Faraday Law Induction

Learning Goals:

Students will be able to:

- Identify equipment and conditions that produce induction
- Compare and contrast how both a light bulb and voltmeter can be used to show characteristics of the induced current
- Predict how the current will change when the conditions are varied.

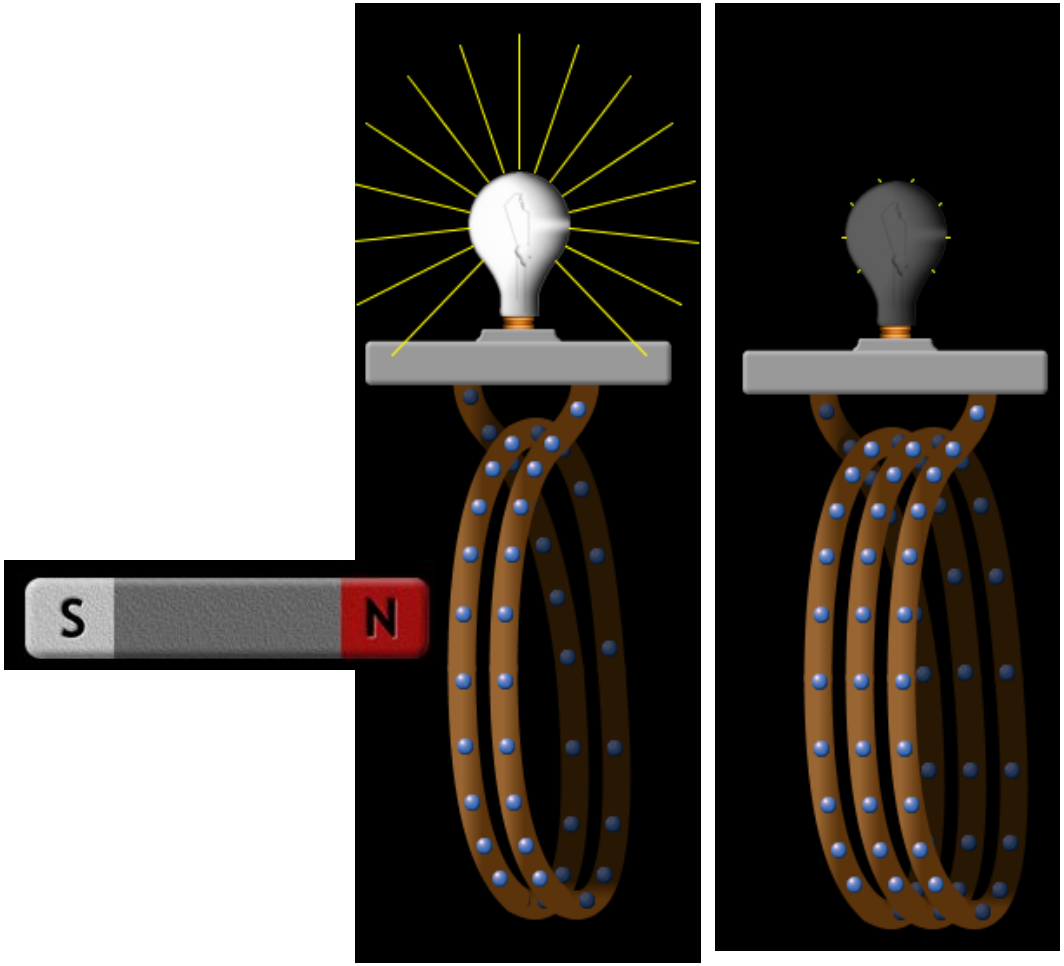
By Trish Loeblein

What would you expect the light to do if you change the coils from 2 to 3 and you move the magnet the same speed?

