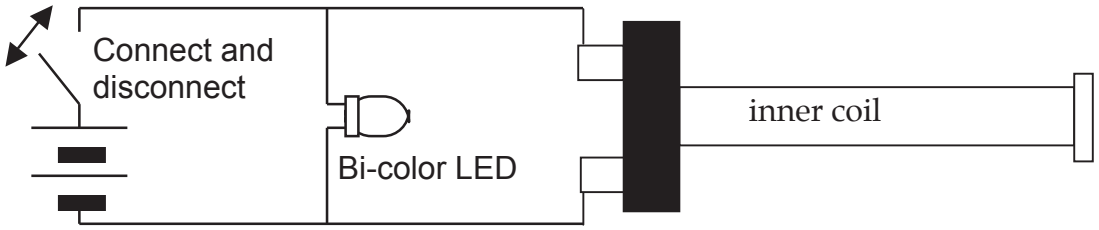
Homework Questions
Section 12

1. Describe an experiment that could allow us to conclude that a signal (such as that picked up by a radio) is produced when charge is changing speed.

2. Referring to the following diagram, describe the behavior of the LED: (a) during the first moment of connection, (b) during steady state, and (c) during disconnection. Explain the reasons for the behavior at each stage.

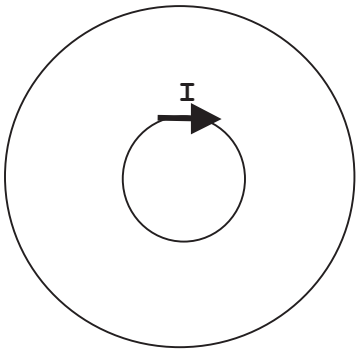


a)

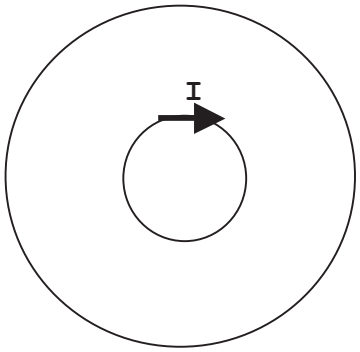
b)

c)

3. Consider the following two diagrams. The direction of the current I in the inner coil is given for both situations. In one, the current is increasing, and in the other the current is decreasing. For each diagram, draw and label direction of charge acceleration a, and the direction of the opposing field E. Also draw the direction of the current in the outer coil caused by the radiated field.



Current direction is shown in the inner coil, and the current is increasing.



Current direction is shown in the inner coil, and the current is decreasing.

4. The hand and finger configuration that is used to depict the magnetic field around a current carrying wire can also be used for the magnetic field in a current-carrying coil, but the thumb and fingers mean different things in each case.

a. What do they represent for a wire? for a coil?

b. Which of the two configurations would be most likely associated with the field of a bar magnet? Explain.

c. Using your answer for part b, what would be most likely pattern for the movement of charge that produces the field in a bar magnet? Explain.

d. Where might be the moving charge be in a bar magnet?

a)

b)

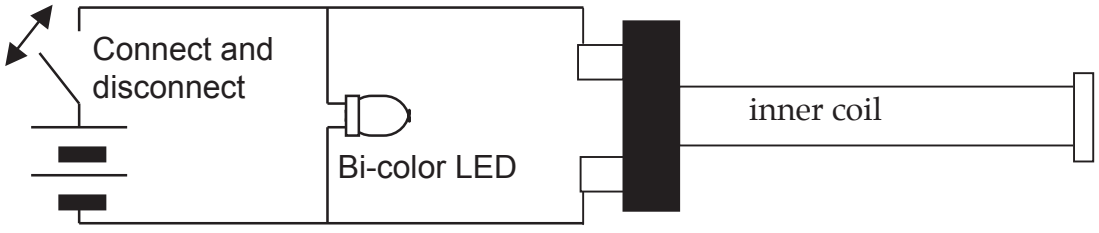
c)

d)

5. If an iron rod is not magnetized, how can it become magnetized?

6. Suppose the needle of a compass has reversed polarity. How could you correct the polarity?

7. When the battery is disconnected from the circuit below, the LED blinks. Where do you think the energy comes from to light the LED? Explain your reasoning.



