Solenoid Invention Kit
Assessment

Figure 1. Wire disconnected from a battery, over a compass.

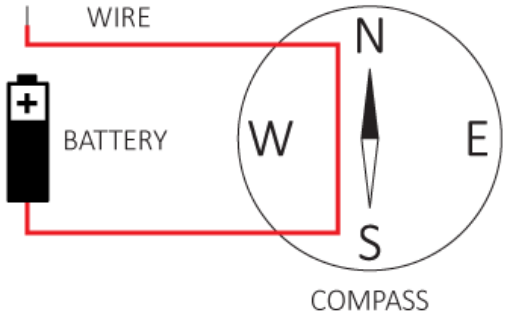
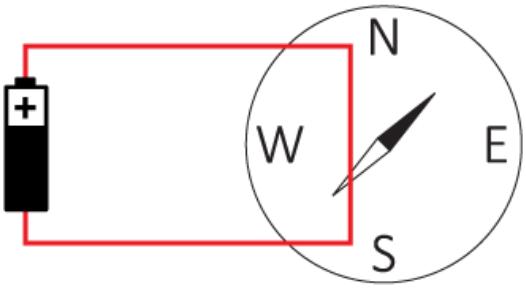


Figure 2. Wire connected to a battery, next to a compass.



Question 1 (multiple choice): What is the best explanation of why the compass needle moved?

A. The battery becomes magnetic when the circuit is closed.
B. Electric current flowing through the closed circuit creates a magnetic field.
C. The closed circuit creates electrical energy.
D. The compass needs the battery connected to be turned on.

Question 1 (long response): Explain as best you can why the compass needle moved.

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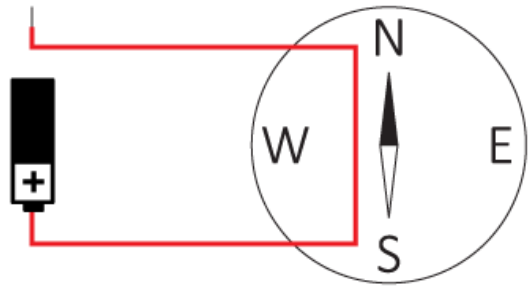
Figure 3. Wire disconnected from a battery, over compass.



Question 2 (multiple choice): Refer to Figure 2. If the orientation of the battery is changed to that shown in Figure 3, which direction will the black side of the compass needle point when the wire is connected to the battery?

A. The circuit will not work, so it will point north.
B. It will still point to the northeast.
C. It will point in the opposite direction, southwest.
D. It will point northwest.

Question 2 (long response): How does reversing the orientation of the battery affect the deflection of the compass?

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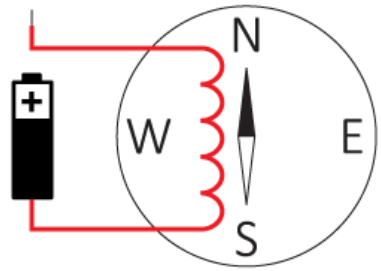
Figure 4. Coil of wire connected to a battery next to a compass.



Question 3 (multiple choice): Refer to Figure 2 and Figure 4. Assume the length of the coiled wire is equal to the length of the straight wire. Once the coiled wire is connected to the battery, how will the deflection of the compass needle compare to the deflection shown in Figure 2?

A. They should deflect the same because there is the same amount of current flowing through the wire.
B. The needle deflects more with the coiled wire because the magnetic field generated is more concentrated.

C. They should deflect the same because there is the same length of wire.
D. The needle deflects less with coiled wire because it is harder for the electricity to flow through the wire.

Question 3 (long response): Explain why coiling the wire results in a greater deflection of 6. the compass needle.

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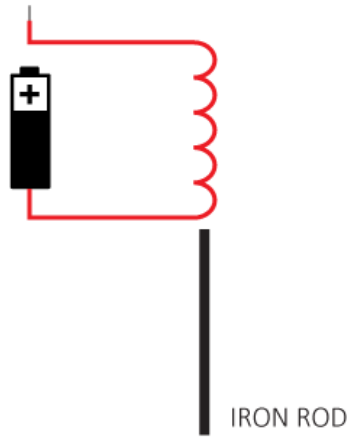
Figure 4. Iron rod next to coil of wire disconnected from battery.



Question 4 (multiple choice): What will happen to the iron rod when the coiled wire is connected to the battery?

A. The iron rod will be pulled into the coil.
B. The iron rod does not move.
C. The iron rod will be repelled by the coil.
D. The iron rod will either be repelled or attracted to the coil depending on which pole of the rod is facing the coil.

Question 4 (long response): What will happen to the iron rod when the circuit is switched 8. on? Explain why.

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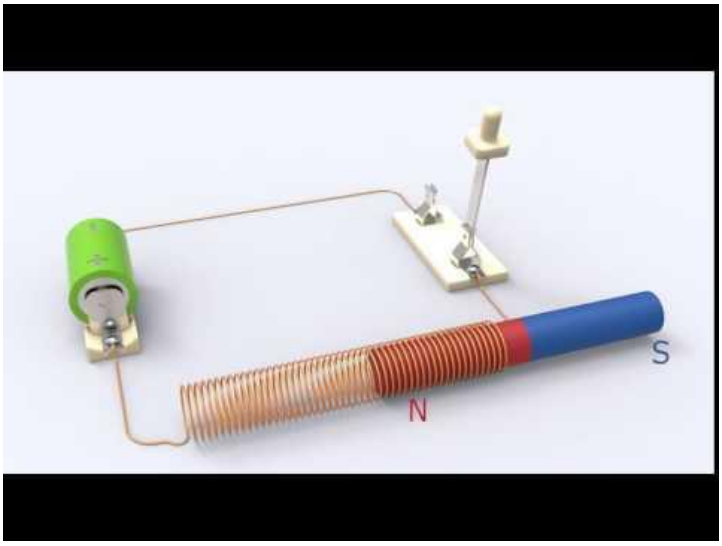
Video 1. Click on the video to play the animation.



Question 5 (multiple choice): Select the best explanation for what was observed in the animation.

A. Permanent magnets are repelled by copper.
B. The pole at the end of the coil closest to the permanent magnet is south.
C. Permanent magnets are always repelled by a coil of wire with an electric current flowing through it.
D. The pole at the end of the coil closest to the permanent magnet is north.