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, \( I_{\text{ind}} \), through the galvanometer
- The direction of \( I_{\text{ind}} \) in the front of the coil
- The direction of \( B \) on both poles of the magnet (labeled arrow)
- The direction of \( B_{\text{ind}} \) on both ends of the coil (labeled arrow)
- Circles on the right indicating the direction of the bar magnet’s field, \( B \), whether the magnetic flux, \( \Phi \) is increasing or decreasing, the direction of the induced field, \( B_{\text{ind}} \), and the direction of \( I_{\text{ind}} \) through the galvanometer

The first diagram, with a south pole leaving the right side of the coil, 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 $\vec{B}$:  \[ \rightarrow \ \rightarrow \]
Change in $\Phi$: increase decrease
Direction of $\vec{B}_{\text{ind}}$:  \[ \rightarrow \ \rightarrow \]
Direction of $I_{\text{ind}}$ in $G$:  \[ \rightarrow \ \rightarrow \]
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, $\vec{I}_{\text{ind}}$, through the galvanometer
- The direction of $\vec{I}_{\text{ind}}$ in the front of the large (detector) coil
- The direction of $\vec{B}_{\text{ind}}$ in the detector coil
- Circles on the right indicating the direction of the source coil’s field, $\vec{B}$, whether the magnetic flux, $\Phi$ is increasing or decreasing, the direction of the induced field, $\vec{B}_{\text{ind}}$ through the detector coil and the direction of $\vec{I}_{\text{ind}}$ through the galvanometer

Complete all four diagrams below.

**i) Switch Open**

![Diagram](image1)

- Direction of $\vec{B}$: ↔ →
- Change in $\Phi$: increase decrease
- Direction of $\vec{B}_{\text{ind}}$: ↔ →
- Direction of $\vec{I}_{\text{ind}}$ in $G$: ↔ →

**ii) Switch just closed, current begins to flow**

![Diagram](image2)

- Direction of $\vec{B}$: ↔ →
- Change in $\Phi$: increase decrease
- Direction of $\vec{B}_{\text{ind}}$: ↔ →
- Direction of $\vec{I}_{\text{ind}}$ in $G$: ↔ →
iii) Switch closed, current flowing steadily

Direction of \( \vec{B} \): \( \leftarrow \rightarrow \)

Change in \( \Phi \): increase decrease

Direction of \( \vec{B}_{\text{ind}} \): \( \leftarrow \rightarrow \)

Direction of \( I_{\text{ind}} \) in \( G \): \( \leftarrow \rightarrow \)

iv) Switch just opened, current flow ending

Direction of \( \vec{B} \): \( \leftarrow \rightarrow \)

Change in \( \Phi \): increase decrease

Direction of \( \vec{B}_{\text{ind}} \): \( \leftarrow \rightarrow \)

Direction of \( I_{\text{ind}} \) in \( G \): \( \leftarrow \rightarrow \)