8. Electric and magnetic fields are different. The following is a list of objects that we would like to be able to move without touching them by using a magnet or charged object.

a. Paper versorium
b. Magnetized iron rod that can rotate
c. Positively charged plastic strip
d. Negatively charged plastic strip
e. Uncharged cotton ball
f. Aluminum wire carrying a current
g. Short straight piece of copper wire.
h. Positively charged metal plate
i. Negatively charged metal plate

Suppose you have a magnet, and you also have a positively charged plastic strip. Which of the above could be moved by:

(1) either the magnet or the strip
(2) only the strip
(3) neither the magnet nor the strip
(4) only the magnet

Be ready to defend your answers.

9. In the previous question (#8) we looked at some ways electric and magnetic fields were different. What are some ways they are similar?

10. What is meant by 6V-DC? What is meant by 6V-AC?

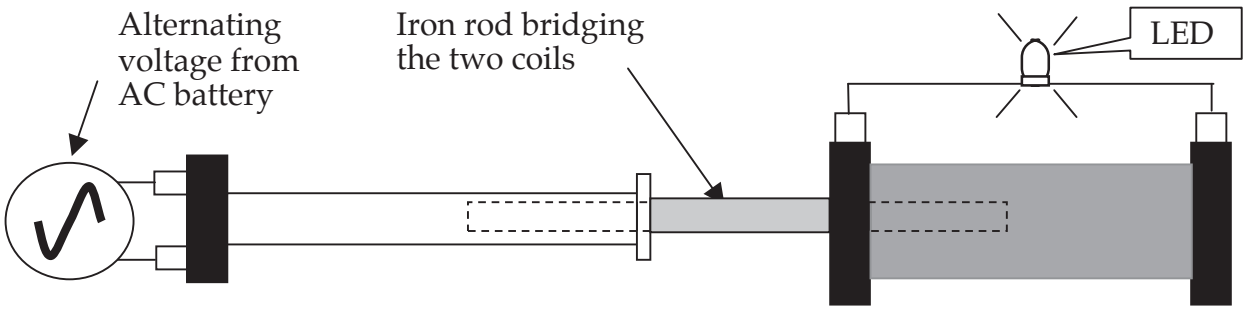
11. Categorize each of the following as AC, DC, or variable DC.
    a) Steady flow rate; 3V steady voltage
    b) Voltage is always positive, but varies between 1V and 4V.
    c) Voltage varies between -2V and +2V.
    d) Voltage is always negative, but varies between – 1V and – 4V.

12. A diode bridge along with other devices can be used to convert AC into DC. A device called an inverter turns DC into AC. It uses a DC input to the inner (primary) coil of a transformer, and gets an AC output from the outer (secondary) coil. How can this be accomplished?

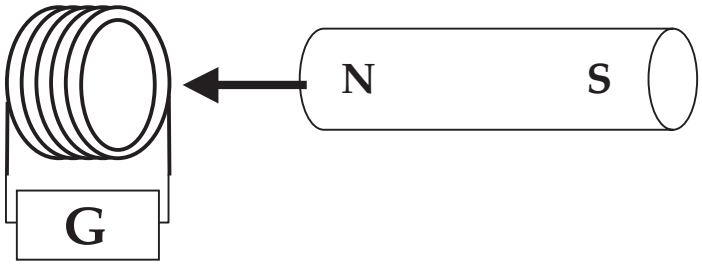
13. Explain the logic behind the construction of a step-up transformer.

14. Explain the role of iron in a transformer.

15. In the following diagram, an iron rod is bridging the gap between the inner and outer coils of a transformer. None of the curly E radiated from the inner coil passes through the turns of the outer coil. So, how is the LED attached to the outer coil able to light?



16. Refer to the following diagram; the coil is on the plane of the page, and the magnet is going into the coil (into the page). a) If the magnet moves as shown, in which direction would charge flow around the coil?



b) Whenever there is a change in some physical quantity, there is always something to oppose the change. What opposes the motion of the magnet into the coil?

a)

b)

17. a) In your own words, what is meant by the term "electromagnetism"?

b) Give some examples of how electromagnetism can be useful to us.

a)

b)

18. It was earlier stated that AC was necessary for transformer operation. Would a variable DC input work as input for a transformer? Explain.