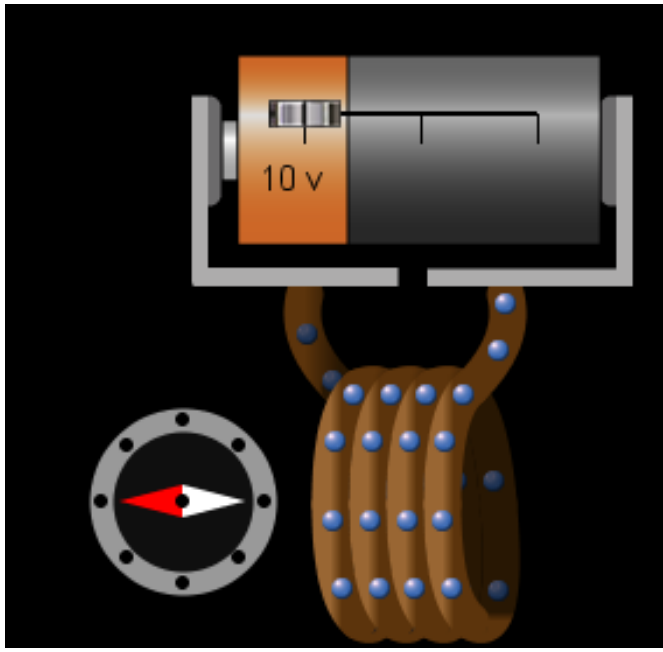
A. Show the same brightness

B. Show less brightness

C. Show more brightness



What will happen if you switch the battery so that the positive end is on the right?



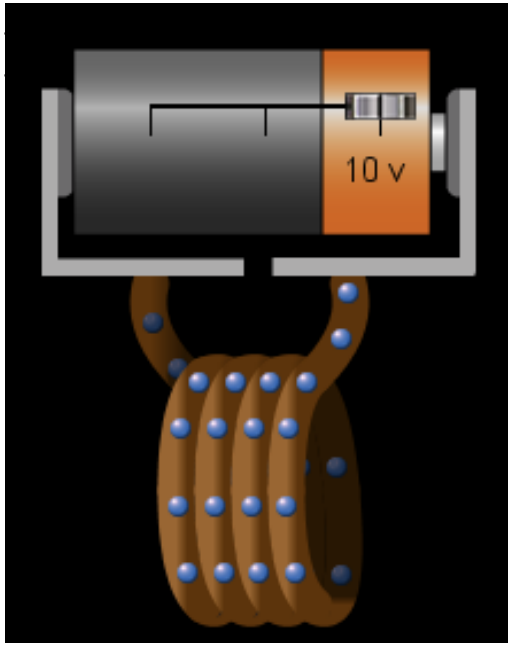
A. The electrons will go faster

B.The electrons will go the slowe

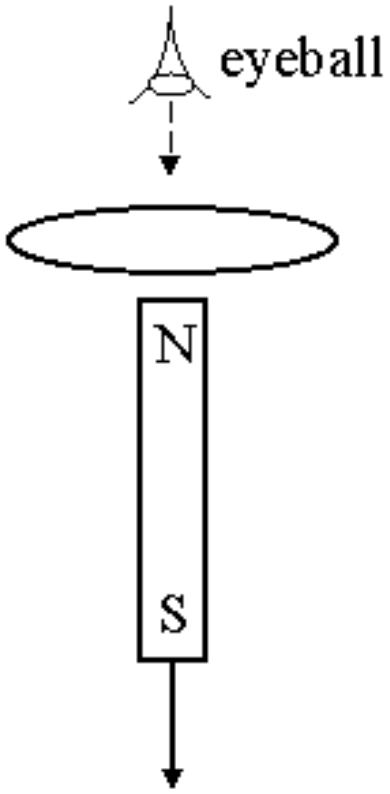
C.The compass will switch directions

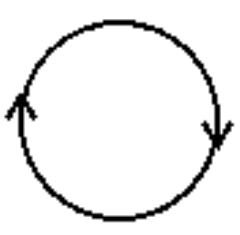
D.The electrons will go the other direction

E.Two of the above.

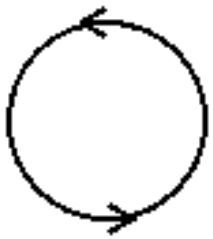


A bar magnet is positioned below a horizontal loop of wire with its North pole pointing toward the loop. Then the magnet is pulled down, away from the loop. As viewed from above, is the induced current in the loop clockwise or counterclockwise?





