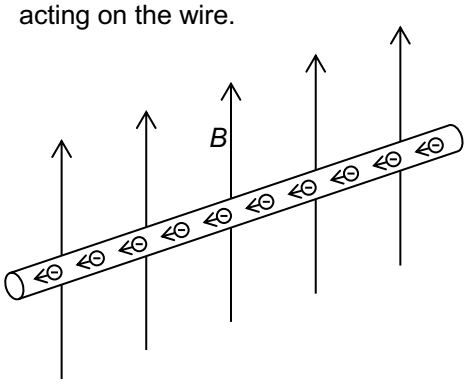
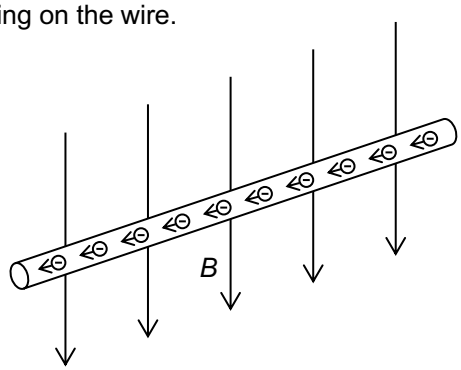
1. Make use of the „three-finger rule“.

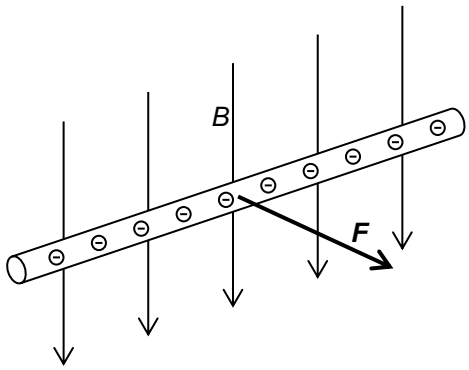
a) Draw the direction of the magnetic force acting on the wire.



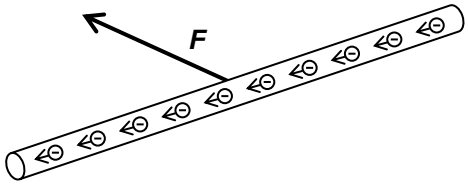
b) Draw the direction of the magnetic force acting on the wire.



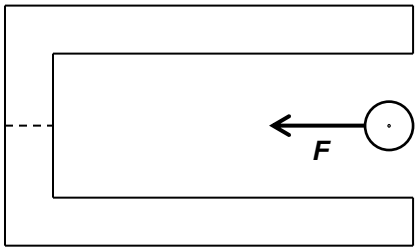
c) Draw the direction of the electron motion.



d) Draw the direction of the magnetic field lines.

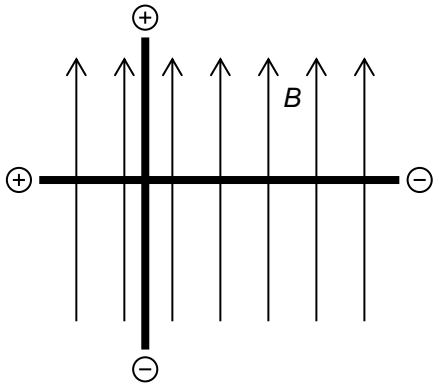


2. A current-carrying wire between the poles of a horseshoe magnet experiences a force to the left. The electrons in the wire are moving towards you (out of the paper).
Label the poles of the horseshoe magnet as S (south) and N (north).

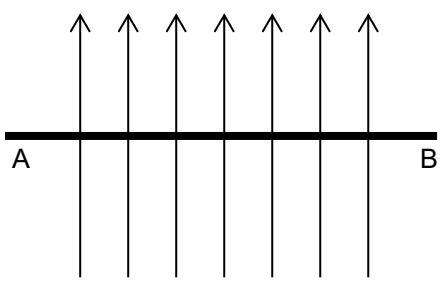


3. Here are current-carrying wires in various magnetic fields. The magnetic field lines are depicted as follows: → Magnetic field lines parallel to the paper, ⊗ magnetic field lines perpendicular to the paper (pointing away from you). The wires are depicted as ▬.

