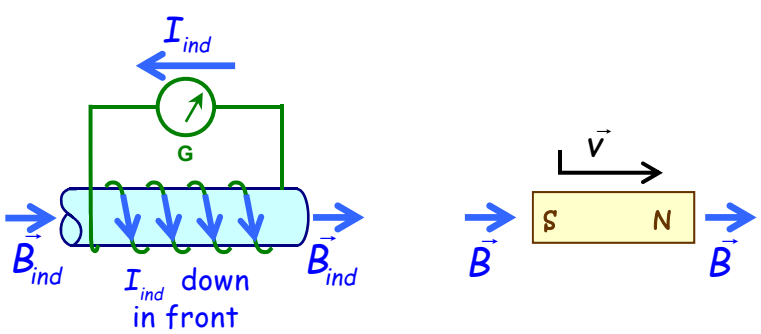
The Laws of Faraday & Lenz – Worksheet

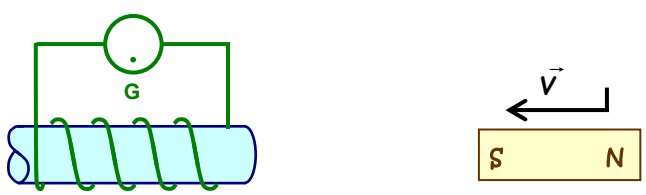
Complete the eight (8) diagrams below for a bar magnetic moving toward and away from each end of a coil. On each draw the following:

- The arrow in the galvanometer as it appeared while the magnet was moving
- The direction of induced current, $\vec{I}_{ind}$ through the galvanometer
- The direction of $\vec{I}_{ind}$ in the front of the coil
- The direction of $\vec{B}$ on both poles of the magnet (labeled arrow)
- The direction of $\vec{B}_{ind}$ on both ends of the coil (labeled arrow)
- Circles on the right indicating the direction of the bar magnet's field, $\vec{B}$, whether the magnetic flux, Φ is increasing or decreasing, the direction of the induced field, $\vec{B}_{ind}$ and the direction of $\vec{I}_{ind}$ through the galvanometer

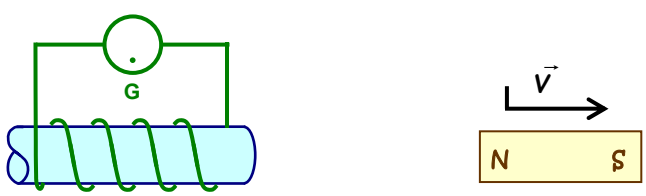
The first diagram, <u>with a south pole leaving the right side of the coil</u>, is drawn for you. **Test this case to make sure your observations agree with the picture**. You must then complete the other seven.



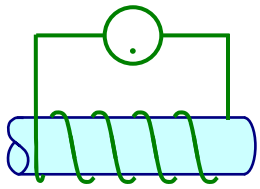
Direction of $\vec{B}$: ← →
Change in Φ: increase decrease
Direction of $\vec{B}_{ind}$: ← →
Direction of I_{ind} in G: ← →

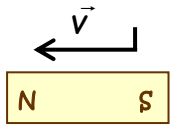


Direction of $\vec{B}$: ← →
Change in Φ: increase decrease
Direction of $\vec{B}_{ind}$: ← →
Direction of I_{ind} in G: ← →



Direction of $\vec{B}$: ← →
Change in Φ: increase decrease
Direction of $\vec{B}_{ind}$: ← →
Direction of I_{ind} in G: ← →



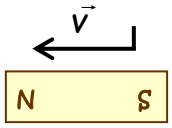


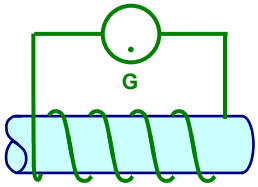
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →



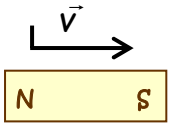


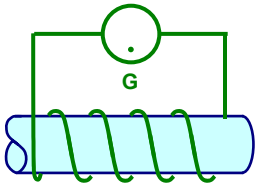
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →



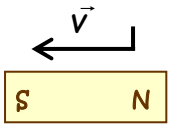


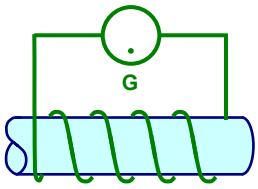
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →



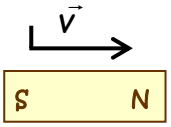


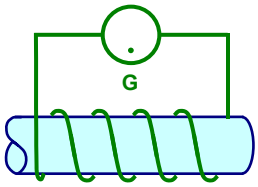
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →





Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

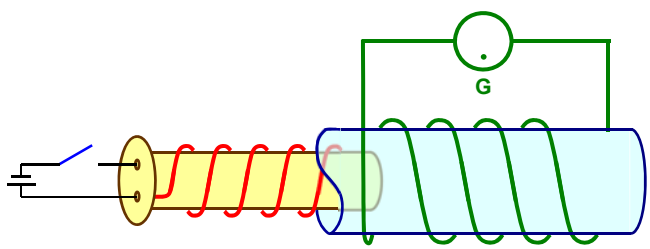
Direction of I_{ind} in G: ← →

Complete the four (4) diagrams below for two coils and a switch. On each draw the following:

- The arrow in the galvanometer as it appeared while the switch was opened or closed
- The direction of $\vec{I}$ in the front of the small (source) coil
- The direction of $\vec{B}$ in the source coil
- The direction of induced current, $\vec{I}_{ind}$ through the galvanometer
- The direction of $\vec{I}_{ind}$ in the front of the large (detector) coil
- The direction of $\vec{B}_{ind}$ in the detector coil
- Circles on the right indicating the direction of the source coil's field, $\vec{B}$, whether the magnetic flux, Φ is increasing or decreasing, the direction of the induced field, $\vec{B}_{ind}$ through the detector coil and the direction of $\vec{I}_{ind}$ through the galvanometer

Complete all four diagrams below.

i) Switch Open



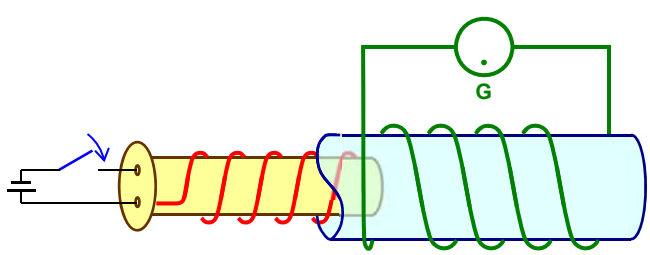
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →

ii) Switch just closed, current begins to flow



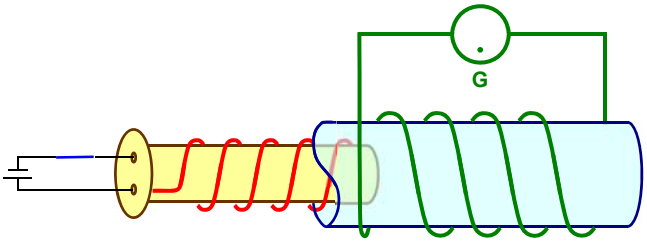
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →

iii) Switch closed, current flowing steadily



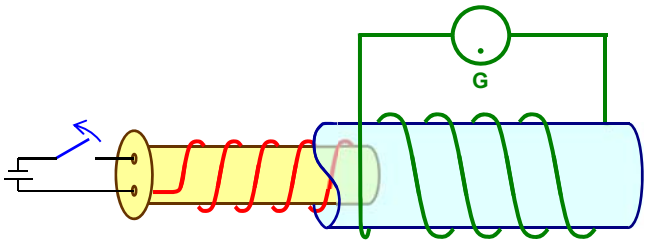
Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →

iv) Switch just opened, current flow ending



Direction of $\vec{B}$: ← →

Change in Φ: increase decrease

Direction of $\vec{B}_{ind}$: ← →

Direction of I_{ind} in G: ← →