A) clockwise



B) counter-clockwise

Answer: The B-field from a bar magnet points out of the North pole. As seen from above, the field through the loop is out (toward the observer). As the magnet is pulled away, the flux is *decreasing*. To fight the decrease, the induced B-field should *add* to the original B-field, and also be out (toward the observer). The induced current will be (B), counterclockwise, in order to make an induced B-field out.

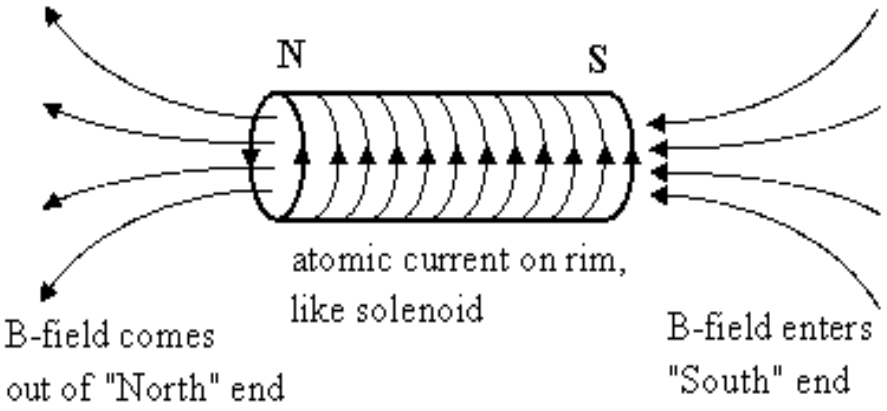
Two bar magnets are brought near each other as shown. The magnets...

A) attract

B) repel

C) exert no net force on each other.

Cool image of magnetic fields on bar magnet



Transformer

You have a transformer with N_p=6 primary windings, and N_s=3 secondary windings, as shown.

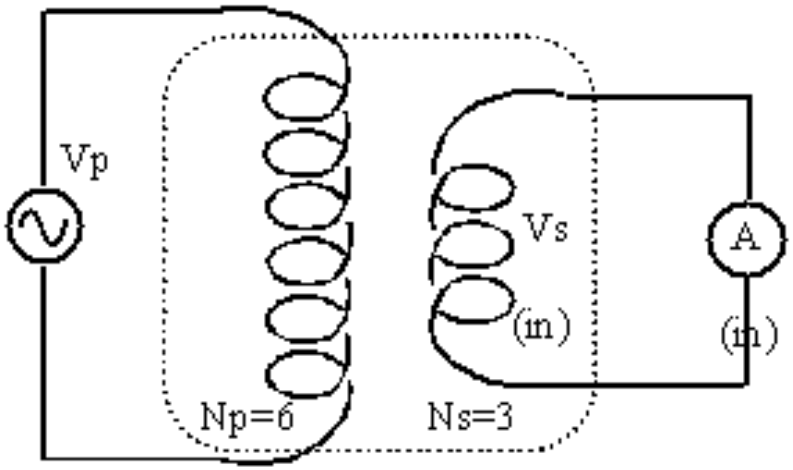
If V_p=120 V AC, what is the current measured by the ammeter "A" in the secondary circuit?

A) 120 A

B) 60 A

C) 240 A

D) Nothing is measured because the fuse in the ammeter blows!



Answer

The fuse in the ammeter blows! The secondary voltage is 60 VAC (it's a step-down transformer). The internal resistance of the ammeter is zero. So the ammeter current is I = V/R = 60 V/(0 ohms) = infinite current. The fuse will blow.

A solenoid is constructed with N loops of wire tightly wrapped around an iron-filled center. Due to budget cuts, the current that ordinarily runs through this solenoid is cut in half. As a result, the inductance of the solenoid is

A. unchanged.
B. quartered.
C. halved.
D. doubled.
E. quadrupled.