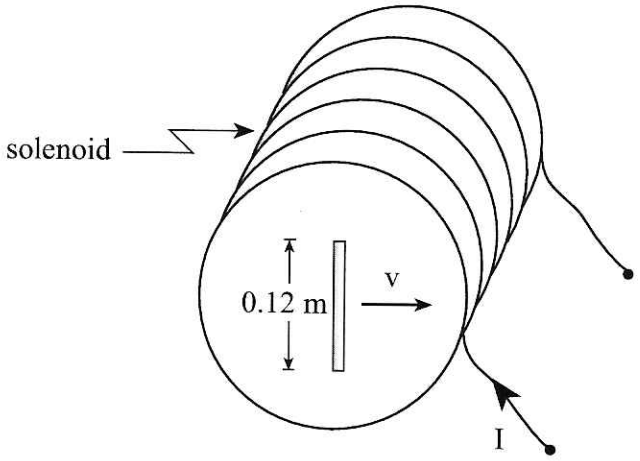
1. What is the magnitude and direction of the magnetic force on the L-shaped conductor? **(7 marks)**



2. A 0.400 m long solenoid has 6 720 turns of wire. A current of 14.5 A flows in the solenoid. An electron inside the solenoid travels perpendicular to the axis of the solenoid with a speed of 6.50×10^5 m/s . What is the magnitude and direction the magnetic force acting on the electron? **(7 marks)**



3. A solenoid of length 0.85 m has a radius of 0.10 m . A current of 25 A flows through its 7 600 turns. Within this solenoid, a 0.12 m wire moves as shown and develops an emf of 0.055 V across its ends.



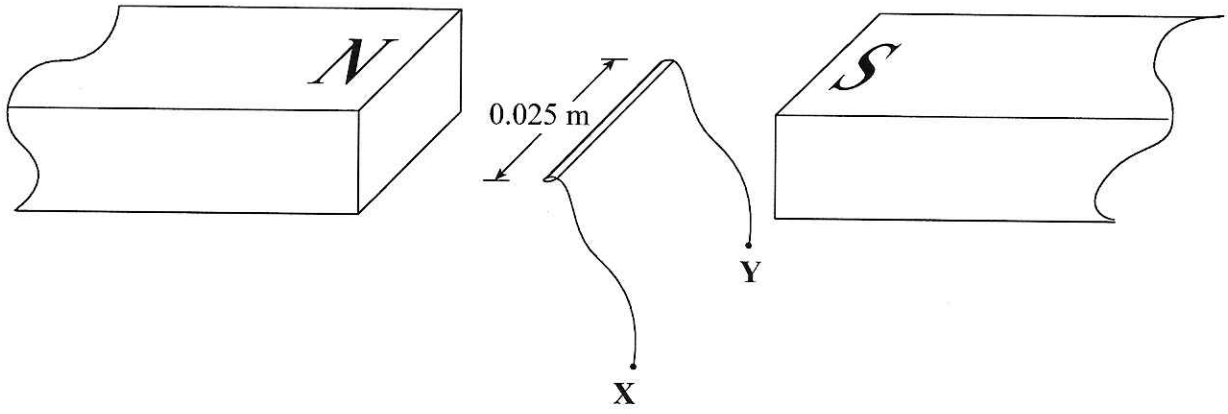
a) With what speed does the wire move perpendicular to the solenoid's magnetic field? **(6 marks)**

b) Which end of the wire becomes positively charged? **(1 marks)**

4. Electrons accelerated from rest through a potential difference of 300 V enter a 4.1×10^{-2} T magnetic field at right angles. What is the radius of curvature of the path taken by the electrons?

(7 marks)

5. A 0.025 m wire segment is positioned in a 0.75 T magnetic field as shown in the diagram below. When a current is passed through this wire segment it experiences a 0.20 N force upwards.



a) What is the direction of the current? (Circle one.) **(2 marks)**

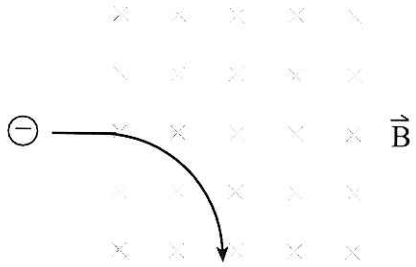
From **X** to **Y** From **Y** to **X**

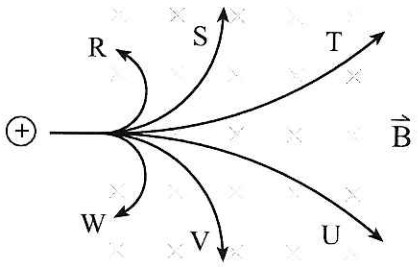
b) What is the magnitude of the current? **(5 marks)**

6. a) A 16.0 V power supply is used to run a dc motor. When the motor is jammed so that it cannot turn, it draws a current of 12.0 A. What is the back or counter emf when the motor runs freely, drawing a current of 2.50 A? **(5 marks)**

b) Using principles of physics, explain why the motor draws a much higher current when jammed than when running freely. (4 marks)

7. An electron travelling at a high speed enters a magnetic field as shown. A proton travelling at the same speed then enters the magnetic field.

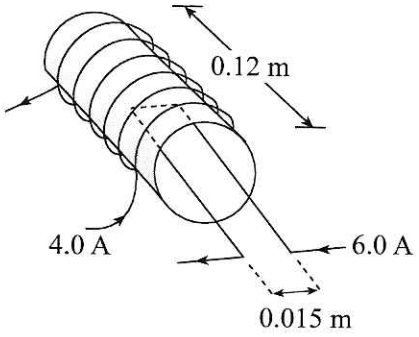




a) Which of the six choices best illustrates the path the proton will follow? **(1 mark)**

b) Using principles of physics, explain why the proton takes the path selected in a). **(3 marks)**

8. The diagram below shows a 650-turn solenoid carrying a 4.0 A current.



What is the magnitude of the magnetic force on the 0.015 m segment of wire carrying a 6.0 A current inside the solenoid as shown? **(7 marks)**