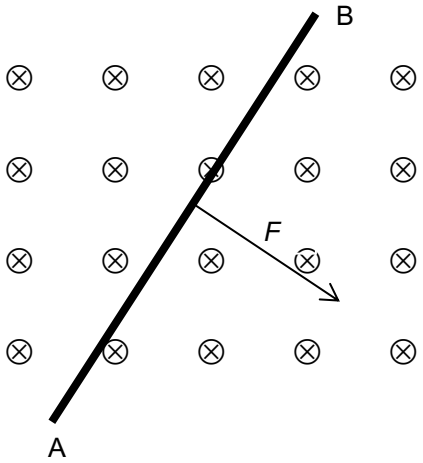
a) Draw the direction of the magnetic force acting on either wire



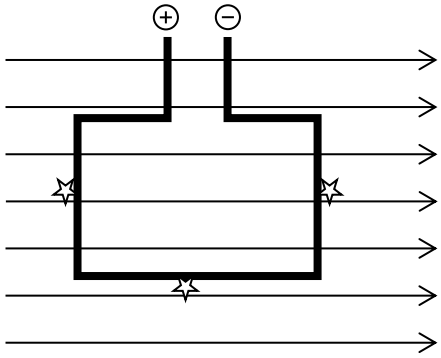
b) Here the direction of the force on the wire is acting away from you (into the paper). Label the poles of the wire (as plus and minus).



c) Label the poles of the wire (as plus and minus)

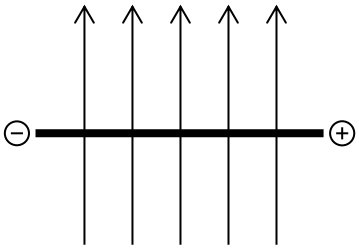


d) Draw the direction of the magnetic force on the wire at the points labeled with ☆.

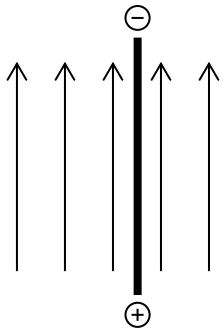


4. For a) to c) please answer the following question:
   - What is the direction of the magnetic force on the wire?
   - What is the magnitude of the magnetic force on the wire?

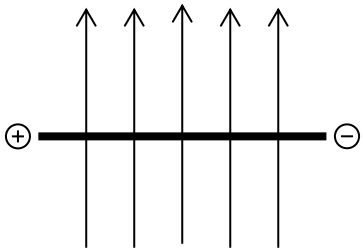
a) B = 0.050 T; I = 3.5 A, s = 9.0 cm



b) B = 10 T; I = 3.0 A, s = 2.0 m



c) B = 33 μT; I = 33 μA s = 33 km



5. A current-carrying wire of 4.00 cm length is perpendicular to the field lines of a magnetic field (B = 0.500 T). The force on the wire is 0.200 N.
   What is the current?

6. In Brasilia the magnetic field of the Earth is B = 14.2 μT. The electrons in the train's overhead wire flow form East to West (perpendicular to the magnetic field of the Earth). The current in the wire is 4.40 kA.

a) What is the force acting on a wire of 65 m length?
b) What is the direction of the force?

7. The force on a current-carrying wire (I = 15.5 A) of 3.7 cm length, which is perpendicular to a uniform magnetic field, is 0.34 N.
   What is the magnitude of the magnetic field?

Solutions:
1. a) towards you b) away from you c) away from you d) pointing down
2. N on the top, S at the bottom
3. a) towards you; no magnetic force parallel to the field lines b) A: - B:+ c) A: - B:+
   d) links: nach vorne; unten: keine Lorentzkraft; rechts: nach hinten. Die Leiterschlaufe beginnt sich zu drehen!
4. a) ⊗ (away from you), 16 mN b) no magnetic force c) ⊙ (towards you) , 36 μN
5. 10.0 A
6. a) 4.06 N b) upwards
7. 0.59 T