Section 12.2: Oersted's Discovery

Section 12.2 Questions, page 556

1. (a) The diagram should be similar to Figure 8(a) on page 556 of the textbook. There should be an arrow pointing to the right above the diagram.
(b) The diagram should be similar to Figure 9 on page 556 of the textbook.
2. (a) The diagram should be similar to Figure 8(a) on page 556 of the textbook. There should be an arrow pointing to the right above the diagram.
(b) The diagram should be similar to Figure 8(a) on page 556 of the textbook. There should be an arrow pointing to the left above the diagram.
(c) The diagram should be similar to Figure 5(b) on page 555 of the textbook. Students should draw a large dot in the centre of the conductor.
3. The student's diagram is inaccurate because the concentric circles are equally spaced. The spacing of the concentric circles represents the strength of the magnetic field around the conductor, so they should be drawn farther apart as they move away from the wire to represent the weakening magnetic field.
4. If I use the right-hand rule, the conventional current model would be used. The diagram would not change, since it shows the conventional current directed into the page and the magnetic field lines directed clockwise around the conductor.
If I use the left-hand rule, the electron flow model would be used, so the diagram would change. The current would be directed out of the page, so the conductor in the diagram would have a dot instead of an X. Using the left-hand rule, if your left thumb points in the direction of the current, which is out of your page, then your fingers will curl around the conductor in a clockwise direction. This is the direction of the magnetic field lines, so their direction in the diagram would not change.
5. If the compass displays north when travelling east under the wire, the magnetic field lines must be in the east direction underneath the wire. Using the right-hand rule, for the magnetic field lines to be in the east direction underneath the wire, the conventional current must be flowing south in the wire.
6. I can control whether the magnetic field is on or off by starting or stopping the electric current. I can control the strength of the magnetic field by increasing or decreasing the electric current. And I can control the direction of the magnetic field by changing the direction of the electric current.
7. (a) The conventional current is pointing to the left so, using the right-hand rule, my thumb would point to the left and my fingers would curl around the conductor from above. My fingers represent the magnetic field lines, and they show that the direction of the magnetic field is through the compass from south to north, so the compass would point north.
(b) The conventional current is pointing to the left so, using the right-hand rule, my thumb would point to the left and my fingers would curl around the conductor from above. My fingers represent the magnetic field lines, and they show that the direction of the magnetic field is through the compass from north to south, so the compass would point south.